Potential Local Impact of Oil and Gas Exploration, Fracking & Extraction in the Wet Mountain Valley

January 22, 2012, 6-7:30 PM
West Custer County Library Community Room, Westcliffe, CO

Co-sponsors:
CSU Extension Service
Custer County Conservation District
Good Old Broads for Wilderness
San Isabel Land Protection Trust
Sustainable Ways
West Custer County Library

Photo: John Fielder
Mineral Development in Custer County

- Natural resources of Custer County
- Mineral Development as a land use
- Location of nearby oil & gas wells
- Private property rights & mineral estates

Ben Lenth
Executive Director
San Isabel Land Protection Trust
Mission:
San Isabel Land Protection Trust protects ranch, farm and forest lands, wildlife habitat, scenic views for public enjoyment, and historic resources.
Natural Resources of Custer County

- Water
- Agricultural land
- Minerals
- Wildlife
- Sunshine
- Beauty
- Oil & gas?

How can we ensure the benefits of local resource utilization outweigh the costs?

Do certain land uses improve or degrade our quality of life?
History of Mineral Development

• Silver: 1870 - on, revisited in the 1960s-1970s; lots of silver remains
• Lead, Zinc, Gold, Copper, Molybdenum
• Exploration for other materials
Oil & Gas in Colorado

• First ‘discovery’ of oil was an “Oil Spring” near Canon City in 1860.

• First successful well was drilled in 1881 near Florence. This was second oil field in the US to be drilled.

• At the turn of the century, Florence had grown to 10,000 people with 25 oil companies and 3 refineries.
Energy production: costs & benefits

• Central to the economy and our lifestyles
• “Energy footprint”
• Energy production is diversifying... but every type of energy production has social and environmental impacts.
Gas $97 Billion

Oil $39 Billion

$136 Billion

Estimated Production Revenue ($ Billions)


Courtesy of Chris Eisinger, CGS
Courtesy of Chris Eisinger, CGS
Mineral Rights

• Split Estate: Any circumstance where rights to the surface and rights to the minerals are owned separately.

• Like any private property right, mineral rights can be bought, sold, leased or encumbered separately from the rest of the property.
Mineral Rights

1. The mineral estate is considered dominant (or co-dominant) to the surface estate; it carries inherent rights to use the surface to find and develop minerals, but

2. the rights of the owner of the mineral estate are limited to areas of the surface that are reasonably necessary to explore, develop, and transport the minerals, which means

3. if there is an existing surface use that would be interfered with, and there are alternatives available by which to recover the minerals, the rules of reasonable use of the surface by the mineral owner may require the mineral owner to adopt an alternative recovery method to accommodate the existing surface use.

4. If there is no alternative means of recovering the minerals, the mineral owner may pursue the only means possible to find and develop the minerals despite the adverse impact on existing surface activities.
Mineral Rights

Extralateral rights:

Mineral mining: A proprietor may follow a vein or lode underneath other properties.

Oil & Gas: A surface owner with intact mineral rights may be required to allow oil or gas to be extracted from under their property ("Forced Pooling"). However, they may prohibit a well site.

• Landowners who are force pooled will receive a royalty interest.
Mineral Rights

The surface owner cannot stop the mineral owner from doing what is reasonably necessary to recover the minerals.

However, the mineral owner cannot negligently or unreasonably use the surface,

and the mineral owner must reasonably accommodate an existing use of the surface.
Mineral Rights in Custer County

Surface ownership:
~40% federal, ~60% private land

~30 to 50% of private lands have split mineral estates

Of those split estates, ~3/4 is held by the federal or state government (Total BLM mineral acres: 255,000; already leased: 809 acres along Custer/Huerfano County border)

~¼ of split estates are held privately, though often in proportional interests

Some ownership obstacles exist to mineral development in Custer County
Fracking

• Today in Colorado, 95% of oil and gas wells are fracked – it is a ubiquitous method in modern oil & gas development.

• Highly water intensive & consumptive

• Less land consumptive than conventional drilling

• Concerns about air & water contamination
Water

• Oil & Gas Development is water intensive
  • 1 well = 11-65 families’ annual use
  • All used and produced water is waste

• Where does the water for drilling and fracking come from?
  • Agricultural dry-up
  • Municipal waste water
Role of San Isabel Land Protection Trust

• Partner with and advocate for landowners through Surface Use Agreements that mitigate impacts
  – e.g. closed loop water systems, limited production facilities, road placement, etc.
  – Hold energy companies to higher standards of well placement, monitoring & restoration

• Protect agricultural productivity and scenic beauty while allowing for extraction
  – “Limited, localized, concealed, & not irremediably destructive of conservation values”
Hard Rock Mining

Higher potential exists for new hard rock mining in the Wet Mountain Complex of Custer & Fremont Counties

Known deposits of Silver, Thorium, other lanthanides (rare earth elements)

New technologies and evolving markets will dictate the viability of all extraction – activity may begin within a decade

One current silver project in Silver Cliff – Corazon Gold Co. – 2011 purchase of 35 unpatented mining claims
Thank you!

Next: Sue Pitman
President, Sustainable Ways
Fracking 101

Source: Weston Wilson, EPA (retired)
What is Slickwater Horizontal Hydraulic Fracturing?

(Hydraulic Fracking injects water into oil & gas bearing strata mixed with sand and chemicals under high pressure to cause the release of oil and/or gas)

“?” And red marks indicate POSSIBLE sources of unintended environmental impact

Source: HydroFrac.png
Wikipedia
Fracking Fluid

Contains mostly water and sand

Also chemicals (some trade secret) including:

Surfactants
Gelling agents
Scale inhibitors
PH adjusting agents
Iron controllers
Corrosion inhibitors
Biocides
Friction reducers
Acids
Crosslinkers
Clay control agents

Sources: Colorado Geologic Survey & Hydraulic Fracturing Fluid Product Component Information Disclosure for Pathfinder C 11-12 1HZ well in Fremont County on 10/30/2012
Pit Chemicals detected in six drilling reserve pits in the San Juan Basin of northwestern New Mexico and the Permian Basin of southeast New Mexico

- 1,2,4-Trimethylbenzene
- Iron
- Uranium
- 1,3,5-Trimethylbenzene
- Isopropylbenzene
- Zinc
- 1-Methylnaphthalene
- Lead
- Oil and Grease
- 2-Butanone
- m+p-Xylene
- Radium
- 226
- 2-Methylnaphthalene
- Manganese
- Radium
- 228
- 3+4 Methylphenol
- Mercury
- Chloride
- 3+4
- Methylphenol
- Mercury
- Chloride
- Acetone
- Methylene
- chloride
- Sulfate
- Arsenic
- Naphthalene
- Barium
- N-Butylbenzene
- Benzene
- N-Propylbenzene
- Benzo(a)pyrene
- O-xylene

Why is Fracking Controversial?

Opens pristine lands to oil & gas development

With associated impacts to the landscape, wildlife, and air and water pollution impacts

Drilling activities on Colorado’s Western Slope - Garfield County

Source: http://www.endocrinedisruption.com/chemicals.photos.php
Why is Fracking Controversial?

- Takes LOTS OF WATER - up 5 million gallons of 100% consumptive water for each fracking event

- Not enough water in Western USA even without oil and gas development

- Annual Water Requirements for Fracking in Colorado: 22,100 to 39,500 acre-feet (AF) - Enough water for 66,400 to 118,400 homes in Colorado

In Colorado, trucks haul fluids over 100 miles one-way into Utah on Interstate 70 (where the speed limit is 75 mph) to a large open pit facility.


http://www.endocrinedisruption.com/chemicals.photos.php

http://www.westernresourceadvocates.org
Why is Fracking Controversial?

- Potential surface and well water contamination from hazardous waste fluid spills and leaking open pits
- Damage to roads from truck transportation of large quantities of fresh and tainted water

Is your mineral estate intact?

→ Check County Assessor’s Map

- Single oval - you own both surface and mineral rights

- Double oval – Someone else owns mineral rights (“split estate”)
• → Check County Assessor’s Map
Ownership record list is on a separate notebook in Assessor’s Office

- Ownership is identified by the number appearing in the ovals on the map
What Planning Commission can “address” in a Special Use Permit

- Dust
- Drill operation hours
- Man camps (through sanitation and septic regulations)
- County Road usage, including dust mitigation
- Require a bond
- Require a hazard plan

Source: Jackie Hobby, Custer County Planning & Zoning
Possible Additional County tools to Mitigate Impacts of Energy Development

• Appoint LGD (local government designee) to Colorado Oil & Gas Conservation Commission

• Provide for BOCC oversight of likely new Hard Rock Mining in Updated Zoning Resolution

• Adopt Oil and Gas Regulations similar to those in LaPlata County after the zoning resolution update is completed

• Adopt 1041 protections for water and mining
Thank you!

Next: Gary Ziegler

Photo: John Fielder
The Geological History of Custer County

Four Billion Years in 10 minutes

Gary Ziegler archaeologist and geologist in residence at Bear Basin Ranch
1) The first 2 billion years - uplifts, erosion and subsidence?

2) 1.8 billion years - old sediments and igneous rock metamorphosed below the surface by heat and pressure.

4) 450 million years - seas covered Colorado - thick limestone deposited. (Pennsylvanian - Mississippian)

3) 300 million years - Ancestral Rockies formed then eroded way by rivers and shallow seas. Uplifted highlands and shallow seas continue (dinosaurs - Triassic, Jurassic)

5) 150 million years - Beginning of the hydro-carbon forming Cretaceous - shallow seas, tropical forests.

6) 30 million years - Laramide orogeny begins - uplifting of the Sangres and Wet mountains - subsidence of inter-montane valleys - filling with breakdown material begins.

7) 1.8 million years - Ice age glaciers and rivers shape the current land.
Colorado during the Cretaceous oil and gas deposits formed.

- Oldest rocks: Island arcs collide with ancient continent to north, rocks metamorphosed to gneiss; granite plutons invade the crust.
- Uplifts and unconformities: Paleozoic seas cover the land after erosion removes older rocks; Paleozoic rocks exposed to weathering and erosion.
- Ancestral Rockies: Gondwana collides with Laurussia; Central Colorado trough subside, fills with sediment; red beds form.
- Laramide orogeny: Plate collision uplifts and compresses the crust; Raton basin subsides, fills with sediment.
- Volcanic eruptions fill paleovalleys.
- Rio Grande rift, Sangre de Cristo Mountains rise; Wet Mountain and San Luis Valleys subside.
- Ice ages: glaciers carve the present mountains.
The unique geological structure of the Wet Mt. Valley
A narrow, deep, subsided basin enclosed by faulted, parallel uplifted mountain ranges
The Valley aquifer is replenished by snow melt and streams descending the east-sloping strata of the Sanges.

The Promontory Divide separates the Valley from the geological different Huerfano Basin.

A high point volcanic escarpment creates a natural barrier.
Economically recoverable oil and most gas deposits in Colorado have been extracted from sedimentary formations of Cretaceous age. These are missing in Custer County except along the far eastern edge.

Horizontal sedimentary formations have been bent up, faulted and destroyed by contact with the recent uplifting of much older, metamorphic rock of the Wet Mountains near Wetmore. In this view the later Niobrara and Pierre formations are missing creating an "unconformity".

Only a few million years of geological events have gone astray...
Conclusion

1) There is very little possibility of oil / gas exploration or production here based upon the geology. No wells have been drilled and no leases are recorded.

2) Production and exploration in the Huerfano Basin does not directly threaten pollution of the geologically protected and enclosed Wet Mountain Valley aquifer.

Gary Ziegler, Fellow, Royal Geographical Society and “Distinguished Lecturer” at NASA Marshal Space Center, 2013
Next: Zack Owens
Alliance for a
Sustainable Colorado

Photo: John Fielder
About the Alliance for Sustainable Colorado

• Our mission is to engage non-profit, business, government and education leaders in collaboration to overcome complex sustainability challenges with 360-degree solutions. The Alliance acts as a hub to guide collaboration, facilitate change, and improve decision-making in order to move the State of Colorado toward a truly sustainable future.
Our Programs

• Statewide Sustainability Network
• Colorado Sustainability Collaborative
• Education & Outreach
• Roundtables & Events
• Policy Advocacy
• Sustainable Business Network
• Alliance Center
Policy & Legislation

- 9th Annual Legislative Briefing on Friday, February 22
- See bills we are currently keeping our eyes on:
  - [http://www.sustainablecolorado.org/programs/policy](http://www.sustainablecolorado.org/programs/policy)
  - SB13-003 Coal Mine Methane Gas Capture
- Policy advocacy efforts through Sustainable Ways’ participation in the Colorado Sustainability Collaborative
- Coloradoenergynews.com
Colorado Oil and Gas Conservation Commission (COGCC)

- Preliminary approval for new rules to limit the impact of drilling near residences and other occupied buildings:
  - Operators proposing to drill within 1,000 feet of an occupied structure must meet new measures to limit disruptions.
  - Existing setback standards extended to 500 feet statewide.
  - Operators cannot operate within 1,000 feet of buildings housing large numbers of people (hospitals, schools, etc.)
  - Operators must engage in expanded notice and outreach efforts.
Questions?

• Zach Owens
• Education & Outreach Coordinator
• Alliance for Sustainable Colorado
  • 303-572-1536
• education@sustainablecolorado.org
Follow State Legislation

http://www.sustainablecolorado.org/programs/policy
Next: Jeff Briggs
Citizens for Huerfano County

Photo: Ben Lenth
Anatomy of oil and gas intrusion in Huerfano and Las Animas Counties

Geologically an intrusion is the forcing of igneous rock between or through existing formations. Oil and gas drilling, especially fracking deep shale for natural gas and oil, temporarily intrudes underground to extract product. But first oil and gas companies must obtain entry to the drilling fields by wedging aside regulatory laws and using split estate laws to more easily obtain leases in our state. Split estate laws give priority to mineral rights over surface rights, often owned by two different parties, with the absentee mineral rights owner trumping the rights of the surface dweller-owner.

Slick water fracking began somewhere around 1997. But it wasn’t until oil and gas drilling became exempt from the Clean Air and Water Acts in 2005 that the practice exploded in North Dakota in the Bakken oil field and in the Marcellus natural gas shale areas of the East. Fracking was too dirty to pass those environmental regulations without likely legal challenges but without them energy companies staked a claim to advantage of a clear playing field. Applications for permits to drill here in Colorado have been uniformly approved, now over 50k. That might be because our state regulators at the Colorado Oil and Gas Conservation Commission, for the most part are people who have worked for oil and gas and/or it might indicate that the money poured into the state’s coffers by mineral exploration is the bottom line. Look into it and see what you think.

So although 2012 is now officially recognized as the warmest year on record with all of the top ten warmest years occurring during the last 15 years, very little thought is given to causality by our country and state, which 98%-99% of all earth scientists attribute in great part to human burning of fossil fuels. A wise approach might suggest that fracking for oil and gas be done as safe and efficient and be at best a bridge to a more sustainable, unpolluting, and conservation based energy technology.

But that hasn’t been our experience south of you. Coalbed methane extraction from 2000 forward has wreaked havoc in Las Animas and Huerfano Counties producing a cancer cluster on the Apishapa River, destroying agricultural fields on the Consetino ranch east of I-25, and ruining drinking water for homes at River Ridge east of La Veta and other places throughout the area. Now we are faced with deep shale drilling and the likely fracking that goes with it.

What follows is a deep map of how oil and gas development is progressing in neighboring Huerfano county. In 2007-08 Shell Oil began purchasing vast leases. To date they own the leases to around 150k acres, most of that private but also with a good chunk of BLM land. Their landmen ostensibly working for small companies but ultimately linked to Shell worked quietly, minimizing their plans—merely paying rather small amounts of money but enough to intrigue land owners to make what they might have thought was free cash. Shell also began meeting off the record with our county commissioners and the county administrator laying out the possibility of cash flow to the county if exploration led to production. In 2010 one of our commissioners actually leased his own land to Shell altho that did not become public knowledge until after our commissioners voted to approve a first permit to drill the first deep shale fracked well and revised oil and gas regulations.

That first deep natural gas well in Huerfano—the Kluskus, two miles west of La Veta, was approved by the Colorado Oil and Gas Conservation Commission, the state entity housed under the Dept. of Natural Resources, in April 2011. There was no advance notice except through the difficult to access and hard to navigate COGCC website, even tho by law the local government desigee (LGD), our county administrator, was to be notified and the public given 20 days to comment. Inadvertently, some local residents of La Veta discovered the proposed well after the first legal period to comment lapsed and immediately began to explore what was in the works. A citizens group which became Citizens for
Huerfano County quickly organized information meetings and began to delve into the arcane process of well approval. An incomplete application was found along with no official notice to the LGD for the Klikus. Now we check the COGCC website on a regular basis, a requirement for concerned citizens because it is unlikely that you will get that kind of news from any other source.

So the well was on the verge of being drilled and at the last, legal moment CHC decided to sue the COGCC and Shell on 7/4/11 alleging those illegalities. Our reasons were multiple. The application requested an open pit which imperiled the immediate water table and no machinery was required to capture Volatile Organic Compounds, the methane flare that you find lighting the sky on many producing wells. There was a minimum $25,000 bond etc. On top of that we sued because we argue citizens to not have an adequate avenue or 'due process' to comment and be part of the approval or disapproval of drilling permits. And of course, we sued because the COGCC did not even follow their own rules in not notifying the LGD and not requiring Shell to fill out a proper application. The suit has temporarily stopped drilling even the our county commissioners joined the COGCC to fight CHC.
Subsequently, the price for natural gas dropped and Shell decided to not immediately press for drilling allowing the legal process to play out. The lawsuit is still being contested by CHC and the COGCC on those illegal application grounds and on 'due process' issues.

Of course, Shell continues to actively obtain more oil and gas leases acquiring recently six sections just above the La Veta town water supply. And the original Klikus property has been sold to a company called Cimarron out of Oklahoma for a substantively overvalued price that only makes since if there is a substantial return on natural gas production. The general feeling is that we are facing an extended 40 year 'play' in Huerfano County.

At every step of the way our county commissioners serving the 2009-13 term and our county administrator stonewalled and dismissed critical citizen input. The commissioner who leased with Shell even went so far as to say he "didn't know" if he had. At the 6/28/11 public hearing concerning the Klikus application in front of the BOCC over 100 people, including PhD geologists and MD's, testified about health and safety concerns. Each and every one was ignored by the county commissioners as they approved Shell's plan intact immediately with only minor provisions for road repair.

Our county administrator resigned his LGD position in the summer of 2012 when he was asked to petition the COGCC to give citizens another ten days to comment on four additional APD’s for oil wells proposed by Shell, a common legal recourse. He felt that the job was too 'demanding' even though Gov. Hickenlooper and DNR head Mike King have said that the LGD position is crucial to give the public an interface on gas and oil issues. That might be because the LGD is a volunteer position therefore unpaid. This leaves Huerfano County as the only one where there is oil and gas drilling without an LGD.

Recently, Shell has purchased the Thorne Ranch which has the #s 3, 6, and 8 water rights on the Huerfano River. They have been able to divert some of that water for their oil and gas operations by filing and getting approval of a Substitute Water Supply Plan with the State Engineer. In so doing they bypass our state district water court by promising that they will keep historical use levels in the river.
The county through their 1041 regulations must also approve of the plan and have done so for the first year. Shell has to reapply every year but can do this for five years. Changing historical use of water from agriculture to industrial at any time but particularly during this time of drought is a very big deal. Meanwhile we have heard that Pioneer Gas in Las Animas County has a legion of lawyers working to determine that produced water from gas wells should be declared non-tributary which would give the
gas companies ownership of that water. In turn they could sell this water to Shell in our county to facilitate fracking which requires up to 5 million gallons of water per frack. Now Petroglyph, the coalbed methane company that was told to comply with tributary water regulations in Huerfano and left rather than comply, has bought new leases in county possibly hoping that Pioneer will succeed in changing the designation for produced water from tributary to non-tributary. So after over a hundred years of water law that declares just about all of our water tributary a big change is in the works engineered by a vast chunk of legal money from oil and gas companies to further their work.

I should mention that our Planning and Zoning Commission did insist in their conditions of approval for the Klikus permit that there should be a 'forum' where Shell would interact with the citizens of the county. Altho they were opposed by our BOCC the P&Z insisted on this provision and prevailed. Meetings have taken place over the last year with an independent facilitator guiding the discussion. Decisions on procedures, however, are still made by Shell. Interestingly, some of the objections to the original Klikus well have been incorporated on the first oil well, the Freeman, that has now been drilled on the north end of Yellowstone Road. Shell's original open pit has been replaced by a closed loop system and there is now machinery in place to capture Volatile Organic Compounds (VOC's) which were part of the seven safeguards advocated by CHC for oil and gas shale drilling. (Other CHC safeguards include substantial bonds, full disclosure of frack and drilling chemicals 60 days before drilling, and baseline water and air testing within 5 mile radius of well site) We are heartened that Shell voluntarily is changing some of its practices but feel that if we had not been so vigilant and thorough in our requests backed by our lawsuit that they would never have happened.

The greater truths about deep shale fracking—that groundwater can be contaminated as proven by the EPA in Pavillion, WY., that disposable wells where gas and oil wastewater is punched down create earthquakes in Ohio and Arkansas as well as Trinidad, CO also scientifically corroborated by federal scientists, that the air is polluted by gas and oil wells as documented in the town of Erie as well as all of Weld County, CO by NOAA satellite, that the shale itself is naturally radioactive and what comes back up in the fracking flowback is radioactive because it's coming back from that shale, all lead to the question—why aren't these practices more tightly regulated to make them safer?

From what I've said it should be clear that at this point you can only depend on your own vigilance and common sense when it comes to drilling issues in your own back yard. You need to establish lines of communication with your elected officials and if need be apply for those jobs so as to honestly and openly discuss these issues. You need to stay on top of lease activity within your county. It might be wise, as well, to join other citizen groups around the state who have suffered and witnessed the affects of drilling without adequate safeguards in order to be prepared for future gas and oil operations in Custer County. And it might be wise to think through your own use of energy and what a wise energy policy for the planet would be.
Next: Gary Taylor
The exploration process

Photo: Kristie Nackord
The Exploration Process

Regional Studies

1. Strategic Fit
   • Does the area fit the broad strategy?
   • Geography
   • Infrastructure
   • Potential resources

2. Data Quality and Quantity
   • Is the existing data base sufficient?
   • Well data
   • Core / Outcrop data
   • Seismic data
   • Production data

3. Regional Geology
   • What is the overall basin history?
   • Overall basin geology and history
   • Comparison to other basins
The Exploration Process

4. Detailed Geology
- Is there evidence of the basic requirements?
- Reservoir rocks
- Seal
- Source rocks
- Migration timing
- Trap
- Production

5. Lease Potential
- Is there sufficient potential to make a play?
- Competitor activity
- Percentage of acreage available
- Tract distribution
- Average lease size
- Culture / Land use

6. Seismic Acquisition
- Should seismic be acquired?
- Regional seismic (trap indication)
- Detailed seismic (trap definition)
- $ Approve Expenditure
- Plan seismic program and permit
- Shoot and process
- Interpret
- Assess play potential
The Exploration Process

7. **Leasing**
   - Should we lease?
   - $ Approve Expenditure
   - Lease large tracts
   - Lease small fill-in tracts
   - Assess potential of total holdings

8. **Drilling Recommendation**
   - Should wells be recommended?
   - Geology sufficient or additional needed?
   - Seismic sufficient or additional needed?
   - Acreage sufficient or additional needed?
   - Prospects in sufficient number?
   - Economics indicate sufficient potential?
   - $ Approve Expenditure

9. **Prioritize Prospects**
   - Where should the first well be drilled?
   - Technical considerations
   - Acreage considerations
   - Logistical considerations
   - Economic analysis
The Exploration Process

**Drilling**

**10. Drilling Preparation**
- Permit Well (Federal, State, Local regulations and issues)
- Public interface
- Assemble internal team
- Contract rig
- Contract fluids
- Contract logging
- Contract equipment – pipe bits
- Ready site – pad, road, assemble rig

**11. Drill**
- Drill well to objective
- Case and log
- Study cuttings core, shows, logs
- Perforate and production test if potential exists
- Frac well as required
- Test well

**12. Assess Potential**
- Is it economic?
THANK YOU

Photo: Dan Ballard