Home on the Range

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Introduction

In an arid region of Western Wyoming sits the Pinedale Anticline — one of the country's most productive gas fields, situated amid a wildlife habitat and world-class trout fisheries. The majority of this land is managed by the Bureau of Land Management (BLM), which mediates energy demands, wilderness, and preservation needs.[1,2]

This balancing act entails certain commitments and, over time, has solidified relations between the various stakeholders in the region. However, impending and ongoing ecological crises like climate change, the sixth mass extinction, and the collapse of crucial ecosystems are forcing us to call into question the relationships that have structured our environments. For theorist Michel Serres, these challenges demand a new social contract that includes humans, flora, and fauna, where common

legal status is shared equally between all stakeholders. What happens if we apply Serres' "Natural Contract" — that nature is no longer an inert resource for extraction but an active non-human actor – to the Pinedale Anticline? A new conversation emerges, legible in a choreography of the space as it is recast as a dynamic and complex plane of relations.

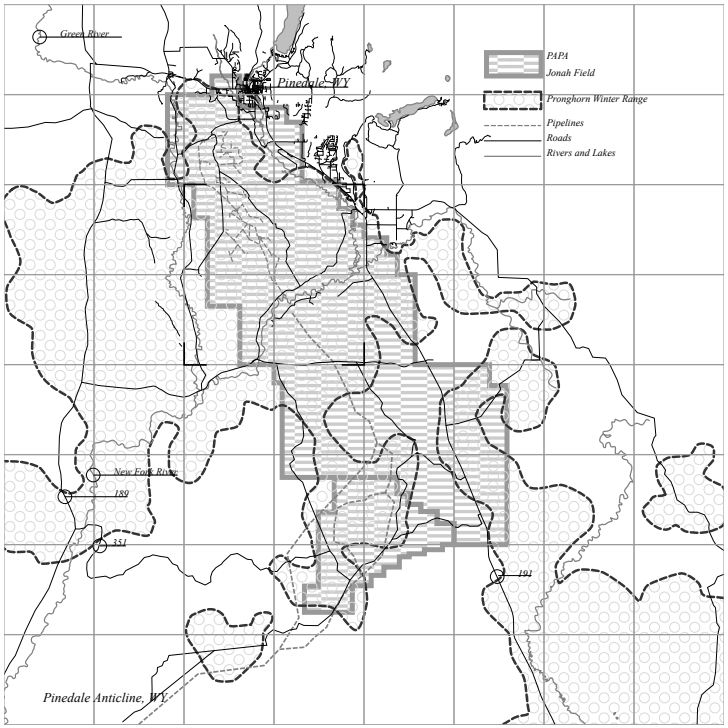


Fig. 1: The PAPA and the pronghorn winter range.

This paper envisions a stage produced by the relationship of two actors: the gas derricks and the pronghorn, both nomadic and migratory. Identifying and spatially representing the roaming characteristics of each enables us to re-imagine the Anticline with new architectural commitments to the relationships between actors.

Geography of Surface Nomads

The region is a border zone between two adjacent communities, and this shared geography constitutes an 'ecotone' [Figure 1]. It is two places in one: the political and subterranean geography of oil and gas derricks create the Pinedale Anticline Project Area (PAPA), while the ecological and meteorological conditions define the pronghorn migration habitat known as the Green River Basin. The edges that rub together in the ecotone can create "new dynamic combinations while also, depending on one's perspective, [inflicting] causalities through habitat fragmentation."[3] The overlap in the Anticline region poses possibilities of safety and threat for each nomad, creating opportunities for coherence.

To understand the ecotone, let's briefly trace the paths of each nomad beginning with the zoomorphic derrick. Subterranean geography accounts for the high number of oil and gas rigs operating in the PAPA. All rigs operate through policies via the BLM that designate the parameters of extraction: density, location, and duration. This organization reflects both the need for derricks to access underground formations and to move within a migration pattern of surface leases.

For the other nomad — 48,000 pronghorn antelope of the Sublette Herd — the Pinedale Anticline is the winter range. Every year, sagebrush and other food resources produced by the rolling ridges and riparian zones attract the herd to this mesa of the Green River Valley. At over 100 miles long, the migration is the largest in the lower 48.[4]

Migration Patterns of Gas Derricks

Below the surface, the PAPA is bounded by wrench faults that define the Upper and Middle Lance Formation at a depth of 5,000 feet [Figure 2]. The derricks are contained

within these formations, and extracting oil and gas requires a special drilling technique called fracking.[5] Important policy changes at the turn of the century created an economic environment that fostered the development and use of fracking inside the Pinedale Anticline.[6] Furthermore, these policies deregulate the liquids used during the drilling process.[7]

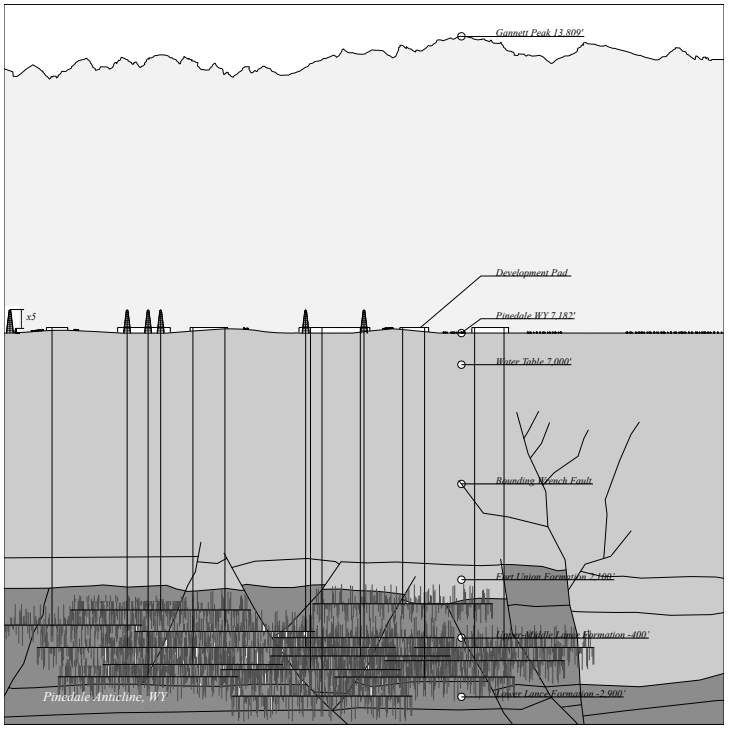


Fig. 2: Oil derricks drilling depth

The proliferation of derricks is primarily controlled by the lease contracts and drilling permits between the BLM and oil and gas companies. Leases determine the time limit and area of operation; drilling permits determine how many wells can be drilled. When compared annually, there is a large decrease in acres per drill permit from 2,453 in 1998 to 231 in 2003.[8] The more than 90% decrease in acreage meant an increase

in density of derricks across the landscape. The shift in policy towards increased density becomes even more apparent when considering the acre per parcel reduction from 40 acres per parcel to 5 acres per parcel in 2002, and the BLM decision to allow infill drilling on existing rigs.

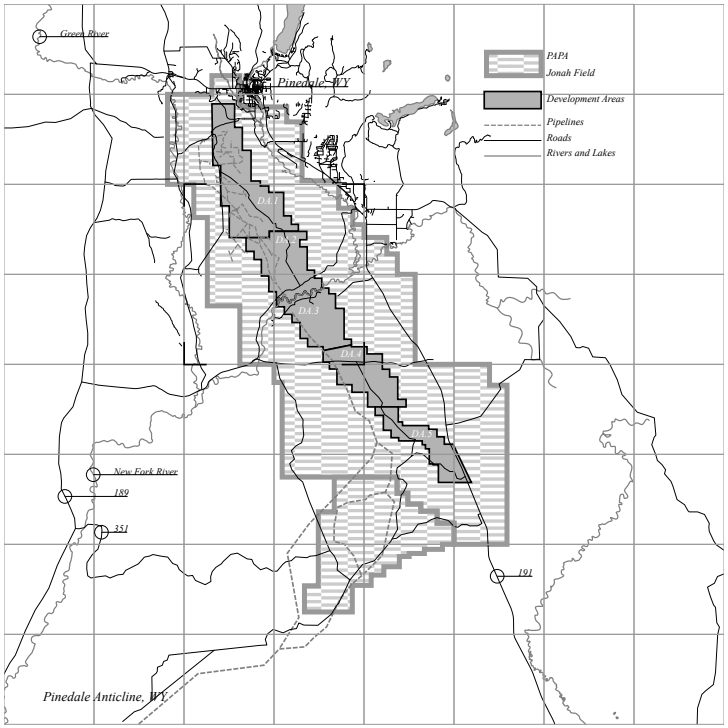


Fig. 3: The PAPA and Development Areas

In 2008, the BLM approved year-round drilling in the field with the stipulation that pronghorn herd populations are maintained during the winter migrations. The derricks were organized into the Development Areas (DAs) we see today to concentrate drilling activity in specific areas [Figure 3]. The DAs allow the derricks to move short distances between drilling pads, which can be connected to one local Liquid Gathering System through pipeline networks.

The current network of pipelines and roads reflects twenty years of sprawling derrick migration and interconnected DA's dictated solely by the spatial organization of the leases[9] [Figure 4].

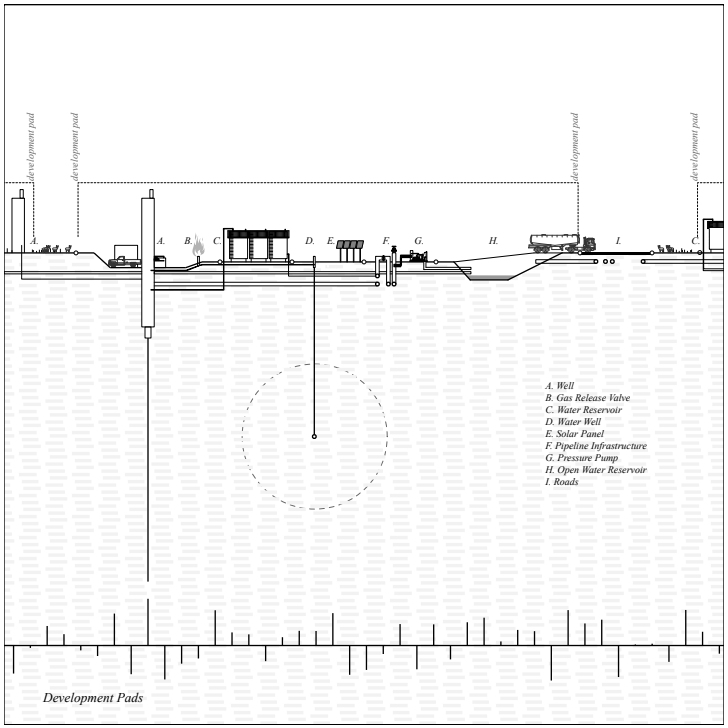


Fig. 4: Development Pads

These spaces, together forming the derricks' habitat, reek of sulfur from off-gassing and open-pit water reservoirs. Diesel engines, pumping gas and other materials through the pipeline network, create a constant humming noise. Combined with the ultrafiltration, reverse osmosis, and ion exchange units that recycle water and transport it back to the derricks, the entire system produces about 50 decibels. The decibel level rises significantly when the derricks drill on the territory's periphery, usually for 2-3 days straight.[10]

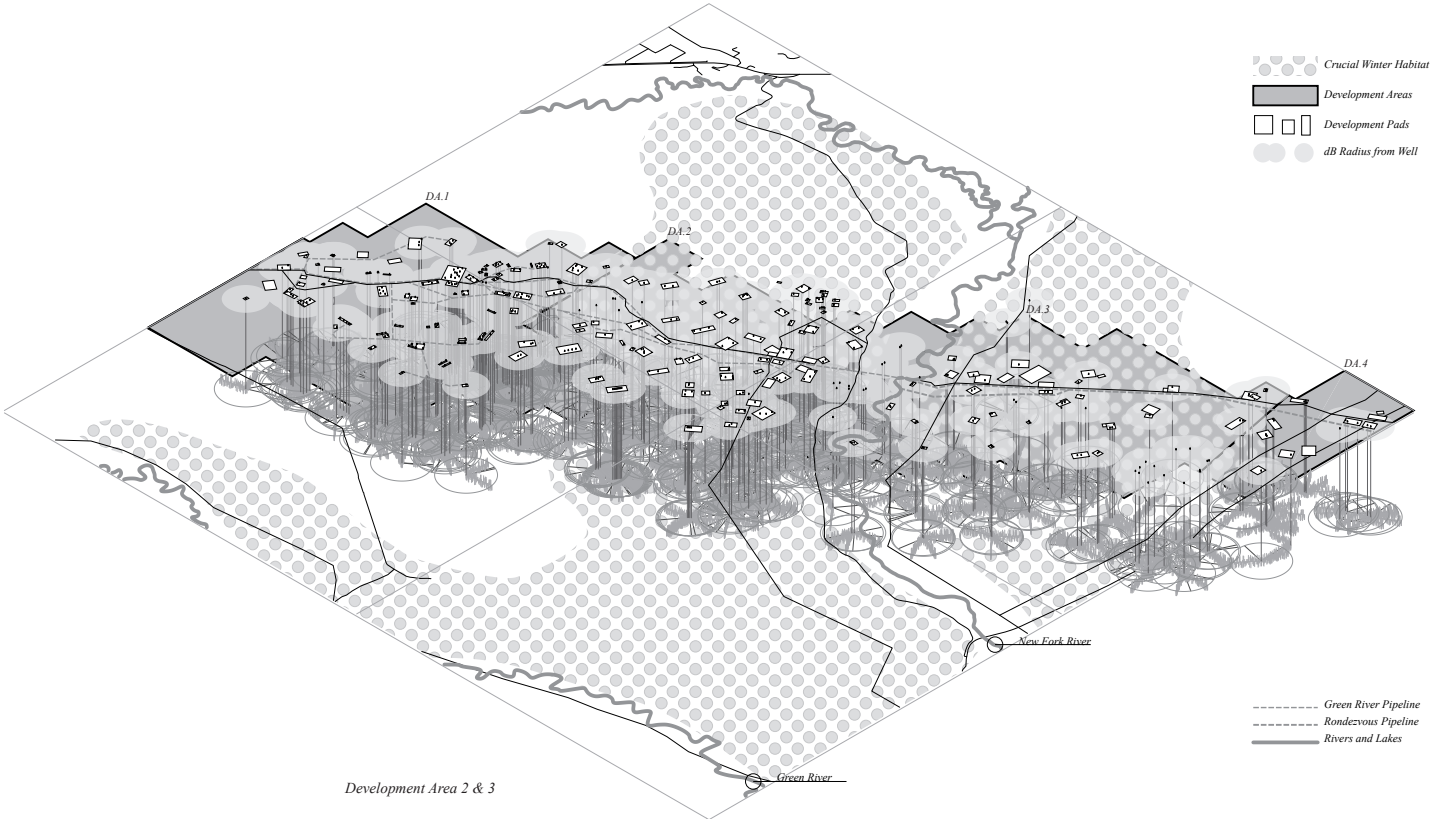


Fig. 5: Development Areas 2 & 3

Legislative deregulation in fracking techniques, combined with a broader political shift toward natural gas production, encouraged the population of derricks on public lands to evolve within and respond primarily to policies based on contracts; its movements manifest a political geography as much as a technical one [Figure 5].

Migration Patterns of Pronghorn

In the winter, pronghorn migrate from the Yellowstone Greater Ecosystem to the Green River Basin. Pressure from historic predators in the prairie ecosystem has shaped their evolutionary history, giving them a keen sense of sight and hearing. In the modern environment, these perceptive adaptations affect the migration and habitat patterns. Biologists concerned with these changing migration patterns conducted yearlong studies for The Wyoming Fish and Game Department and have recorded several stopover areas due to stress during migration to and from the Green River Basin.[11]

Stressors on the migration route include highway crossings and large fenced areas that inhibit pronghorn movement.[12] Pronghorn are not jumpers but sprinters; they cannot leap over most highway and ranch fences and are forced to crawl under them. Fences that are

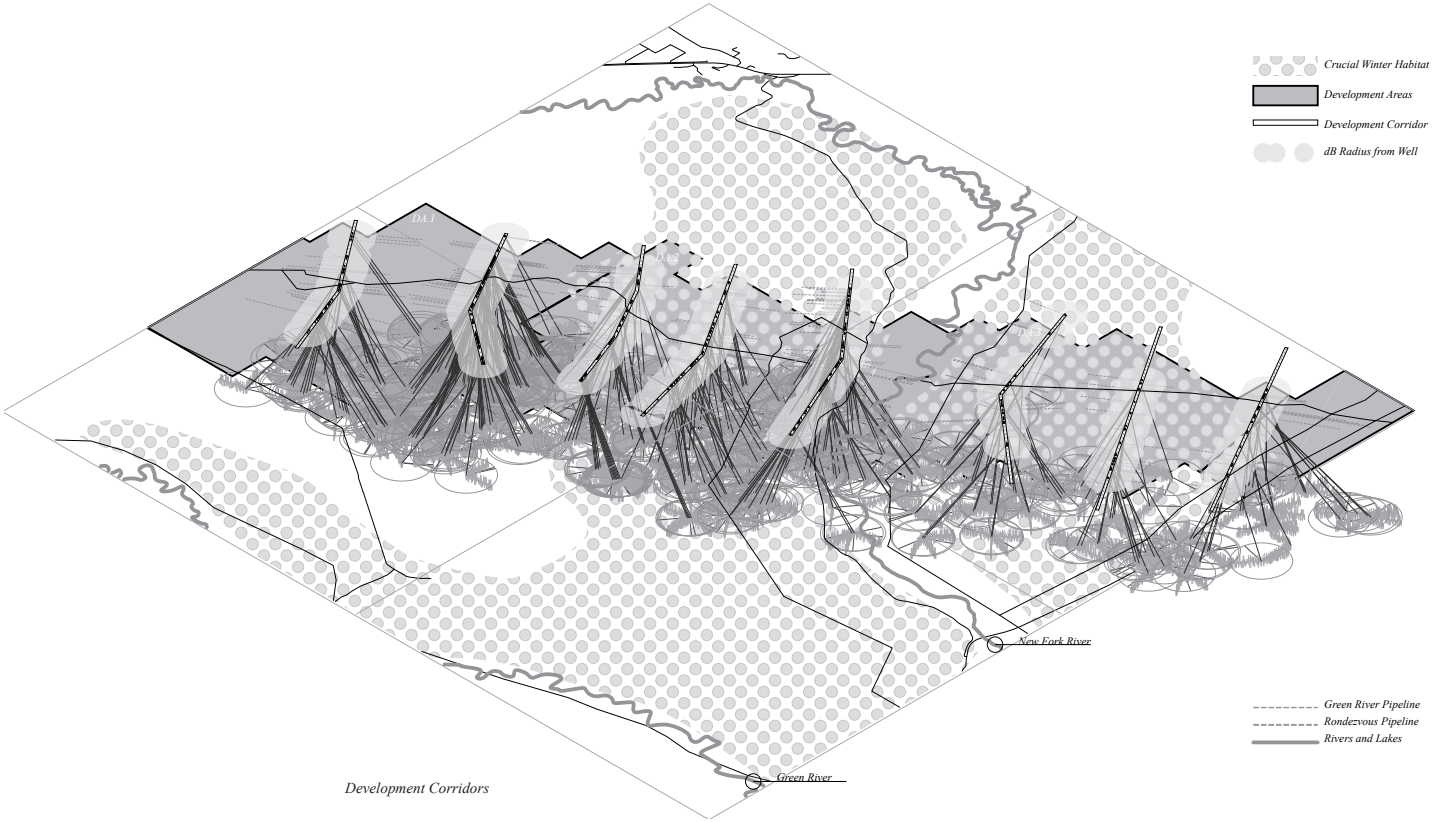


Fig. 6: Development Corridors

not passable have a traumatic effect on the pronghorn population, in some cases disrupting genetic sharing necessary to maintain healthy populations by dividing the herds into smaller groups.[13] Consequently, the National Parks Service has tried to reduce the number of obstacles by federally protecting the migration path from Teton Valley to the Green River Basin. Although the research resulted in a land bridge over highway 191 into the Green River Basin, the federal protection of the migration path ends before the winter range inside the contested ecotone.[14]

Moiré Patterns: Conversations between Pronghorn and Gas Derricks

Ironically, the derricks currently offer an unintentional form of protection by establishing a “wasteland wilderness” in the crucial winter range of the pronghorn herds through piecemeal parcel management inside the Development Areas.[15] The impact of the derricks has deterred other subterranean-dependent species, including humans dependent on water wells, from inhabiting the area, decreasing the number of stressors like fences and heavy traffic seen along the migration route.

Snowfall alters each nomad's use of the ecotone during the winter months. In winters with little snowfall, pronghorn abandon the search for high quality habitat patches inside or near the crucial winter range, instead foraging within low quality habitats without interacting with the derricks. The consequences of low quality habitats are predicted to have negative health impacts like malnutrition and have expanded the territory of the pronghorn beyond their ideal habitat.[16]

During months with heavy snowfall, pronghorn have been recorded using areas closer to the derricks, "perhaps using roads associated with the oil and gas rigs to facilitate movement."[17] Although these areas have high numbers of audio and visual stressors from the derricks and landscape disturbances, it is suggested that the pronghorn situate themselves in these crucial habitats because they provide freshwater, riparian vegetation from the New Fork River, and access to sagebrush. These patterns sugges that the true impacts of gas field development on the pronghorn may only be seen during the most severe winters in the Upper Green River Basin, when animals are forced by higher snow depths to navigate the small and unorganized patches of crucial winter ranges between derricks.[18]

If the derrick mobilization of the PAPA continues its seemingly random densification in crucial habitat areas, it can be expected that the usage of these high quality habitats by the pronghorn will decrease even more in winters with low snowfall. Consequently, usage of low quality habitat areas can be expected to increase, changing pronghorn habitation patterns. While the derricks have provided some form of refuge as "wasteland wilderness," high quality habitats have decreased by 82% from 2005-2009, forcing the pronghorn outside their typical areas.[19]

Future Nomadic Geographies

The ecotone, in its current form, does not acknowledge pronghorn rights. In an attempt to reorganize priorities and rights, Bruno Latour suggests human rights and non-human rights must create a totality that challenges existing hierarchies – disparate actors can no longer be defined by a single objective.[20] Such a levelling of actors calls into question Modernisms' axiomatic split of "humans" and "non-humans."[21,22] Within this reorganization, the facts, values, and lines between stake-holders are redrawn. As opposed to regarding distributed agency as a relic of so-called 'primitive societies,'[23] this reorganization acknowledges the potential of a relational ontology that casts animal and plant life in new roles.[24]

Herein lies the crucial importance: derrick mobilization patterns have the power to redefine accessibility for both nomads within the ecotone because they have the ability to *produce* space. The space is the outcome of an activity in economic and technical realms, but extends beyond as a political and ecological by-product.[25] In the case of the Pinedale Anticline, it combines two seemingly different nomads into the same imagined geography.

If the spatial organization of the derricks were more accommodating to the migration patterns and habitat and resource areas of the pronghorn, it would provide an ideal winter range for the migrating pronghorn herd by identifying crucial winter range areas as such while at the same time limiting its own access to these areas. DAs informed by the pronghorn habitat terrain would in turn provide more efficient transportation networks and allow for an increase in derrick migration along the corridor. Along proposed corridors, a pipeline network links the derricks and wells into a direct system that efficiently transports and stores oil, gas, and water [Figure 6]. Inclusion of liquid gathering systems and

pressure pumps along the pipelines would maintain the infrastructure and reduce the amount of human traffic necessary inside each DA corridor. Further measures like mandated directional drilling, infill drilling, and derrick sharing practices can be taken up to encourage an increased density of wells.

The lease structure would need to be modified to allow for remote parcels to be associated with derricks, but not physically connected to them. With practices of derrick sharing and infill drilling, the remote parcels would begin to make up a separate spatial organization and preserve the ridges as crucial winter range habitats for the pronghorn herds. These areas become, "...encoded in laws that restrict human use of putatively 'primal' lands of which humans count as 'visitors.'"[26] In doing so, they spatially acknowledge the prospect of a new symbiosis, one that questions species hierarchies.

As a case study, the Pinedale Anticline can be a reference for the cohabitation of non-humans and human infrastructure. The challenge is to reconceive of open land beyond typical perceptions of *emptiness*. A survey of existing migration routes and habitat areas along with watershed boundaries and freshwater reserves could begin the process of formally 'seeing' the space as a shared ecotone, based on an understanding of interlocking patterns of movement.

Can we separate the PAPA from the Green River Basin, and should we? A reimagined choreography of movements in this ecotone begins to articulate something else. We propose a commitment to a new rapport between the users of the PAPA and the Green River Basin, collectively on the Pinedale Anticline. We suggest a possible architecture that facilitates the term 'coherence', as used by Tim Morton to describe when 'an object appears so deeply linked with some other object that if the one orients a certain way, the other

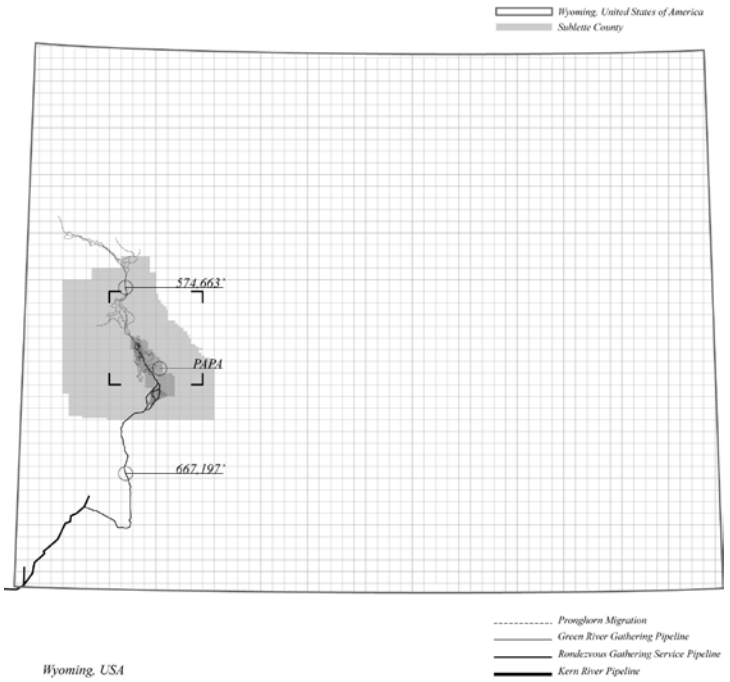
will immediately [defying the speed of light] orient in a complementary way.'[27]

This stretch of BLM land has the potential to operate as a new kind of territory, both of and for a different future. An open dialogue between pronghorn and derricks, both nomads within such a political ecology, is possible.

Notes

[1] Bureau of Land Management, "Our Mission." blm.gov. 2016 May 08.
[2] Bureau of Land Management, "Renewable Energy." blm.gov. 2016 May 08.
[3] Rob Nixon, *Slow Violence and the Environmentalism of the Poor* (Harvard College, 2011), 30.
[4] Some herds continue through the Green River Basin to the Red Desert, extending the migration to over 170 miles.
[5] The Lance Formations are 2,000' closer to the surface than those that lie outside the faults due to geological compression, a phenomenon known as a 'Tight Gas' formation.
[6] US EPA; OAR, *1990 Clean Air Act Amendment Summary*. 2015 October 27. http://www2.epa.gov/cleanair-act-overview/1990-clean-air-act-amendment-summary
[7] In 2005, the Energy Policy Act excluded "the underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities" from the Safe Drinking Water Act of 1974 and the Clean Water Act of 1972. Kendall Gurule, "Halliburton Loophole," Frackwire. 2013 June 05. http://frackwire.com/halliburton-loophole/
[8] The average acres per drill permit remains around 300 after 2003, with an abnormal drop below 100 acres per drill permit in 2011. The reason for this change in density is more dependent on the rise of drilling permits than acres leased. Data gather separately and compared by authors. blm.gov.
[9] The success of this sprawling system can been read again in the evolution of the pipeline diameters that were connecting the PAPA with the Black Forest Processing Plant and the Opal Plant, which in turn distributed gas to Colorado, Nevada, and Utah. The pipeline dimeter increases from 12" to 20"; allowing the volume of natural gas to be transported increased from 100,000,000 cubic feet per day [12"] to 320,000,000 cubic feet per day [20"]. EIA - Natural Gas Pipeline Network, "Transportation Process and Flow." 2016 May 09. http://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/ngpipeline/process.html
[10] Earthworks, "Oil and Gas Noise." https://www.earthworksaction.org/issues/detail/oil_and_gas_noise#.WMBnrGfasYM
[11] Renee G. Seidler, "Path of the Pronghorn." NineCaribou Productions, LLC. 2016 May 09. https://vimeo.com/78590437
[12] Renee G. Seidler, "Identifying Impediments to Long-Distance Mammal Migrations," in *Conservation Biology*. vol 29 no 1, 99-109.
[13] Bruce Dorminery, "Fracking Away the Wildlife," *Pacific Standard* 2015. http://www.psmag.com/nature-and-technology/fracking-away-the-wildlife-44012. Quote from Brian Maffly, National Wildlife Federation.
[14] Jon Beckmann, "Path of the Pronghorn," NineCaribou Productions, LLC. 2016 May 09. https://vimeo.com/78590437
[15] Peter Galison, "Waste-Wilderness: A conversation with Peter L. Galison," *Friends of the Pleistocene*. 2011March 11. https://fopnews.wordpress.com/2011/03/31/galison/

[16] Renee G. Seidler, "Identifying Impediments to Long-Distance Mammal Migrations," *Conservation Biology* vol 29 no 1 (2014), 99-109.
[17] Wildlife Conservation Society, "Wildlife & Energy Development: Pronghorn in the Upper Green River Basin - Final Report." February 2011. http://www.wy.blm.gov/jio-papo/papo/wildlife/reports/pronghorn/2011ph-ar.pdf
[18] Ibid.
[19] Ibid.
[20] Bruno Latour, *Politics of Nature* (Harvard University Press, 2009), 233.
[21] Ibid., 235.
[22] This split of animals and humans goes as far back as Rene Descartes. While both were conceptualized as automata, only humans had a soul and therefore were different. Mayr, Otto, *Authority, Liberty & Automatic Machinery in Early Modern Europe* (The John Hopkins University Press, Baltimore and London), 63.
[23] Latour, *Politics of Nature*, 233.
[24] Peter Galison, "Waste-Wilderness: A conversation with Peter L. Galison," *Friends of the Pleistocene*. 2011 March 11. https://fopnews.wordpress.com/2011/03/31/galison/
[25] Henri Lefebvre, "Social Space," The Production of Space (Blackwell 1991) 84
[26] Peter Galison, "Waste-Wilderness: A conversation with Peter L. Galison," *Friends of the Pleistocene*. 2011 March 11. https://fopnews.wordpress.com/2011/03/31/galison/
[27] Tim Morton, *Dark Ecology: For a Logic of Future Existence* (Columbia University Press, New York, 2014).



Site overview in relation to Wyoming, USA.