The Future of Meadville:
Some Potential Effects of the Production of Unconventional Fuels

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March, 2013

Dr. Matthew Ferrence 4/10/13 Date *Dr. Kate Darby* 4/10/13 Date

Pledge

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This work is dedicated to the citizens of Meadville, that they embrace their future as theirs.

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Abstract

Northwest Pennsylvania is an area that has a long history with extractive industries. In 1859, the first commercial oil well was drilled in Crawford County, which led to an oil boom that caused huge economic growth in the region. The oil industry left almost as soon as it had developed however, and less than twenty years after the first oil well was drilled, the region's economic boom had gone bust. Given this history, and given Meadville's steady decline since heavy manufacturing largely vacated the region in the 1980s, there is a pressing necessity for some type of development to take place. This being the case in many localities within Pennsylvania and Appalachia, the recent development in the past 5 years of the region's extensive unconventional shale resource—due to the adoption of new technologies (horizontal drilling and hydraulic fracturing) that enable producers to extract those resources—has largely been seen as a godsend. Just as soon as development of these resources started however, many individuals and communities have reported various degradations of social, economic and environmental resources as a result of the rapid and untrammeled growth of the oil and gas industry. Crawford County and the rest of northwest Pennsylvania are likely to see in coming years a heightened development of these unconventional oil and gas resources, but the potential effects it may have on the Meadville and surrounding communities remain uncertain. With respect to Meadville's history, the importance of future planning in providing stakeholders with a perspective on the potential effects of future uncertainties, and with respect to my literary background and the efficacy of the creative approach in diffusing information about complicated events, I have taken an interdisciplinary approach in revealing many of the potential effects of oil and gas development. Through conversations and interviews I conducted with a variety of key stakeholders in Meadville and around, I was able to ascertain many of the current effects that oil and gas development in other areas, as well as to a small extent already in Crawford County, has had on local industry.

Glossary of Key Terms

Hydraulic Fracturing: The process by which fossil fuels are extracted from tight layers of shale through the injection of a highly pressurized slurry of liquid (usually water), a proppant (usually sand) and other additives. The water is used to create fractures in the shale, the proppant is used to keep these fractures open, and the chemical additives are used for a variety of reasons, from maintaining viscosity in the slurry to clearing the well-bore of cement debris. Anywhere from 98-99.2 percent of the slurry is made up of water and proppant, whereas the other .5-2 percent is made up of chemical additives. These chemical additives are one of the foci in the environmental debate surrounding hydraulic fracturing.

Horizontal Drilling: Refers to the process of manipulating a drill-bit, after it has drilled to a certain vertical depth, to turn the well-bore 90 degrees and continue to drill in a horizontal fashion. This method is used today in the extraction of fuels from most shale plays because the ability to drill horizontally through a shale formation drastically increases the surface area of permeable surfaces available to the well, thus increasing the productivity of the well.

Unconventional Oil and Gas: When I refer in this document to unconventional drilling, or unconventional fuels, I am referring to those operations that are seeking to extract fuels from tight-shale formations. Most drilling operations that seek to extract fuels from tight-shale formations would not be able to do so without using one or both processes of hydraulic fracturing and horizontal drilling.

Preface

At first, I never intended to write about fracking. My original interest in doing research and writing this document was to ascertain what issues my local community saw most pertinent to their development as a *community*. In order to ascertain what these values were and perhaps find some common issues that a majority of the community shared, I planned to interview local stakeholders—public officials, business owners, academics, organizational leaders—and ask them what they thought what was most important to Meadville's development. The kind of issues that I wanted to hear about were the ones that were intrinsically linked to the future, those uncertain phenomena—population, demographic changes, new industries, new taxes, the continued existence of existing industries and old taxes, infrastructure changes and new infrastructure—that city planners deal with on a daily basis, but that perhaps weren't being considered enough as full-bodied potentialities with a whole set of possible implications for the community and its citizens. I wanted to delve into what is called scenario planning, or scenario development, which simply described is the creation of a potential field of outcomes and implications, sometimes expressed in the form of a narrative or a literary illustration, that might unfold from some previously unconsidered, or little considered, future phenomena. The 'future phenomena' were to be revealed by my interviews with Meadville's stakeholders.

What I meant by "development", and for that matter, what I meant when I used other large words like "values," "community," and "stakeholders," and what I was actually going to do with all of this information and what I was going to focus on and what kinds of questions I was going to ask and how my scenarios were going to unfold and what strategies I was going to use, my advisors for this project didn't seem to have the faintest idea. The professors I reached out to had more of a hard time trying to understand me than I had of understanding myself, and finally all of this confusion and my trying to alleviate the confusion, even though I was confused myself, came to a head. A professor asked me very plainly; very simply: "What the hell are you talking about?" Those words have always haunted me as a writer and an amateur academic, for often I know, as do my professors know even better, that I am almost always not talking about anything, or rather, I am talking about too many things at once, and I never seem concerned enough to make a coherent point about any of them. This has been one of the challenges of this

document—to say something pertinent about oil and gas development that goes beyond a simple illustration of the industry and its effects. After changing my writing style and actually rewriting the entire document, I have come the creation of a new point of view, innately bonded my illustration of oil and gas development. It is my hope that this point of view bleeds through the structure and the tone of my writing, and thusly may my reader obtain a point of view of on the subject that they have perhaps not yet considered. Through the presentation of such new information and new perspective do we create dialogue. This is essentially the objective of my writing—my most obstinate point—that discussions made here inspire discussion within the reader, and that those discussions within the reader inspire discussion between the readers and others. This is essentially my definition of "community," that the citizens of an area communicate with one another their ideas and their visions for that area, and from that, work together to realize those visions. In writing about Meadville and the future of its economy, its social fabric and its relationship to its environment, I am prophetically interested in Meadville being a community.

It might then be construed that from this that I do not see Meadville, as its social ties currently exist, to already constitute a community. Let it be understood that I do see Meadville as a community and one with many assets. However, there are some important distinctions to make when talking about a healthy community versus an unhealthy one. The definition of community I want Meadville to embody and the definition any geographically located group of people should aspire to, is that which demands more than the characteristics that we passively find ourselves already to maintain and which demand nothing from us. The kind of community that I am vying for, a healthy community, stresses the need for a high level of social capital.

In using social capital as the criterion by which I judge a healthy community, I am focusing on the type of community that limits itself to a small locality—a neighborhood, a town, or a city—not only because of its more manageable nature in terms of scope, but because my subject, Meadville and to a lesser extent, Crawford County, is such that that it do not constitute a large, nor extremely diverse, area. Much has been written about social capital and I will not go deep into the intricacies of its meaning, the debate that surrounds the expediency of certain values of social capital over others, nor the plaints that argue a high level of social capital does not necessary constitute everything that is necessary for a healthy community. Suffice to say,

social capital *is* essential to the creation of a healthy community. Social capital is commonly defined in the academic literature, as summarized by Haines and Green in their text, *Asset Building and Community Development*, by social relationships and networks that themselves are productive and improve the well-being of residents, especially depending upon the amount of people investing in these resources[1]. The level of social capital in a community can be identified by looking at certain criteria necessary to a high level of social capital. Those criteria which Temkin and Rohe identify in their article, "Social Capital and Neighborhood Stability: An Empirical Investigation" are broken down into those that constitute the sociocultural milieu—the feeling that the community is spatially distinct, the level of social interaction among residents, the degree to which residents work and socialize in the community and the degree to which residents use neighborhood facilities—and those criteria that constitute institutional infrastructure—the presence and quality of neighborhood organizations, voting by residents, volunteer efforts and the visibility of the neighborhood to city officials[2].

My original intent in writing this document was, to a certain extent, to evaluate the level that a perceived issue of importance in Meadville, with unknown future implications, might affect the sociocultural milieu and institutional infrastructure already existing in Meadville, and how a proactive stance by the Meadville community—inspired by my future planning exercise—might confront and mitigate those effects, thereby putting the Meadville citizenry in a better stance to improve their social capital. Such a project was beyond my limitations as a student and my understanding of the very dynamic and complicated issues mentioned, and was perhaps inappropriate in the first place given my role as an individual academic, detached from the community as I am. The essence of these ideas however, is still very much present within my present project; nevertheless, I chose to take a different approach.

Within most municipal governments is that department which deals mainly with issues pertinent to the future of their city: the planning commission. In Meadville, the planning commission is responsible every several years for the elaboration of the Meadville Comprehensive Plan. The last comprehensive plan was written in 1993 and as such, the commission is currently in the final stages of its comprehensive plan for 2013. Before undertaking this monumental task, a "Draft Vision Statement" was published on the Meadville city's website which serves as an inspirational and idealistic guide for which recommendations

offered in the actual comprehensive plan represent the more mundane provisions necessary to attain such a vision. In this statement, the municipal government envisions for itself the realization of the highest quality of life for its citizens, the sustaining of its position as the center of employment for the surrounding region and the solidifying of a prosperous image, centered in an environment of arts and culture, higher education, public recreation, a flourishing downtown, unique neighborhoods and a variety of small business owners[3]. Many of these visions are similar to the criteria of social capital, although it should be pointed out the realization of the tenants of this vision do not in themselves represent the attainment of a high degree of social capital. Whereas social capital deals mainly with social relationships apparent between the members of a community, municipal planners mainly concern themselves with institutional development—that which reveals a high level of commerce and cultural appeal (the arts), but don't necessarily constitute a high degree of intra-community trust and bonding. According to Safford—who in his book evaluates the reasons why Allentown succeeded in mitigating its declining steel industry whereas Youngstown did not—says that the most important thing in preparing cities for times of crisis is for government policy to target the strengthening of mechanisms or organizations which seek to bridge ambient fragmentation in the community. Although some attention is paid by local government to strengthening ties with important bridging organizations like Allegheny College, the lack of integration between the college and the rest of the community is symbolic of the inefficacy of current measures to strengthen bridging organizations.

Another large limitation to municipal planning is its lack of ability to gauge for a series of unpredictable events that could come to play in the communities' near future. Most "master plans" that cities use to forecast their futures "are based on a series of assumptions that tomorrow's city will behave much like today's"[4]. This trend in traditional forecast planning fails to anticipate major shifts and unpredictable trends in the urban environment, often rendering planning obsolete before it is implemented. For example, Meadville's Business Action Plan Update from 2007, which serves as the main planning document in the revitalization of Meadville's downtown, is completely reliant upon statistical analysis and past and current economic trends, without once addressing the uncertainties lurking in the near future. The draft version of the Meadville Comprehensive Plan, which is set to be released this year, maintains in its introduction certain criteria which are fundamental to future planning.

"Comprehensive planning should not be rigid and unwieldy but should be dynamic and innovative – the point of the planning process is about enabling the community to take advantage of current and future opportunities. The most important aspect of a comprehensive plan is its role as a tool to address the constant change and evolution of a community"[5].

But it may be that this draft's assertion, that "First and foremost a comprehensive plan at any level should reflect the values of those it is aiming to serve" essentially emphasizing planning as a "value-driven" process, although important and admirable, may be the very reason why planning tends to be short-sighted. The importance of involving the community in a locality's formal planning process cannot be understated, but without a framework that encourages participants to be visionaries who dream of a better world and continue to help and design and implement policies to achieve that better world, the planning-process inevitably becomes boxed up in a process that creates, to use Isserman's words, "increasingly feeble, myopic, degenerate frameworks that are more likely to react to yesterday's events than to prepare the way from here to the future"[6]. When talking about planning, we should not be thinking about what is practical and workable, rather we should first operate on "what we think is possible and desirable, thereby strongly influencing our actions in the present"[7]. If we deprecate our own visions with notions of pragmatism, which so fatally plague the political field, we often become "absorbed in operational and managerial activities characterized by short time horizons and value choices likely to be equally short-sighted and ad hoc"[8] . Based on these considerations of the current limitations of the traditional planning field, I resolved to embrace a relatively novel process that had recently entered the milieu.

A professor in the Environmental Studies department first introduced me to scenario planning, or scenario development as it is alternatively called, and from then on I thought of ways that I could use this approach to engage the sort of uncertainties that Meadville might be facing in the near future. Scenarios, I have highlighted earlier, are simply the illustrative results of a qualitative and quantitative approach to elucidating the impacts of a perceived uncertainty on a subject; in our case, the subject being a city. After encountering this bewildering definition, my further research into scenario planning theory gave me somewhat clearer understanding of what scenario planning is supposed to be, or at least, what it should look like. The following is an excerpt from my final proposal for this project, which in its roundabout and heavily source-dependent description of scenario planning probably best reveals the half-baked understanding that I had of it at the time.

Faulkner (2002) writes that the purpose of scenarios "is to gather and transform information of strategic importance into fresh perceptions" (117). Scenarios include elements…that cannot be formally modeled…They go beyond objective analyses to include subjective interpretations" and "above all…scenarios are aimed at challenging the prevailing mindset" (Schoemaker, 1995, p 27). It addresses the shortcomings of more traditional forecasting by engaging and informing the communities it deals with (Holway, 2011), and it provides stakeholders with a qualitative and contextual narrative rather than a quantitative and scientific projection to engage a variety of possible outcomes for a variety of uncertainties (Shnaars, 1987; Peterson et al, 2003; Schwartz, 1991; Shoemaker, 1995).

The things that I drew from this survey of scenario planning theory, words and phrases like "fresh perceptions," "subjective interpretations," and "challenging the prevailing mindset" led me to believe that scenario planning was not just the run of the mill forecasting model, nor was it the kind of thing limited to specialized labs with expensive software and statistical modeling equipment. Scenario planning is elastic, it is workable, it has no prescribed methodology nor does it limit its practitioner to some preconceived expectation of a certain kind of results, analyzed and presented in a specific manner. Perhaps most attractive to me in the scenario planning model was that it lent itself to the literary—"it provides stakeholders with a…contextual narrative"—and the best part about the literary approach is that it has no rules. Now that is not to say that literature and the literary method doesn't come without its own set of best practices and generally agreed upon effective methods of carrying out a narrative—the literary canon for any subject or culture is proof of this—but there is no prescribed rubric by which one may write an effective narrative. That is to say, one cannot in the act of creative writing, follow as a set of instructions to obtain results, as one might do in a mathematical formula or for a scientific experiment.

In approaching the subject before me by which I would apply the scenario planning approach, —by this time I had narrowed my topic to oil and gas development— I needed an end product that would satisfy multiple criteria. 1) It couldn't be solely concerned with quantitative data—just as the Meadville Comprehensive Plan stressed the importance of a value-driven planning process and social capital, the relationship of local government to its people, so too do I stress the importance of a citizenry in deciding its own future. Besides, as I hope the reader understands by the end of this document, oil and gas development is not an objectively determined phenomenon. For all of its perceived necessity, oil and gas development in deep shale is a *choice:* it is a choice made by society, when it comes to choosing one fuel source, one

lifestyle, over another; it is a choice made by an individual, whether or not to allow drilling on or under their land; it is also, in my opinion, a choice that should be within the capacity of a locality, as the most important arbiter of social capital, to decide. 2) Related to this idea, my results would have to be accessible to a large audience and not obstructive to the reader just because the particular craft I was working with necessitated an intricate jargon. My point is to generate discussion amongst the people who are going to be affected by oil and gas development, not stymie it by excluding the most important demographic from the conversations that were already happening, in the professional and political field, without them. Finally, 3) I needed a craft that had a profound and long tradition of elucidating the necessary truths about a phenomena, of which prior to that elucidation, was largely considered an enigmatic, unapproachable and indefinable subject. The literary approach fit these criteria.

I am not presuming that what I have written will come anywhere near the sort of literature that in the past has been responsible for creating a widely accepted conceptual definition of a phenomena, much like the world came to associate trusts with Ida Tarbell's portrait of Standard Oil or the Mississippi with Mark Twain. I am not saying that the outside world will give a hoot about what I have to say. All I am hoping is that Meadville, the locality of which my narrative is essentially about, might raise an eyebrow. When we raise an eyebrow, we start to see what is around us.

Although the wide margins of the literary narrative afford us great latitude in how we write, it is important to understand that almost all works of literature are categorized within a particular literary canon. This canon essentially characterizes the work—it provides a watermark for our reading in which we might identify how a particular piece of literature falls within a larger stylistic tradition. Essentially what is being worked at by categorizing our literature, beyond facility of reference afforded when we speak about particular category or school of literature, is a larger understanding of the philosophical approaches that an author might take, as to how a particular author thought they might best convey their story—their information—through a concisely defined style and historical context. The literary canon is mostly a convenient tool for the reader and the critic, to boil down not just what the author is saying, but also to ascertain what assumptions the author is carrying with them when they write and perhaps even helping one understand why the author chose to write about a certain thing in the first place. Usually, literary categorization is superimposed upon and author and their works. It isn't always

that an author accepts the titles—rationalist, modernist, existentialist, etc.—that are bestowed upon them by the critical world. The literary canon is primarily for readers to help them read, not writers to help them write. This doesn't necessarily mean however, that authors do not consciously enter the process of writing without a notion of the larger style that they are working within and without a long list of influences, whether they are conscious of them or not, that have affected the way they write. In fact, this is how the notion of a literary canon might be useful for an author to help them write. To categorize our writing, while avoiding any tendency for us to stifle the creativity of our own unique process and style, constitutes a reference—the field for our sport—that offers us a series of tools, already proven to be effective, that we might use in order to create a successful piece of literature.

Thus, when I endeavored to write a literary narrative I had to choose what kind of literature, what style of narrative might be most effective given the point I was trying to make about the content that I was researching. In bringing together two traditions, public planning and literature, traditionally not understood to overlap with one another, I had to choose a literary approach that naturally lends itself to the bridging of disciplines. I wanted an approach that gave itself to the reportage of facts in order to shed light on a subject—oil and gas development in deep shale—that normally wasn't very approachable—due to its scope, its controversy and to a lesser extent, its technical nature—in order to make those facts more available and thus, the entire subject of oil and gas development, more approachable. Facts were important, but so was readability. What I found when I chose to use literary journalism as my stylistic reference was that these two things, facts and readability, are not so opposite in nature. I found within the craft of literary journalism an innate power to unify the essential tendencies of several distinct disciplines—notably the tendency of literature to be readable given its aesthetically pleasing prose; the tendency of scenario planning to be primarily concerned with scientific rigor in order to justify a potential future as possible; and the tendency of my subject, oil and gas development, to be controversial and confusing in nature.

I like to think of literary journalism as a balance. It is a balance between the subjectivity of its author and the faithful reporting of real things as they are; it is a balance between the rigorous foundations of a formal structure and the creative element of an author's own personal eclectic style; it is a balance between an author's responsibility to the privacy of the individuals he is covering and the author's responsibility to dive completely into the lives of their subjects

and reveal the truth as they understand it. Norman Sims writes in his book, *The Literary Journalists* that although literary journalism avoids strict definition,—because of the varying degrees of its interdisciplinary nature—from a historical perspective, literary journalism brings together the old traditional imperatives of journalism, to provide us with news of far-off places, and fiction, in order to illustrate everyday stories that bring us inside the lives of our fellow person. By companioning these two imperatives, literary journalism creates an imperative of its own to which most works of literary journalism generally abide: the confirmation that everyday life contains great substance[9]. Although this message is not necessarily the primary intent of my work, it is an important characteristic of and inherent within, the conclusions I make—that because every community is important, it is imperative that communities' be able to make educated decisions about their future.

Probably the first author to call attention to himself and others as falling within the bounds of the developing consciousness of literary journalism was Tom Wolfe. During the early 1960s, Wolfe started breaking with journalistic conventions, using fiction-writing techniques in feature stories. Wolfe and his unique journalistic style were widely popular and controversial, awarding him a prime spot in limelight; he soon came to defining his particular style and that of other similar literary journalists as New Journalism. This "new" form of journalism widely embraced the use of literary techniques typically associated with the fiction genre while still maintaining the traditional journalistic convention of dispassionate, even-handed reporting. The combination of these two techniques probably found their most compatible subject in that of the psychedelic hippie movement of the 60s and 70s and its de facto leader, Ken Kasey. In his book on the subject, *The Electric Kool-Aid Acid Test*, Wolfe uses experimental techniques that would feign be seen even in a novel, like extended use of onomatopoeia, stream of consciousness writing, eclectic use of expletive punctuation and free association to mirror the "head" culture that he is perceiving, one which would be exceedingly difficult to understand if wasn't for Wolfe's reproduction of these phenomena in exactly the way he perceived them. For example, it was common practice of "Ken Kasey and his Merry Pranksters"—as the close-knit group of hippies that is Wolfe's subject is most often referred—to perform an incoherent sort of free-association that they called "rapping" as a method of "transcending the bull-shit" and coming "into the pudding," the opposite of what the Pranksters considered to be the normal day-to-day plane of mundane conventional assumptions that the world operated on. Wolfe adopts this sort

of free association, in addition to an eccentric utilization of punctuation, for his own writing when on page 45 he tries to encapsulate the LSD experience.

> The whole thing was …*the experience*…this certain indescribable *feeling*…Indescribable, because words can only jog the memory of…that *feeling!*... Or can you remember when you were a child watching someone put a pencil to a sheet of paper for the first time, to draw a picture…and the line begins to grow—into a nose! and it is not just a pattern of graphite line on a sheet of paper but the very miracle of creation itself and your own dreams flowed into hat magical…growing…line, and it was not a picture but a *miracle*…an *experience*…and now that you're soaring on LSD that *feeling* is coming on again[10]

Here, Wolfe is using mimicry of the practices that the Pranksters used in their acid trips. Whereas they used free association in order to create an appropriate expression of their experiments, Wolfe is using it in order to make sense of their experience for the outside world, to take a drug and the experience it rendered, which "couldn't be put into words" (42) and put it into words. This practice of mimicry, which Wolfe repeats over and over again is present in also in his stream-of-consciousness prose and in the lingo of the acid heads—words and phrases like "on the edge," "into the pudding," "freaking" and "wonked"—is essentially a means of putting Wolfe on the same or similar plane as his subject, thus reflecting his desire to provide a truthful and even-handed account of the world he is depicting.

In my writing I chose not use the eclectic literary devices and experimental figurative techniques that Wolfe and other writers in the New Journalism movement use to make their representations of situations simulate a more first person experience for the reader. I ultimately chose to use a more traditional style that is more akin to the less controversial literary journalists, Tracy Kidder and John McPhee. Wolfe however, provided a very important contrast to these authors. He is well known as a larger than life figure that absorbs the public spotlight and invites controversy into his domain through his experimental writing. Wolfe, unlike Kidder, isn't afraid of making his presence as an author known in the literature, and it isn't uncommon for him to make an outright judgment on a situation he is reporting. This intentional inclusion of the first person into journalistic reporting, as well as Wolfe's highly unique and non-traditional writing style and his personal disposition to be a public figure have caused critics to go so far as to associate Wolfe and his writing with egoism. This egoism is largely frowned upon in a journalistic world that seeks to dissolve the author's presence and present an objective perspective of a certain real-world situation.

The truth of the matter is, however, that there is no such thing as a purely objective form of journalism. Always present within an author's written words are their point of view. Not just the content that the words try to convey, but also the order of the words and the structure of a written piece, whether consciously formulated in a certain way or not, are significant lenses onto how an issue might be observed. We see a conscious decision in McPhee's work, as I will later discuss, to create a literary structure that lends light on how the author wants the issue of conservation to be viewed by the reader. Whereas most journalists consciously avoid the inclusion of their perspectives, it is largely recognized by literary journalists, especially New Journalists like Wolfe, that such an exclusion of personal perspective is impossible and notwithstanding, unfaithful to the reader in purporting to offer a fair representation of an issue. For a writer like Wolfe, the only fair representation of an issue is that which brings forth all of the perspectives and assumptions present in a piece of reporting, so the reader might then have all the tools to distinguish between what they take to be important and what not. Although I do not often include the first person in the following document, (nor can Wolfe and McPhee be said to include themselves often in their literature) I do not seek to utterly cut my presence from the text. I believe, as might Wolfe and most literary journalists, that such a presentation that avoids the elephant in the room, that is the reporter, is incomplete and unfaithful to the reader.

Tracy Kidder was thrown into the limelight with his Pulitzer Prize winning nonfiction, *The Soul of a New Machine*. Kidder's challenge in writing this book was to make something extremely technical and specialized, the computer of the 1970s, into something interesting, relatable, and expressive of some human element. The book, as evident from its critical claim and public success, achieved this. It made the struggle to create a cutting-edge computer interesting and profound. It made the people who engineered this computer, often associated with the dark and faraway corners of the underground (the computer engineers in Kidder's book actually work in the basement) into actual relatable humans, characters with real-life struggles, similar to those that any of us might experience in our own lives. This is the objective of most literary nonfiction—to illustrate some unfamiliar and often seemingly mundane corner of the world and reveal how that corner of the world is actually imbued with the same complicated and soberingly human conflicts that we might find in our own lives. Kidder is able to do this in several ways.

Besides presenting the necessary background facts and history for any story, Kidder structures his chapters in a way that cuts up the history—which on its own might bore the reader—into manageable chunks that are then interposed with a profile of the characters he mentions in this history. He combines personal interview with general background to make the historical backdrop come to life through its real life characters. In this way Kidder creates a climax in the story in which the scenario enfolding—a team of engineers decide to create their own cutting edge computer in competition with another team of engineers in the company—is transposed with the interviews of those characters that bring to life their personalities, their motivations, their inhibitions and their perspectives on other key characters in the scenario. Thus, the story ceases to be about the scenario—the creation of a successful cutting edge computer—but, by and by, becomes about the people creating the scenario—this computer that engrosses and "that gave meaning to [their] life" (273). This point is perhaps most illustrated near the end of the book, when the main character, Tom West and his team have finished the computer that they have been working on so long and for which the book—"…A New Machine"—is titled. That is, the engineers have finished the computer, but the book is not over. One of the principal characters, Ed Rasala says a line that captures the anticlimactic nature of the whole ordeal: "It's a computer,' Rasala said" (266)[11]. But, as the continuation for another 2 chapters illustrates, that's not all it is.

Kidder uses these last 2 chapters as a reflection on the whole entire computer making process in order to put the story in perspective, not just from the author's point of view, but from that of the engineers themselves. The importance of the whole process of creating the computer is best summarized not by the author, but by a line attributed to one of the engineers: "Ninety-eight percent of the thrill comes from knowing that the thing you designed works, and works almost the way you expected it would. If that happens, part of *you* is in that machine" (273). This is not only the inspiration of the title of Kidder's book, but it is illustrative of the methodology Kidder uses to express the meaning of his book. *The Soul in a New Machine* relies heavily upon Kidder's narration—the dialogue in the book is extremely limited or disjoint and in order to explain the engineering tasks and obstacles that beset the book's characters, the engineers, Kidder must rely heavily on explanations that usually take the form of his own creative analogies to processes that the common person better understands. On page 41 Kidder compares the function of software in a computer to that of the "system of electrical and

mechanical devices" that translate the turning of a key into the physical adjustments necessary to start an engine and on page 76 Kidder ascribes the categorization of a computer's memory banks to "a logical system by which phones and groups of phones could be easily identified—a system of area codes, for instance". The technical nature of Kidder's subject material requires him to be fairly heavy-handed compared to most journalistic reporting. However he more than makes up for this large presence in his work by making it apparent that the essential meaning of the book comes from the books characters themselves and not Kidder's apparent subject, the new computer. Kidder makes this evident from his extended portraits of several of the engineers on the project and his relating of their ruminations on the whole process after the computer is done. Kidder forces the point home in the end when the minute stature of the entire computer making process, in the grand scheme of things, is emphasized by Kidder himself: "It's just a computer. It's really a small thing in the world, you know" (290).

This reliance on people to provide the essential meaning to any work of literary nonfiction is inscribed in Kidder's work as well as that of Wolfe, but it finds its most dedicated sympathizer in the work of John McPhee. McPhee is somewhat of a grandfather in the tradition of literary nonfiction, he developed an ulterior style to that of Wolfe's "New Journalism" as early as the 1960s and he received a Pulitzer Prize in 1999 for a collection of books about the geologic history of North America. Whereas Wolfe embraced a stream of consciousness writing approach that to put him, his ego, on the level of the people he was profiling, McPhee's journalistic approach developed a much more gentle approach that relied heavily on character description and an attention to detail. In his book on the former director of the Sierra Club called *Encounters with the Archdruid*, McPhee takes a highly personal approach to the profiling of this famous and high-profile individual, Dave Brower. In order to humanize this larger than life figure (Brower was known as a stalwart and uncompromising hero of the conservationist world), McPhee observes the man and his behavior at its most human state, when surrounded by the natural beauty of the places he wants to save from destruction—a copper mine in the Cascades, a housing development on a relatively unspoiled Georgia island, a dam project that poses to flood a small portion of the Grand Canyon. However, the situations in which McPhee finds Brower are all the more humanizing because he observes Brower in direct juxtaposition to his strongest and most effective antagonists, men of equal stature to Brower in terms of the accomplishment of their careers and the eminent status of their public repute. In some situations Brower seems

bested by these formidable adversaries—he is essentially making a spiritual argument for the preservation of the country's remaining natural assets as opposed to the more tangible and readily accepted argument of his antagonists, that we need copper; we need ecologically mitigated housing development; we need environmentally sound water and power.

McPhee is a minimalist when it comes to interjecting himself as a third person commentator or as individual participant in the narratives that he constructs. Instead, McPhee relies on a subtle and meticulous, but highly suggestive structuring of his narratives to convey his point. In *Encounters with the Archdruid*, McPhee splits the entire book into three parts, further splitting the parts into non-descript sections (there are no chapter headings); even further splitting these sections into smaller sections denoted by paragraph breaks. The three parts, as I have already mentioned, each describe a scenario in which Brower is juxtaposed in a conflict over the preservation of a specific place with the correlating antagonist. The sections mark transitions within the parts between the main narrative and the off-shoot narratives—character back stories, setting background, isolated interviews and minor related narratives. The smaller sections denoted by paragraph breaks are extremely uncommon and mostly only occur near the end of the book where they are used as a structural device to create a sense of heightening drama, subliminally signaling the reader that the climax is in full swing. The major sections of the book on the other hand are the primary structural element utilized by McPhee to attain perspective on the underlying narrative being presented. The underlying narrative to which I refer is subliminal even to the three primary narratives that dominate the book—the three distinct settings in which Brower is pitted against his antagonist—and this narrative seeks to make Brower, the very symbol of the preservationist cause, the character with whom the reader sympathizes and understands the most.

Although the author's opinion is expressed explicitly on rare occasions, like when McPhee reveals his fatalistic disposition in declaring that "the message in the sky over Cumberland Island was 'Finis," (148)[12] McPhee's writing style and the deeper meaning of what he is trying to evoke is much more persistent in the way he structures his sections. From pages 19-26, McPhee illustrates an argument between Brower and his pro-mining antagonist, Charles Park with the scenery that they are directly encountering around them. The arguments of both Brower and Park are given the back-story necessary to make their references known to the reader but they are juxtaposed in such a way to lend sympathy to one idea over another. In the case of

this section, Brower brings up an abandoned mine that they encountered earlier in their journey that poses as an eyesore on the landscape. The irresponsibility of this particular mining company in failing to clean up the main site was pointed out by Park, who then continued to say that operations like that would never happen in the present day. Park's pro-mining argument rests on the point that the products that we use in day-to-day life require the precious minerals that we must mine. Thos minerals are finite, they are where they are, and those minerals are sometimes located in aesthetically pleases landscapes like the Cascades. He says that "When you create a mine, there are two things that you can't avoid: a hole in the ground a dump for waste rock" (26). Although this represents a pragmatic argument McPhee seems to find a coup de grace in what Brower says next—"Except by not doing it at all"—after which McPhee ends that particular section, leaving that thought in the reader's mind and thus imbuing the reader with a propensity to sympathize with Brower's arguments.

McPhee does not, however, idolize Dave Brower. In fact, McPhee is a faithful reporter and he reports everything he observes; in particular, he does not fail to present Brower's weaknesses and contradictory tendencies. In some instances, McPhee goes beyond the simple and detached elucidation of Brower's negative qualities to proactively highlight them, such as when he compares Brower to Christopher Columbus, his antagonist to Fernando Cortez, on page 142. In essence, McPhee is trying to obtain a balance, even-handed distillation of Brower, as was Wolfe when he was profiling Ken Kasey, or Tracy Kidder in his presentation of Tom West. These authors, being literary journalists, are committed to a more well-rounded representation of the truth. Despite their individual biases and strategies in presenting the facts in a certain way, they are primarily concerned with presenting the facts. This is why it is difficult to call *Encounters with the Archdruid* a book about conservation and preservation, or *The Electric Kool-Aid Acid Test* a book about the acid generation struggling to define itself, even though these ideas represent the underlying themes of the books. The books, more than anything else, are balanced portrayals of the characters and the scenarios and contexts within which the characters find themselves: the acid movement, the struggle to create a computer, the leader of preservationist movement confronting his most difficult opposition. Perhaps then, the most appropriate descriptions of these books are their given titles, for they not only give the reader the context of what the book is essentially arguing, but it is giving the argument as well. *The Soul in*

a New Machine surrounds the creation of a "New Machine;" it argues for the "The Soul" in this new machine.

Common to all of these authors, besides their equanimous presentation of the truth as they encounter it, are the fundamental literary structures that they employ. All three of these books rely heavily on a single protagonist to portray their stories. In the case of *The Soul in a New Machine* and *Electric Kook-Aide Acid Test*, which were not intended as a portrait of a single person, the purpose of a primary focus on charismatic characters like Tom West and Ken Kasey is to better lend their stories to the sympathies of the reader. In the end, these books are about people so it is essential that the reader receive some tangible and primary focus for their human attention; the primary character often being representative of the entire human element of the story. In the course of research and the writing of my document, I found it difficult to focus on just one person. Such an approach often lends itself to a rigorous course of reporting that was beyond the scope of my project.

In the course of their reporting, the authors of all three of these books and those of most literary journalism dedicated themselves to months of first person reporting, sometimes engaging their subjects for weeks at a time (Tom Wolfe traveled with "the Merry Pranksters" in their bus and McPhee attended multi-day outings with David Brower and his antagonists on multiple occasions). Although I have had months to carry out the research of this project, I had by no means the amount of free time available to dedicate myself to my subject. Furthermore, the very breadth of material that my project attempts to cover is astronomically huge compared with the subjects of most literary journalism. For example, out of the three books, Kidder probably covered the topic that was the largest in scope—a team of engineers building a new computer—and even that seems microscopic compared to the scope implied by a project on the potential impacts of oil and gas development on a small municipality (Meadville). What this tells me is that if I were to undertake this project in the future, I would probably have limited the scope of my research. That is, instead of trying to interview dozens of different key stakeholders and present each of those interviews as equally estimable to one another, I probably should have focused on a couple different key players in then enfolding gas development and presented an extended narrative of my interactions with them against sub-narratives and side-plot considerations that I gathered through a secondary bout of less focused research. I still could have presented a document that undertook to sketch the potential impacts of oil and gas

development on Meadville, but I would have done it through the narrowed lenses of a just a couple key players.

On the other hand I will remind the reader that this project was not undertaken as strictly a piece of literary journalism. Instead, as I have highlighted up until now, I have taken an interdisciplinary approach that combines specialized forays into the fields of scenario planning and literary non-fiction. There is one more discipline, however, within the milieu of which this document has been researched and written. Just as much as my research into the potential effects of oil and gas development has taken a scenario planning and literary approach, it has also been a project supervised under the auspices of the Environmental Studies department at Allegheny College.

Environmental Studies is itself a field worthy of interdisciplinary status. It has loose parameters and blurry distinctions. The environmental perspective taken in this project does not mean that I have set out from the beginning to take a pro-environment point of view, that is, not in the way in which "pro-environment" is popularly understood within the oil and gas debate. The controversy that surrounds hydraulic fracturing in deep shale is often characterized as a conflict between those who are "pro-environment" and those who are "pro-industry". This dichotomy of stances and hyperbolic distinction of values however, does not accurately represent the issue. Those who are considered to be "pro-environment" or "environmentalist" are those who are popularly belittled as narrow-minded upstarts who blow the whistle on anything that might alter the landscape. Those who are considered to be "pro-industry" are often presented as the exact opposite: equally narrow-minded capitalist schemers who have no concern for public health or safety, let alone any concern for the transformation of the landscape.

It is upsetting that such classifications even exist; notwithstanding they are popularly presented in the media and they result in embitterment on both sides of the issue. As Burt Waite, a local proponent of oil and gas development points out however, the distinctions aren't so black and white. Those who have proclaimed themselves "pro-industry" or "pro-environment" are very small group indeed, and it is their propensity to lock themselves into predetermined mindsets and gross assumptions that ends up embittering "the enemy" and stymying discussion in the first place. The vast majority of people, Waite says, are undecided; that is, they want to know more about the issue, they want to be educated. They are not "environmentalists" or "industrialists," although they may have characteristics and sympathies for each, rather they are a

diverse group of people who simply want to do the best they can for themselves, for their families and for their communities. The choices they make—whether to lease their land, to support a regulatory measure or to take other actions—are dependent upon and are only as good as the information they receive.

To offer a balanced perspective, as I have said, is a standard I have set for this document. To generate discussion by such a balanced perspective is my objective. Nevertheless, in proclaiming to follow the direction of literary journalism and in the spirit of transparent discussion, I will say that I am pro-environment. That does not mean that I am "pro-environment" in the sense that my values are stubbornly placed in archaic notions of the preservation of nature. I embrace a broader classification of environmentalism that, true to the interdisciplinary nature of its academic discourse, recognizes the extremely complicated and dynamic relationships that exist between all biotic and non-biotic phenomena. I recognize an environmentalism that places nature not in the context of an entity external to humankind and man-made things, but expresses nature as an integrated idea that includes all human and non-human structures, processes, relationships and lives.

Our understanding of the world is not simple to say that oil and gas development is bad for the environment, or that oil and gas development is good for humans. No one can be certain in these matters. However, living in a global society, as integrated and diverse as ours is, entails certain responsibilities. I believe it is our responsibility as humans and as inextricable components of our environment to do the best that we can to conserve our world. In my opinion, when it comes to issues of global climate change, peak oil, environmental degradation, and the controversy that is associated with them, it is best to air on the side of caution. Again, it is a matter of my opinion, but nevertheless I believe it to be overwhelmingly true that we as humans are not doing enough to conserve and protect our environment—our planet—for future generations of people, not to mention the future generations of billions of forms of other life that share this planet with us. For these reasons, as well as because of recent scientific prediction that forecasts the extreme, some might say mortal, degradation that is to take place on our planet in coming decades, I am opposed to the continued development of fossil fuels resources. I do recognize that these resources are essential to the maintenance of our society (and our culture) as we know it today, but I nevertheless believe it essential that we cease extracting fossil fuel resources from the earth at once. The alternatives that I propose and a continued discussion of

these issues are not appropriate for this document. Nevertheless, I find it important that my point of view in this issue may be plainly known so that one reading this document might better appropriate for themselves an understanding of the pivotal nature of decision: to drill or not to drill.

I am by no means trying to influence the readers of this document into the adoption of my point of view. In researching for and writing this document, I have taken great pains to encapsulate and clearly portray how many key-players in the Meadville area are looking at the issue of oil and gas development; how they are adapting their institutions and what assumptions they are operating on. I put forth the opinions of my subjects with direct citation, with the least alteration possible and the highest adherence to the original intent of their thought. Nowhere, other than in this prologue, do I explicitly state my personal opinions on any matter nor have I once intended to make my opinions implicitly influence the way the way a certain interviewee is interpreted. Notwithstanding, there must always be a margin for unconscious influence on the text. What I hope from those reading this document is that they approach this subject with the same meticulous caution that I have. This document represents an introduction into the subject of oil and gas development for the residents of and around Meadville. It is the first step that many might take on sustained education on the subject. It is essentially a road sign—"Look ahead"—so that those driving might consider which way to turn when the road splits.

Introduction

The Crawford County Historical Society is a quiet pocket of desks and file cabinets on the first floor of a stout building on Arch Street, east of downtown Meadville, Pennsylvania. Within the volumes of manila folders that the Historical Society has under its care are thousands of news clippings—crumbling, fraying, yellowing with age—that detail the past of Meadville. Although the Historical Society maintains other sources of information, the news clippings are especially interesting. They provide the reader with a lens into the past. There are no retrospective interpretations in these articles, no ponderings and reflections that talk about the past with a contemporary point of view, no "shoulda, coulda, woulda". Instead, one is able to see the people in these articles—the ideas, thoughts, and worries that were brewing in their heads—as they lived in the present. Once upon a time the people of Meadville didn't have a single worry about the future. Once upon a time, the people of Meadville didn't need to plan for the future because they future seemed so bright.

Today, the people still talk sentimentally about the good old days. Those were the days when plenty of well-paying blue collar jobs were around, the days when Talon and Avtex and Bessemer and Lake Erie Railroad were still around, the days when restaurants and retail occupied every storefront downtown, the days when people were out en masse in the evenings, going about their entertainments and their shopping with ample spending money. Perhaps the most common point of pride that Meadvillians like to brag is that which an employee of the Crawford County Historical Society brought up while sifting through old records on Meadville industry: "We skated through the depression". This remark was immediately followed by a list of Meadville's well known contributions to society—"the first caterpillar tractor, the first below ground oil pump, the zipper, channel lock tools, and on and on…" That man in the Historical Society was essentially pointing out an important characteristic of Meadvillains—their industry.

In fact, Meadvillians have been proud of their industrial history for as long as Meadville has been around.

A crumbling stack of papers coughed up from the records of the Historical Society yielded an interesting history of the Bessemer and Lake Erie Railroad. The manuscript, its typewritten words fading in to a metallic blue, is titled "The Story of a Railroad" and it detailed the history of the B&LE Railroad, from its beginnings with Meadville entrepreneurs who set up a short rail to ship coal and oil from Mercer and Butler counties, to the time it was taken over by Andrew Carnegie, becoming an essential piece in his incorporated holdings that linked his steel mills in Pittsburgh to tidewaters through Conneaut Harbor at Lake Erie, emancipating him from doing business with the prominent Pennsylvania Railroad. According to the unknown author of this history, it was the long range business judgment of certain Meadville entrepreneurs, including A.C. Huidekoper and the rail manager J.T. Odell that was responsible for eventually making the B&LE's "tonnage per mile greater than the tonnage per mile of any Railroad in the United States"[13].

Due to a decline in the rail industry because of competition with the trucking industry and outdated federal regulations, most rail-lines were being consolidated into one of 6 major regional rail companies. The Bessemer was sold to Erie Lackawana but the decline continued, eventually leading the federal government to consolidate all major railroads into a single quasi-federal company, Conrail. In the 1990s, Conrail began to retire and disassemble certain portions of rail infrastructure near Meadville and the surrounding area, striking a symbolic chord: the prosperous days when Meadville was an important transportation hub were over. This steady decline of the railroad towards the end of the 20th century was indicative of another decline affecting Meadville, that is, the decline of heavy manufacturing. Meadville's economy, substantially based the manufacture of primary components of fabric (synthetic rayon thread and zippers) as well as other manufactured goods, was seeing a steady downturn.

But heavy industry was not only vacating Meadville. All over the industrial north, from Michigan, through Ohio and Pennsylvania and up to New York, an area that is now known as the rustbelt—heavy industry was moving down south and overseas, where taxes were less and labor was cheap. Some of these communities that once relied upon one or two large manufacturers to employ the better part of their populace, serve as a crux for their ancillary business and the

funder of civic life, were left dead in the water whereas some communities were able to pull out relatively unscathed and perhaps better off. Although the different outcomes in each community were for the most part dependent upon the extent that large manufacturers pervaded the civic life and social fabric of these communities—that is, how much these communities depended on these industries for their existence, both economic and cultural—the way these communities end up is also dependent upon the existence of submerged relationships and cultural ties that may have been present before the prevalence of these singular industries.

In his comparison of the post-industrial transitions of Youngstown, Ohio and Allentown, Pennsylvania (both steel towns until their main manufacturers left in the 1980s), Sean Safford[14] points to the existence of hidden, even weak social relationships in the civic interactions of Allentown that connected key constituencies, enabling the necessary cooperation between these constituencies and thus, eventually pulling Allentown safely away from regional crisis. In Youngstown the steel industry occupied the role of civic and economic leadership resolutely and completely, so when the steel industry left, the community was left with no remaining institutional organizer to facilitate discussion between different civic groups and business leaders; Youngstown was left fragmented and retrogressive. Although certain preexisting conditions existed that gave Allentown an advantage over Youngstown, it was nevertheless the emergence of broker organizations that bridged the necessary space between civic leaders and economic leaders, so when their economic leaders left town, the broker organizations were able to form connections between different civic leaders and new industries and development, leading Allentown to embrace new and adaptive technologies. The essential point here is that Allentown and Youngstown, in response to the decline of their principle industry, took different routes, and that Allentown's route, which created a structure of concentrated forms of civic participation that allowed key actors to set forth a coherent set of policies, was more successful. Youngstown did not set up a clear structure to channel civic participation and successfully organize collective action, resulting in opposing and fragmented response to crisis that led nowhere.

In Meadville, there was very little structural response to declines in employment and population after the vacating of key industries like Talon and Avtex. Although Meadville saw a surge of tool and die industry in the area, the population of Crawford County's four centers of

population (Conneaut Lake, Meadville, Sadsbury and Vernon) fell by 10 percent from 1980 to 2000, and the amount of young people declined in certain townships from 1990-2000, falling below statewide norms. The 2007 Business Action Plan Update, elaborated by the Meadville Planning Commission and the Redevelopment Authority documented these changes, pointing out that "The Region now faces a long-term demographic crisis. If trends continue, the situation will not be one of a core community surrounded by demographic growth, but a rapidly declining city surrounded by stagnating townships"[15]. However, no serious institutional response was made by the city until 1997 when the city came out with its first Business District Action Plan; some twenty years after the region saw the beginnings of hard times in the late 1970s. This plan and the plan's most recent update in 2007 have done little to abate continued population decline, income loss and unemployment rates.

According to the most recent census in 2010, population in Meadville has continued to decline, falling by a little over 2 percent from 2000 to 2010, from 13,685 residents to 13,388 residents. Unemployment in Meadville, which was already bad in 2000 at 9 percent—5 percent over the Pennsylvania and national averages—had increased to 12% in 2010, still some 3 percent over the state and national averages. Household income and benefits in Meadville fell during this period also, with households of high income (above $75,000) decreasing 3.5 percent and households with middle income (which was already considered by the city to be a "missing demographic" in 2007) fell almost 5 percent. These middle and high income bars were mitigated by an increase in more households earning less per year. 15.4 percent of households earned less than $15,000 in 2000 whereas 24.7 percent of households earned less than $15,000 dollars in 2010—a 9 percent increase over ten years. This information is corroborative with the percentage change of families living under the poverty line. In 2000, almost 14 percent of families lived under the poverty line in Meadville; in 2010, the number was 24.5 percent, nearly an 11 percent increase in families living under the poverty line[16].

All of this demographic data essentially points to Meadville's unremitted economic and social decline over the past 30 years. Beyond the numbers, the effect of this decline can be seen in the attitudes and behaviors of the populace. As is the case with many economically depressed post-industrial cities, Meadville residents often take a pessimistic and fatalist attitude toward positive change in their community. This community pessimism was revealed openly in a

survey that the city took of over 94 merchants in Meadville in 2007, as part of the Business Action Plan Update, showing that more than twice as many people responded negatively than positively to the question, "*What's the first word or phrase that comes to mind when you think of downtown Meadville*". These negative attitudes about the future can be directly related to the shock and grief that the people of Meadville felt when their very civic icons—Talon, Avtex, the railroad—left Meadville for good. People put their trust in these corporations much like the people of Youngstown put their trust and social capital into the steel industry. People believed, much as Albert Ruff shared his belief to an attentive audience at the Kiwanis Club in 1972, before the decline of industry in the area, that corporations are "good citizens." Whether that belief was shattered when they heavy industry left is uncertain.

Since Talon left, manufacturing received a symbolic defeat, and the people lost a good deal of their trust, their optimism, in the ability of singular industries to provide lasting prosperity. However, even if people might not have a high degree of trust, that doesn't mean they don't want what they used to have. An Allegheny College professor put it this way, "People want it the way it was; they need a path to a new future." Meadville lost 8-9 thousand jobs in 10 years, they fell hard and fast, so essentially people are akin to having a path that will lead them out of poverty in the same amount of time or less. Now, with shale gas being talked about as potentially worth trillions of dollars for the entire U.S., and with a veritable gas drilling boom taking place in Pennsylvania since 2008, the question is presented, does this drilling boom represent that "path to a new future" that people in Crawford County could be hoping for?

Step 1. Leasing

"When you come to Appalachia, you encounter an incredibly underdeveloped legal infrastructure for the oil and gas industry". Russell Schetroma wears a shiny collared shirt, tucked into black tweed held down with suspenders and a yellow silk tie hanging down his chest. Outdoors, in the late February cold, he wears a black wool trench coat and a black fedora with a feather tucked into the band. He is dressed well, but his fashion sense seems oddly similar to that of the time he is discussing, back when Northwest Pennsylvania was known as *the* Oil Region. "That might not have been the case if the oil and gas industry that first started right here, over in Titusville, continued in the area". But at the turn of the century, Titusville and the rest of the Oil Region were left high and dry when a gusher was struck at Spindletop, an oil field in Texas. The oil strike at Splindletop was the key to landing the United States as the largest oil producer in the world. It initially produced 100 thousand barrels of oil per day; the world has never since seen so productive an oil field since. Although the oil industry had already started to expand beyond the reaches of northwest Pennsylvania by the turn of the century, Spindletop put the nail in the coffin. "The herd left town"[17].

Russell Schetroma's business is title work—that is, finalizing and refining leases for oil and gas drillers—but he is also an instrumental academic on the cutting edge of shaping Pennsylvanian common law around oil and gas. His firm, Steptoe & Johnson, occupies the second floor of a concrete building that overlooks the downtown mall on one side and the Meadville Market House on the other. Its offices are somewhat hidden, a rookery above the other, more well-known occupant of the building, PNC Bank. Schetroma is a well-known lawyer not just in the Appalachian region, but nationally and internationally as well. He often makes references to his conversations with "colleagues" and "friends" down in Dallas and Fort Worth; his office above the bank is more of a stepping stone between conferences in South America and Europe and Asia and basically anywhere there is oil and gas trapped in the ground.

His main attentions however are fixed upon Pennsylvania, in "helping our state, so the courts have a means to develop law". Schetroma works with Steptoe and independent academics to develop best practices that serve as a common reference of legal precedent that can be used by the courts to decide litigation. Simply put, "we see what other states with more experience have done and see what of that is most easily incorporated into this state". He also writes articles that attempt to provide leasing agents and drilling companies with a reference for developing legally up-to-date lease agreements. This is all within a vein to proactively interpret existing law, anticipate developing practices according to that law, and generally mitigate the lack of current legal precedent that surrounds oil and gas development in PA.

Because Pennsylvania is "extremely common law," it is usually up to the courts to decide legal precedent rather than statues adopted through the legislative process or regulations established by the executive. However, oil and gas drilling, especially that which uses unconventional drilling techniques like horizontal drilling and hydraulic fracturing, is relatively novel to Pennsylvania, and therefore Pennsylvania has little in the way of existing legal precedent to determine law around oil and gas drilling. Although this represents an "exciting time," in which "lawyers have a chance to actually participate in making law" in Pennsylvania, Schetroma points out that it also makes for a chaotic atmosphere in which the reactionary nature of legal proceedings have to decide what is okay and what is not okay on a case by case basis. Thus, PA courts have to mitigate the inundations of disputes that take place between lease holders, environmentalists, and operators on their own, whereas other states with more experience in oil and gas law might throw out the large majority of cases based on prior legal proceedings that have determined the validity of these disputes. "In Texas, people are stopped at the door if they want to contend a lease".

The whole discussion produced an excited tone in Schetroma's voice. The rapid growth of oil and gas development in PA has caught a lot of people off guard, hence the consistent and monstrous lack of consensus in public opinion facing it. Drilling is such a hot topic partly because it is so new to Pennsylvania. Even Schetroma is somewhat perturbed by the gross heedlessness on the part of the industry. This is apparent by the very nature of his endeavors in helping to establish oil and gas law, such as his paper to encourage the reform of language that producers and leasing agents use in their leases. "General Reflections Upon the Evolving Eastern Oil and Gas Lease" chides out-of-state producers for rushing in with the assumption

"that all states have formal oil and gas laws that are consistent with what is known in one or more of the Western producing states" and the assumption "that Eastern states provide similar regulatory regimes to those known and operated in the West"[18]. One can almost imagine Russell Schetroma standing over his oil and gas clients, his resolute stature complemented by suspenders and a non-pulsed countenance, wagging his fingers at a hastily drafted lease agreement. "I am so offended by the bazillions of dollars being invested by my clients in holes in the ground in a state that has no essentially no oil and gas law background".

Despite the legal vagaries brought forth by unbridled oil and gas development, Steptoe & Johnson itself has seen a lot of growth from the shale-drilling boom in Appalachia. For over 100 years Steptoe & Johnson has been servicing the coal, oil and gas industries. From its inception in West Virginia, the firm has grown to include 13 offices in Kentucky, Ohio, Pennsylvania, Texas and West Virginia with 180 attorneys and 200 paraprofessionals. The firm in Meadville was acquired two years ago by Steptoe & Johnson, probably in response to the firm's large growth in the area of title work since 2008. Carol Powell, the office manager there, hints at the extent of growth that the Meadville oil and gas firm saw when she says "Our firm wasn't big enough to represent a fortune 100 company" and "There has been so much title work that we transformed to deal almost exclusively in that work" [19].

Although the firm's growth has been mainly due to the increased drilling that has occurred in other parts of the region, like across the border in Ohio, the Meadville office has seen new hiring of attorneys, at least one of which is a Meadville local, Benedict Kirchner. Ben's youth is almost belied by the close trim of his hair, but he was nevertheless familiar with the schools in the area—he grew up in Saegertown. "High schools in Crawford do a pretty good job. Most of our staff is from the area"[20]. Kirchner also sees the potential of oil and gas drilling beyond its immediate implications in the growth of Meadville oil- and gas-based industries like Steptoe. "This industry has been here since 1859; it has brought prosperity since 1859. Farmers in the area have always paid their taxes with lease money". This statement seemed to have some truth to it. According a study conducted last year by Sinoma Perry, in her interviews with farmers who had leased their lands to fracking companies in Bradford County, PA "the majority of the leased landowners I spoke with…had already been leasing their land for more than 30 years"[21]. Those leases were for vertical wells (not the more recent horizontally drilled wells

normally associated with large fracking operations), interstate pipelines, and a single gas storage facility in the area, but more often than not those farmers saw little to no development on their land. “According to farmers I interviewed, they simply used the lease signing bonus, which had been $5–10 per acre every 5 years on average, to pay off some of their taxes or other yearly expenses”.

Indeed, if one goes out on any surface road in Crawford County, they are bound to see the occasional apparatus of valves that the industry calls “Christmas trees” and the green or opaque settling tanks that abate them. In areas south of Meadville near the bottom of the county—townships with names like Fairfield and East Fairfield, Wayne—these apparatuses seem to take the place of milestones on the highway. If one is looking out for them, they can see the muddy tracks of pickup trucks painted into the snow, leading back to hidden corridors in the woods. Sometimes these backcountry private roads are gated; sometimes not. They break up the rolling smoothness of corn rows picked clean in the winter. Some are visibly rusted with age, the white paint peeling off them—relics left over generations before, the leases most likely passing from one generation of farmers to the next, renewed every 4 or 5 years, a little extra money trickling in. They are wells most likely extracting gas from sandstone plays; some like the Kantz Corners and the Cochranton Plays have proven reserves between 10 and a hundred thousand billion cubic feet of gas. They are an inextricable part of the landscape, a landscape that, especially in the winter, seems so inclined to be quiet, gray, depressed; empty. It is a landscape common to Pennsylvania.

Like most things concerning the burgeoning oil and gas industry, the prosperity that it brings to agricultural regions is something of a contentious issue. The tension raised by this issue is all too obvious from the title of a book released in 2010, *End of Country*. Although sometimes lacking scientific rigor, the book lends important insights into what sorts of transformations in land use can be expected to take place in a highly rural landscape receiving a rapid influx of drilling activity. The author, Seamus McGraw, relates the story of his community—a remote and hilly landscape of struggling dairy farmers in the Northeastern corner of Pennsylvania, in Susquehanna County—and how this community was forced to dire straits in a struggle against the drilling companies that purported to make local residents rich. Although the issue that initially sparked the trauma was a contamination of some the residents’ drinking water wells, a larger social impact also arose from what only started as a plea from some

residents for Cabot, the operator drilling the wells, and the DEP to make serious investigations into source of the contamination. In the end, some families who had for decades generations been bound together through a sense of common purpose in making a meager living from the barren land were in just a few months torn apart, from disparities in lease earnings and disputes over the benefits of drilling.

The social effects of increased oil and gas development are not as well documented as the environmental effects or even the economic effects (the comprehensive impacts of which are also little studied), but there have been a couple of articles in the past few years that attempt to shed some light on the issue. In the previous study that I mentioned, Perry discovered some important insights through a series of interviews that she did with farmers who had taken leases with unconventional drillers (those that use hydro-fracking in tandem with horizontal drilling) as part of the ethnographic fieldwork she did in Bradford County from 2009-2010. "During focus groups and interviews…[people] expressed the feeling that the shale gas industry had forever altered the connections they had with their family histories, childhood memories, their lands, their neighbors and communities, the past, and the present". These changes were taking place because of a change in quality of life; the noise, traffic, distrust of drinking water, discord with local public officials and disputes between neighbors. Perry points out that the changes occurring to the landscape were universally acknowledged by local landowners, "regardless of their opinions about whether the shale gas developments were having an overall positive or negative impact in the county". People were gaining an appreciation of "what the land, water, soil, rivers, wildlife, neighbors, families, and a sense of community truly means to them…*because of* the rapid changes being brought about by the shale gas boom in the county". The residents of the area who had developed and experienced a traditional way of life for generations were now experiencing a sense of collective trauma and fear about what the future might hold for them.

Many of these findings were confirmed in a similar study conducted over the same time period, 2009-2010, over four counties in Pennsylvania and New York currently experiencing unconventional oil and gas development to different degrees (two had undergone extensive leasing, two had already experienced significant drilling). The Penn State and Cornell researchers in this study interviewed residents of the four counties to ascertain the opinions of a variety of stakeholders on what they considered to be the current and potential future impacts of

unconventional oil and gas development in their communities. A huge concern for residents surrounded the risk to the "rural way of life" that existed in the area and for which many residents either chose to live in that area, chose to stay, or in one way or another gained their livelihood through that association. As one resident in Bradford commented ". . . a lot of people very much value their rural quality of life here, the main reason why they live here…. if you had a list, that's top—above natural beauty and all that kind of stuff. So that's definitely something time will tell, if that gets diminished or not"[22].

On the other side of these risks however, proponents of oil and gas development point out the benefits to be had in preserving a rural way of life. A man in Mt. Pleasant, a community south of Pittsburgh that was the staging area for Range Resources' first wells in the Marcellus Shale, said that with lease money farmers could finally afford to resurrect their dilapidating farms. "There are a lot of happy people here. I mean there is people here who had barns that had been falling apart. They resurrected these barns"[23]. This hopeful sentiment—that oil and gas development is the key to helping farmers preserve their heritage, their way of life—is a widespread one, and according to McGraw in his book, *End of Country,* it was a serious reason why many farmers chose to agree to the leases in the first place. But as one leasing agent makes clear in McGraw's book, there was no guarantee that farmers would use the lease money they got to preserve their heritage, to revive their farms.

> I've signed farmers who were sitting there with broken-down equipment, a broken roof, losing money because they couldn't put a fence up to keep critters out of their corn silo…You go and write them a check and they've got a brand-new tractor and a brand-new Ford truck, and the corn silo's still the same… I see a lot of them worse off than when they started, because they get that one check, they change their lifestyle[24]

For a lot of farmers, it's a difficult decision to accept a lease for an unconventional well. Sometimes, especially if there is a lot of competition between drillers, leases can produce huge economic benefits for landowners, but the bad publicity about fracking is circulating too. The influx of mixed information—with producers promising large royalty payments and other community and environmental groups claiming that fracking can have long-lasting negative effects is an issue that causes confusion and tension amongst landowners in those rural-scapes where intensive drilling is predominantly occurring, but the debate doesn't only occur in the country.

In the conference room with the lacquered oak table, the distaste Russ Schetroma had for Act 13 could be seen in his face. "Act 13 wasn't anticipated by anyone in the law field". He's perturbed because although he considers it inappropriate that drilling is happening so rapidly in a state that has no law governing that drilling, PA has a tradition of courts creating that law, not state legislators. Act 13 was signed into law by Governor Corbett in February of 2012; it gives counties the ability to adopt an "impact fee" for all unconventional drilling operations within county lines, and then designates that money to the Pennsylvania Utility Commission (PUC) for distribution of monies to state agencies, with the bulk of the money going to those counties, townships and municipalities that are encountering oil and gas development from oil and gas activity[25]. The fee for each well is dependent upon that year's consumer index price for gas, as well as the number of years that a particular well is operation[26].

"With the gas wells, it does open doors for some of those townships that are struggling" says the assistant director of Crawford County's planning commission. On the third floor of the Crawford County Courthouse, an imposing brick and mortar structure that dominates Meadville's diamond park, there sits the county planning commission office. The office is a confusing corridor of removable partitions and desks, but farther down the tall and wide stone corridor, at the end of the hall, there is a conference room where some of the commissions have their meetings. Arelene Rodriguez, pronounced with the r rolled—Ro-drrri-guez—the secretary emphasizes over the phone, states that "where they're getting money, it can help them possibly build a new township building that they've been possibly wanting to do, it gives them a little bit more money to do some of the stuff that is going to get impacted, but has been impacted before"[27]. The "stuff that is going to be impacted" is a reference to the roads, the housing stock, the schools, and all of the other public services and infrastructure that can expect an impact from large scale oil and gas development, whether the impact is wear and tear on the roads, or increased demand of services like police and fire. The statement that these things have "been impacted before" was intoned passively, but it is nevertheless a reference to the lasting legacy of decline that the loss of heavy industry left behind in rust-belt cities like Meadville. That decline was alluded to in Rodriguez's next statement. "I don't want to say it is horrible, because it isn't horrible. It is helping some of those townships get some money and bring in people that they want and maybe increasing their tax base and helping them out. You know, some of those townships can barely get by".

Act 13 does not sit well with all parties, however. Soon after Act 13 was signed into law, the appeal by 7 Pennsylvania townships for their rights to implement zoning ordinances on oil and gas drilling rigs called into question the intent of such a law. Although Act 13 bound drillers to the restrictions put in place by the Commonwealth and the DEP, the act also rescinded the right of municipalities to implement zoning and regulatory measures that might restrict drillers from certain locations. The Pennsylvania Commonwealth Court ruled in favor of the municipality, saying the restrictions on their ability to zone and to regulate oil and gas drilling violated their due process. The decision has been appealed by the Corbett administration however, and now both industry and municipalities await a decision from PA's Supreme Court.

That leaves local regulators all throughout the state sitting on their hands. In another large conference room, in Meadville's Fire station, Meadville's Zoning Administrator, Gary Johnson said that "Even if we wanted to implement zoning regulations on the oil and gas industry, so we might prepare for it, we couldn't. We have to wait for the decision on Act 13"[28]. But even then, the city isn't sure that it would even regulate the industry if it could. The predominant view is that shale development in Crawford County "hasn't happened yet, so we just don't know". Arlene Rodriguez repeated this sentiment when it came to the county's plans for creating a zoning ordinance. "We just can't plan for something if it's not certain. In meetings, it [the potential oil and gas boom] does come up but it doesn't stop us from…you know it is not a constant—'but the oil and gas is coming! Ahh, we have to do something!' We can't do it that way because we don't really know".

Step 2. Drill

If one were to take highway 322 across the bridge, out of Meadville and into Vernon Township, past the strip of franchises—the Home Depot, Giant Eagle, Dairy Queen, Comfort Inn—parking lots and the occasional misplaced local establishment like Chovy's and Casey's, way up on the hill, past Walmart but just before the Salvation Army, and if one were to take right-hand turn here, cruise down this road and pull into the parking lot near a series of corrugated metal warehouses, one would find Moody & Associates.

Moody & Associates is a consulting and services firm that, ever since 1891, has conducted professional services for groundwater issues and water well development. The business was mostly drilling water wells in people's back yards until 1950 when it started offering consulting services. In the last 3-4 years, the business has taken on another transformation that has been responsible for the firm's expansion into two new offices near Bradford County, PA and Canton, OH, as well as an expansion in their existing offices in Meadville and Houston, PA. The transformation has been responsible for the firm's doubling in staff, from roughly 60 individuals—some biologists and ecologists, but mostly geologists—to nearly 120. The reason for the change: "We at Moody have found ourselves well-positioned to be of assistance to the industry"[29]. And the industry he is talking about: well, shale drilling of course. Moody samples, tests and cleans source water for the hydraulic fracturing industry.

Sitting in a small conference room in the back of what looks like a low-ceiling warehouse, Burt Waite, a bespectacled man of mild manners and gentle features—the plaid button-up dress-shirt, the pens in his pocket, the large gold-rimmed glasses and khaki all betray him for a geologist—pants put his forearms on the table and closed his hands, one upon the other. "Pennsylvania is experiencing a level of gas development never before seen in this state. I see shale gas in Pennsylvania as equitable to the boom that followed the Drake well in Titusville, or the Haymaker that happened later on in the 19th century. Marcellus is a game changer". Waite, among many other things, is a respected geologist. He is a high profile member of Moody & Associates insomuch as he is well known around the area as being a sort of representative of them, as well as an unofficial representative of the shale drilling. He is a

member of PIOGA, the Pennsylvania Independent Oil and Gas Association—the principal association that represents PA's oil and natural gas industry; self-described the "producers association directed by producers for the benefit of producers"[30]. He is also a member of a DEP committee that looks at issues of stray gas in the Marcellus Shale and he has given numerous talks on the subject of stray gas and related issues of cement casing of oil and gas wells.

The issue of stray gas showing up in people's water wells is probably the most contentious and the most debated topic when it comes to the extraction of oil and gas from tight shale. One of the most well-known and wide-spread instances of groundwater contamination by methane occurred in Dimock, PA, in 2009, when 15 families filed a federal lawsuit against Cabot Oil and Gas Corp, and the DEP fined the company 120 thousand dollars in addition to suspending its operations until the company could abide by a series of strict probationary regulations. Local residents complained that methane was bubbling from their faucets early in 2009, after more than 20 gas wells had been drilled, and the DEP found that some of Cabot's well casings were faulty, allowing methane to seep into groundwater[31]. In December, 2011, after Cabot installed water treatment systems in the homes of several residents and after encasing the entire length of its well casings, the DEP allowed the company to stop delivering water to residents. In early 2012, in response to continued complaints from homeowners in the area, the Environmental Protection Agency (EPA) stepped in and conducted water testing, finding hazardous levels of barium, arsenic and manganese in the water, but they stopped delivering water to the residents anyway, saying proper treatment could reduce the chemicals to harmless levels. The 120 thousand dollar fine was the largest single fine the DEP had ever issued to an operator.

But it is little compared to the bill Chesapeake has collected on its 190 violations (that's 60 more than Cabot incurred in Dimock), having paid 1.2 million dollars in fines by June, 2012. Chesapeake agreed to pay another 1.6 million dollars in damages to 3 families in Wyalusing, Bradford County (most of Chesapeake's 200 PA wells are located in Bradford County) after the DEP found poor casings in Chesepeake's gas wells to be the probable cause for the contamination[32]. Similarly, a 2008 investigation by the Ohio Department of Natural Resources of an incident in which methane migration caused the explosion of a family home in Bainbridge—a suburb of Cleveland, Ohio—found that a local driller, Ohio Valley Energy

Systems, was to blame—they had not built proper casings and even despite clear warning signs, the company decided to frack the well, causing 1,000 gallons of fracturing fluid and 150 gallons of oil to leak from the casings[33]. The Ohio company assumed guilt, whereas Cabot and Chesapeake claimed a lack of proof to incriminate them, and in addition to assuming the construction of a 1 million dollar water main for homeowners, Ohio Valley Energy Systems settled in court, paying homeowners, the Bainbridge township and an insurance company an undisclosed amount of money. Such clauses of nondisclosure (except for Chesapeake's settlement, which represented a landmark case) are typical of reported incidences of contamination[34].

In 2004, 80 miles northeast of Pittsburgh in Jefferson County, 3 people died from an explosion that occurred in their home. According to the DEP's man in charge of methane migration investigations, Fred Baldassacre, gas that seeped into the home from several adjacent wells being drilled by Synder Brothers was set off by a spark; it exploded, killing Charles and Dorothy Harper, as well as their grandson, Baelee. The company was sued and reached an undisclosed settlement with the Harper family. The investigation remains open, pending compliance by Synder Brothers to conduct pressure tests on their wells[35].

These are just a few of the examples of supposed cases of methane contamination by nearby gas wells that have come out of the woodwork since oil and gas development really began to ramp up[36]. Industry however, argues that these cases—some are highly publicized, many are not—represent 'anecdotes' only, and industry consortiums like the American Petroleum Institute and the Pennsylvania Independent Oil & Gas Association, claim that still, no examples of fracking having polluted ground water exist. The DEP will tell you the same thing, and so will the EPA for that matter. From some faraway office in Harrisburg, the press secretary of the DEP, Kevin Sunday spoke the phrase very clearly through the phone: "There has never been a documented case in which hydraulic fracturing has been linked to groundwater contamination".

Burt Waite was eager to take this claim one step further. Instead of regurgitating the oft repeated phrase "fracking has never been shown to cause groundwater contamination," which is another way of saying, "we don't know what fracking can do," Waite went so far as to say that fracking itself would never even be capable of contaminating groundwater. "Communication by

way of hydraulic fractures cannot happen, by the laws of physics it cannot happen". He stood up from his chair, went to a white board and began drawing with a red dry-erase marker.

The drawing involved two straight lines, the well bore, and many crooked lines, the fractures. He started by talking about a normal, conventionally-drilled gas wells, that is, wells that don't need to use horizontal drilling. "When we frack these wells down to a depth of 2 thousand feet in a sandstone formation that contains oil and gas, we can place fractures here, here and here," marking each "here" with crooked lines next to the bore hole. "There is no communication with the groundwater here," he marks a point above, closer to the surface, "because lithostatic pressure keeps the fractures horizontally oriented". Here is where Waite's career as a geologist made itself abundantly obvious. Essentially, lithostatic pressure is overburden pressure, or the stress imposed on a layer of rock by overlying material. Therefore, in a shallow well below the water table, the pressure of the overlaying rock is so much that the fractures produced by a fracking job must go horizontally; they cannot force their way vertically against so much pressure and thus communicate with groundwater. However, in drilling operations that are seeking to extract the gas from the Marcellus or Utica Shale, "we go deeper where there is no longer lithostatic pressure. The fractures tend to go vertically. However, even if these fractures were able to make their way thousands of feet upward through sheer rock and reach 2 thousand feet, the depth of a typical gas well"—he has drawn a long crooked line that connects up to his earlier drawing of a vertically-drilled well—"the lithostatic pressure at that depth would then cause the fractures to go horizontally"—he suddenly jerks his hand, and the line that he was drawing up and up and up, now goes clear to the right.

Then why all of the reports from people complaining about methane in their wells? If what Waite is claiming to be true, how does methane get in these people's wells? Although some cases of well contamination have been linked to the seepage of naturally occurring, organic-rich methane into certain drinking wells (this would be from methane pockets that exist at very shallow depths in the ground) it has also been shown in peer-reviewed studies that the methane occurring in some people's groundwater after intensive drilling in the close proximity is likely to come from sources deep within the earth[37]. The DEP claim the issue to be a simple one: the methane is leaking through cement casings. The DEP has pointed to faulty well casings in nearly all of the cases in which it found drilling companies to be responsible for methane

contamination of water wells. Over the phone again, that disembodied voice from Harrisburg, Kevin Sunday: "Gas pockets, much closer to the surface than the shale [that's being drilled for], are the ones contaminating groundwater. The drilling can often disturb shallow pockets of gas, which then travel through natural fractures in the ground or through casings in the bore holes of the gas wells, in the case of sub-standard cement jobs". This is how the DEP explained what happened in Union Township, Tioga County, when that 30-foot geyser of methane gas and water erupted from an abandoned well that was nearby a well being actively drilled using nonconventional methods[38].

Burt Waite, in his nonchalant way of referring to industry accidents, had this to say about the issue of methane migration occurring from faulty well casings.

> I don't think [methane migration from faulty well casings] is common. It is overstated in the number of occurrences, but it can't be overstated in the severity of the issue. If gas contaminates a water well or leaks into someone's basement, the result is catastrophic; everything is done to prevent it. But if someone shuts off a valve or forgets some safety procedure…well, stuff happens.

Waite was insistent that industry takes every possible precaution to prevent "stuff" from happening, but his reasoning is that you can never prevent accidents from happening. As soon as the issue of methane migration was brought up, he went about making his point clear. "Look, shit happens. Something is always inevitably gonna go wrong…Every 18 minutes someone dies in an automobile accident". But no one pays attention to all of the automobile deaths. Instead, "You are going to see something happen every few days in the paper" that has to do with fracking, but in reality, according to Waite, "those occurrences will be rare, uncommon"[39]. What it comes down to for Waite is that the whole issue of methane contamination, really of oil and gas development in general, is that "it is all so overblown in the media". When asked about why he thought there was so much environmental backlash in the first place, why so many people are so resistant to the large scale oil and gas development posed by unconventional drilling in deep shale, he said it was because "it is a new thing. People in Pennsylvania are not accustomed to seeing big rig set ups and trucks in their towns. When I go to some of these seminars, there are always people who are so pro-industry and then there are these people who are so pro-environment that nothing you say will ever change their minds".

Russell Schetroma, the attorney with the suspenders, shares some of the same ideas with Waite. In the same nonchalant way he expressed how "this is an industrial process. Things happen". Schetroma's ideas about the narrow-minded environmentalist however, were a bit more developed. "Antis maintain this perfection standard in which they think something should only be done if it is perfect". According to Schetroma, those opposed to oil and gas development don't want it because it doesn't fit within their conception of a perfect process. In essence, Schetroma is able to write off those vehemently opposed because, with them, "you can never get to a definable point where it's okay," because what is necessary, is never good enough.

The arguments that Waite and Schetroma make and their opinions about those opposed to fracking are nicely summed up in a point-counterpoint article published in the journal Nature and called "Should Fracking Stop?"[40] The point made by Ingraffea and Howarth is that "Natural gas extracted from shale comes at too great a cost to the environment". Their point rests upon the fact that hydraulic fracturing is a huge undertaking, with huge resource inputs and waste outputs, and that the effects of these inputs and outputs deserve, being of such unprecedented nature, to be studied more. They point out that the little peer-reviewed data that does exist currently "gives reason for pause," especially when considering the carbon-footprint, the air and water pollution that fracking has already in some cases been shown to cause, whereas its main *raison d'etre*, it economic long-term economic benefits for the US, are in reality extremely uncertain. The counterpoint made by Engelder, the penn-state researcher who was responsible for making the Marcellus Shale a big deal, is that "Fracking is crucial to global economic stability; the economic benefits outweigh the environmental risks". Engelder starts out by illustrating what he says to be the huge potential for shale fuels in promoting and propping the domestic economy, and sustaining our energy needs until renewable energies are more developed. He goes on to dispel some of the principle issues that people associate with fracturing, those being water use and water contamination. Water use is a non-issue, he says, whereas the only legitimate fears about water contamination are those based on the issue of the flow-back water which returns from the ground after fracturing with high salt content and nasty chemicals. That water, he says, can be safely recycled—all we need to do is focus on improving industry practices.

These two sides of the issue are sides that are perhaps never to be conciliated. The problems and solutions that either side brings up are not based upon scientific fact, yet they do

represent the two world-views that dominate this issue, but are seemingly forever at odds. One world view says that we must be cautious, whereas the other world view says that we can't be cautious.

If one were to take the 322 South out of Meadville, through the lowland woods flooded with water from the overflowing French Creek, past the large sand and gravel mines that flank the road on either side, past the railroad that cuts through flooded corn fields, past the scrap heaps and truck yards, the occasional tool and die manufacturer, and if one were to take a right just where the road abuts a bend in the river, and then cross the river, one would soon see on their right-hand side, Ernst Conservation Seeds.

Ernst Conservation Seeds has been around forty years and is purported to be one of the largest native seed producers and distributers in the Northeast region of the United States. In 2010, Ernst Biomass, an operation independent of Ernst Seeds, began converting the company's 4 thousand acres and 8 thousand tons of switch grass into pellets and briquettes primarily for use as a solid fuel. Near the back of the main Ernst compound, through an array of allies and corridors that navigate between the giant red and white warehouses that house Ernst's seed sorting and storage, and under an awning of an open-air warehouse, Dan Arnett was working with a man in a camouflage hunting cap, trying to scoot a large, multiple ton piece of machinery unto a forklift. It was a 'bricketer', a large but mechanically simple machine that converts switch grass straw into cylindrical briquettes. "We've stopped making briquettes. We just make pellets now"[41]. It was a wet, dark, gray, brisk February day. Arnett spoke with the forthwith and unapologetic nature of a working man, a man with a mission. "Drilling in deep-shales is directly driving the demand for this product." The pellets were originally intended for use as biomass and perhaps, if the technology improved one day, biofuels. But as Arnett points out, "The technology of cellulosic ethanol is so far from where it needs to be". Somewhat encouraging to Ernst's switch grass-biofuel pioneers was the phenomena that biomass-burning stoves were gaining some popularity, and the industry seemed to be developing on its own. Meanwhile, in September of 2011, Ernst Biomass was approached by oil and gas drillers who wanted to use Ernst's switch grass pellets for use as an industrial absorbent. Most unconventional wells are required to use an absorbent in order to solidify drill "cuttings," the mud and dirt and rock that is produced by the

drilling of a well. It turns out that Ernst's switch grass pellets are a much better absorbent than the wood pulp and fly ash which is typically used as an absorbent. Now, since September of 2012, "the demand [of switch grass pellets] far exceeds supply" and that's with delivery to only two drilling sites. Ernst can't produce the pellets fast enough, barring an improvement in their machinery. "There's also huge room to grow—what with 66,000 wells intended to be drilled by 2025". Arnett has already been able to hire 5 or 6 guys because of the increase in demand of his biomass, and he says there is a definite potential for increased employment.

Ernst Conservation Seeds, the parent company of Ernst Biomass, also has seen growth due to the boom in oil and gas development. According to a spokesman, "maybe ten percent of all our business is now for reclamation projects by the oil and gas industry". He described one project in which Ernst sold ¾ of a million dollars of seed for a single project. Most of the increased business is from the reclamation of the large amount of land displaced by new pipelines. Because the DEP requires producers to restore their developments with native seed for reclamation, that means big business for Ernst. "It started in the last 3 years and it's steadily gonna grow". In his opinion, especially after attending a local PIOGA meeting, "this area is gonna go off. This area is up and coming". That means more for Ernst than just more seed orders and more switch grass pellets; it also might mean free gas to heat their many greenhouses and large seed-cleaning operations. Speaking as to whether or not the Ernst family had leased their land Arnett exercised once again his straightforward logic. "They haven't signed a lease yet, but they're businesspeople with 5 thousand acres of land. What do you think?"

Step 3. Frack

Roger Willis' corner office on the second floor of a small office building in Meadville, Pennsylvania is nothing imposing. It is spacious, neat, but nothing that might betray to the uninformed that it is the presidential office of a company whose revenues are in the hundreds of millions of dollars[42]. Willis however, doesn't put on any airs. One might see him riding his bike in the area along with a local group of spandex-clad cycle-jockeys every Thursday, or on the weekends someone might find him at Voodoo Lounge, a local brewery-restaurant-bar that is just across the parking lot from his office. He works for Universal Well Services, which provides pressure pumping and reservoir enhancement services to the oil and gas industry.

In short, Universal Well Services, Inc is a fracking company. That means when a drilling company wants to want to inject fracking fluid into one of its wells—usually to stimulate increased productivity in a conventional oil well, or to extract gas and oil from a tight shale formation—they call a company like Universal, and Universal responds by sending in hundreds of truckloads of water, sand (called propant), and a small percentage of chemicals, along with other mobile equipment like fracture fluid storage tanks, sand storage units, chemical trucks, blending equipment and pumping equipment.

Defending his industry, Roger Willis sees that fracking poses no new or special threat to the environment. Rather than being something that should be postponed and in the meantime dawdled over and argued about, or worse, 'regulated to death,' fracking should be embraced with the careful tact that is already required of any new industry, especially those industries that fall under the realm of mining and extraction, so that our country can start to wean itself from foreign fuels and rural, impoverished communities like Meadville can benefit in the meantime.

"Fracking is no new thing. Pennsylvania used to be covered by hundreds of small operating companies. Working on a regional basis, these small drillers—their dividends only in the multi-million dollar range—would target a particular area, and put in dozens, sometimes hundreds of wells." Roger referred to the wells with a wave of his hand in the direction of the back window of his office. The window occupies the entirety of the rear wall of his office; the place he was pointing is across Water Street, past the downtown mall and over a couple tool and die shops, a scrap yard, and the rail track that border the French Creek, beyond Radio Tower

Hill—he was pointing to an agricultural landscape that stretches on for miles, from Vernon Township to the Ohio border and beyond, a landscape that is not new, by any means, to the extraction of fossil fuels.

30 miles away from Meadville is the Oil Creek valley, a heavily wooded landscape that was once described as a wilderness; the only people who ventured there were a kind of rough-neck that existed long before the oil industry was founded in these parts, those pioneers who sought out the region's vast resources of timber. Now, the Oil Creek Valley is still heavily forested, and its timber resources are still a small component of local industry. The area was home to steel manufacturers for much of the 20th century, and the vast hulls of buildings this industry left behind still stand like giants, immutable parts of the landscape, in Titusville and Oil City; they are still used today. The most striking part of the valley's landscape however is to be seen if one were to take a walk in the woods. Everywhere in these woods, even in Oil Creek State park, can be found the rusting, rotting, decomposing remains of one of the United States' most iconic industry: oil. Everything from tools left behind to pieces of drilling equipment half-buried in the dirt, to the slowly-collapsing remains of entire structures can be found in the woods that thrive in this valley. In 1859, 'Colonel' Edwin Drake drilled the first known commercial oil well in these woods, near Titusville. He did it using an oil derrick he fashioned himself and a cable-tool drill, adapted from a technology that had been developed almost 2 thousand years prior by the Chinese to drill for gas and shallow wells for salt water, and is still in use in modified form the Appalachian basin today[43].

That initial well inspired wildcatters (petroleum prospectors, named so because during the infancy of the oil boom, oil wells were located in isolated areas where one could supposedly hear the cries of wildcats) from all over the country to pour into the region and try their hand in extracting oil. This initial 'Black Gold Rush' lent itself to irrational overexploitation, which caused drastic fluctuations in the price of oil, eventually inspiring John D. Rockefeller to try and stabilize the industry by monopolizing the sphere of oil refining and transportation[44]. This oil boom in the Titusville area and down into Venango County caused a drastic increase in immediate economic activity—17 million dollars were grossed for speculators and investors by

direct sale of oil alone (not to mention all the profits gained from an increase in ancillary business that housed, fed, cleaned and supported the wildcatters)[45]—but down the line, it left little lasting good to show for the permanent residents of this region. The region's title as 'Oil King' would last only 14 years, and although the notion was widely shared that oil had a bright future, it did not mean that the place where the first commercial oil was founded, the Oil Creek Valley, would share in oil's long-lasting success.

This was the 'Gilded Age,' as coined by Mark Twain and Charles Dudley Warner; this was the age of rapid economic growth, industrialization and mechanization that, by sacrificing planning, order and often the environment to progress, saw the United States at the forefront of industry. In his book, *Petrolia*[46], author Brian Black talks about the lasting psychological impact of oil extraction in Northwest Pennsylvania. "Petrolia introduced the practice of creating industrial wastelands to a nation with an economic drive for growth that could not be satiated". That first oil boom set the precedent for almost every subsequent industrial process to come. Because in the very beginning the environment and a responsible development approach were sacrificed unheedingly for the benefit of a growth on an industry and the economic progress that followed, that prioritizing of growth over development has come to be the standard by which every industry in our history has operated. This has been the ideology by which oil and gas production had remained relatively unregulated in Pennsylvania until the 1980s.

Besides establishing a lasting legacy of extraction in the region, the long history of oil and gas development in Northwest Pennsylvania has created an issue that threatens to impair the future development of safe drilling in the region. For almost a hundred years after Drake's first oil well, there was absolutely no regulation of the petroleum industry. The first regulation of oil and gas producers to come into place was minimal; in 1955 the state of Pennsylvania simply required operators to register the locations of their wells. Since then the state dispensed about 120 thousand drilling permits, which by the state's estimates, leaves an about 200 thousand wells unaccounted for in the commonwealth. Of those 120 thousand wells that the state has on file, the locations of only 2 to 4 per cent of them are known; the locations of these 8,257 abandoned oil wells are listed on the Department for Environmental Protection's website, all of which are located in Northern and Western Pa.

In 1984, Pennsylvania passed its first law that actually introduced real regulations for gas and oil driller—at the time, a controversial law: The Oil and Gas Act. The law required operators to register their wells and plug inactive and abandoned wells with cement, and also to pay a 50 dollar surcharge per permit (later increased to $150 for oil wells and $250 for gas wells), this money being used to initiate the state run Abandoned and Orphaned Well Program. This goal of this program is to locate abandoned wells and plug them with cement. Since 1989, they have plugged 2,871 wells, less than 1 per cent of PA's total estimated number of abandoned wells. The program, funded by drilling permit money, has slowed in recent years, plugging only 23 wells in 2012. This lack of activity is a result of a lack of funds—although in 2012 Pennsylvania received over 200 million dollars in impact fees from the commonwealth's newest bill regulating the oil and gas industry, Act 13, none of that money that new money being generated from unconventional wells has been appropriated for plugging wells[47].

The multitude of abandoned wells are a problem because they provide potential pathways for which methane, displaced by the drilling of new oil and gas wells, can seep to the surface. Sometimes that seepage can be explosive and extremely dangerous, as illustrated by the recent methane-geyser that Shell's drilling operations displaced in Tioga County. In a review of DEP's hydraulic fracturing regulatory program by an independent review board known as STRONGER (State Review of Oil and Natural Gas Environmental Regulations), it was noted that the DEP had not required operators to identify possible conduits by which hydraulic fracturing fluids could migrate into old abandoned wells. The review recommended that the "DEP consider whether there are areas or situations in which wells (active and abandoned) in the vicinity of hydraulic fracturing operations provide pathways for fluid movement into groundwater. In such areas or situations, DEP should require operators to identify and eliminate these potential pathways for fluid movement into groundwater before conducting hydraulic fracturing operations"[48]. Although the state has overhauled its drilling standards twice since STRONGER issued its opinion in 2010, it hasn't been until now, with a third proposed overhaul of drilling standards by the state's Office of Oil and Gas Management (OOGM), that the state is considering rules requiring operators to "identify on the well permit application the location of abandoned gas or oil wells within 1,000 feet of the entire well bore length"[49]. Although STRONGER ascertains that the current state of Pennsylvania's regulatory atmosphere is, "over all, well managed, professional and meeting its program objectives," there are many groups that would say that

DEP regulations, and much more the frequency and quality of its inspections, leave a lot to be desired[50].

In February of 2011, the New York Times published an article that pointed out the potential danger of operators dumping millions of gallons of wastewater on water treatment facilities which then released the treated water into Pennsylvania's Monongahela and Susquehanna Rivers, which provide drinking water to millions of people. The controversy surrounded a series of unpublished reports by the EPA and industry groups that revealed water treatment plants were incapable of removing certain contaminants present in hydraulic fracturing waste water, including high levels of radiation present in some waste water, and thus many of these water treatment facilities were probably breaking the law[51]. Soon thereafter, the EPA called for the Pennsylvania DEP to perform additional testing for radioactivity at water-intake plants and requested state documents to review whether permits were strict enough in requiring monitoring and limiting pollution by water treatment plants. In response to these concerns, the DEP called drilling operators to stop sending their wastewater to treatment facilities that are exempted from total dissolved solid (TDS) treatment requirements. The Marcellus Shale Coalition, an industry representative group, replied quickly afterword and drilling operators complied.

In a more recent challenge to the efficacy of the DEP, Pennsylvania state representative Jesse White called on state agencies to investigate the DEP for allegedly mishandling situations in which landowners' claimed their drinking water had been contaminated[52]. The allegations came about from a court case being held in Washington County in which DEP employees testified that DEP reports to property owners concerning possible contamination didn't contain a complete list of contaminants found by lab testing. The omissions in these landowner reports including dangerous heavy metals and VOCs associated with fracturing fluids.

The reliability of the DEP is something that has been questioned by many anti-fracking groups and individuals who point to several cases in which regulators have left the DEP for jobs in the oil and gas industry. Many point to Governor Corbett's close ties with the oil and gas industry, not to mention the campaign contributions almost every PA legislator (actually Corbett has received the most) has received from the oil and gas industry[53]. The distrust in part has to do with Pennsylvania's long history of opting not to regulate the oil and a gas industry. The

STRONGER review board, in its 2004 evaluation PA's general oil and gas regulatory program (not the hydraulic fracturing regulation program reviewed in 2010) saw fit to mention PA's long history of a hands-off approach to oil and gas development. "From the beginning, oil and gas development in Pennsylvania occurred in an unregulated fashion with little thought given to anything but getting the product out of the ground"[54].

Industry proponents, on the other hand, seem to be pretty satisfied with the regulatory atmosphere promulgated by the DEP. Burt Waite points out that even from an industry point of view, regulations are important. "It makes everyone play by the same rules". Wait was sympathetic with the DEP, saying that early on, when oil and gas development was just starting to explode in Pennsylvania, "the DEP took a while to ramp up its hiring and the training of its staff," but now they are equipped and handled to deal with the industry, "the level of their inspections are good". Really, the only bad thing Waite had to say about the DEP regulatory program is that it tends in some situations to lose focus on the big issues and focus instead on the minutia. "The spilling of a 5 gallon bucket of brine water is reportable—that's ridiculous—but the regulation surround casing and cementing, that's important". Russel Schetroma thinks that although "the vast bulk of regulation is legitimate and useful, some of it is just silly." He repeated the sentiments of Waite, that industry actually finds some regulation to be important. "You have the largest oil and gas producers working here. They want solid regulation because they don't want anything bad to happen". He brought up the BP Oil Spill and how that situation cost BP a lot in the way of money and public image. "These companies don't want that kind of problem". In Schetroma's mind, this reluctance of operators to get into any kind of trouble in the first place is the most important notion in giving oil and gas development the green light.

Brian Hill used to work with the Pennsylvania Environmental Council on the French Creek Project, a Meadville based initiative that sought to spur grassroots efforts to reduce point and nonpoint source water pollution in the Meadville area. He was a member of the Citizen's Advisory Council to the DEP and served as a member of the DEP's Environmental Quality Board. Now, he is president and CEO of the entire Pennsylvania Environmental Council. He has is calling from his office in Pittsburgh on the south bank of the Monongahela River. The office is located in a large brick building with another brick building just like it across the street. On one side of the building is a large cement mixer, on the other is a warehouse complex known

as the Boulevard Building. He was thinking…"If the question is whether [a moratorium] would've been a good opportunity when governor Rendell was around, yeah, it would have. But PA is already plunged into this—it's too late for that".

Hill had an interesting perspective in the whole issue of what was the proper regulatory route to take concerning hydraulic fracturing. He did not totally trust the DEP to get the job done to a sufficient degree—"the public agencies have mainly been reactionary"—but he didn't support a business as usual, trust the producers kind of route either. Well, in a way, he is pro-industry, but only when it comes along with corporate responsibility. It was with gusto that he brought up the fact that "Certain key players in the industry have been looking into an accreditation program". When we think of an accredited college we think of a college that has been deemed by a third party to have maintained a certain standard of excellence. But accreditation also makes economic sense. Hill used the example of forestry practices that have been marketed as sustainable; they have been given accreditation by an independent group, or set of standards, like the Sustainable Forestry Initiative. The same kind of accreditation is being developed by the oil and gas industry in order to "create standards above and beyond what state and federal agencies require"[55]. According to Hill, this has two advantages. "It separates those companies that meet the requirements from those that do not" which essentially gives landowners more capacity to pick and choose between those companies that have a proven record and those that do not, making those companies that are accredited more marketable. "It also has an environmental advantage," because there are stringent standards which are being set and met by operators and they have a vested interest in maintaining those standards. This is not a replacement of a regulation, rather it would serve as another level internal regulation which will help to make oil and gas development safer and cleaner.

If one were to look at a satellite image of Oil Creek valley, once can see a clear pattern. The pattern involves large square swatches of cleared forest, seemingly equidistant to one another, the patches almost form a checkerboard image out of the landscape. Expand one's view out of Oil Creek valley and the checkerboard continues—this pattern of square patches extends for miles in every direction to encompass the entirety of northwestern PA. They are the earthly proof of a legacy of extraction. All of these squares, they used to have drill rigs on them, and

although they used far less resources and required far less capital to drill than an unconventional well, each and every one of them took their turn, extracting what they could from below the soil.

"There are something like 8 thousand wells that have been drilled and fracked in the French Creek watershed" said Willis. "Thousands of wells for years operated under the radar". These were drilled mostly by small drilling companies—"the production numbers were too small to interest big companies". According to the STRONGER review, by 2004 the Commonwealth had records of over 5,000 operators, "many of whom have only one or a few wells". Before the development of the Marcellus shale (which started in 2005, a year after this report was published) PA was producing 2.3 million barrels of oil and 157 billion cubic feet of gas a year, with all of the production coming from the western portion of the state. Fracking has occurred in Pennsylvania since the 1950s and since the 1980s, nearly all wells drilled in Pennsylvania have been fractured. Deep-shale gas wells however, are productive enough to interest the big guys—companies like Range, Chesapeake, and Cabot" says Willis. Now, PA produces the same amount of natural gas in 26 days than it used take a year to produce.

All of this has meant big business for Universal Well. A local company, they had been doing this fracking for years, long before anyone started getting excited about the Marcellus shale. In the past 4 or 5 years however, Universal Well has seen the kind of growth that most companies dream about. They have been able to hire 200 new employees since the growth started, "all of them with a payroll way above state average". Most of the guys they hire come from the area but most of the actual activity, the fracking, happens in other parts of the state. All of the evidence however, points to the potential of this region, of Crawford County. 1 well is already in production in East Fairfield township, in the southern part of the county. According to initial reports released from that well, the gas here is good. In their initial reports, Range Resources expected the shale to be 200-250 feet thick where they were drilling. When the most recent reports came out however, the shale was found to be 280 feet thick, and the pressure readings were better than normal. That all points to productive shale—"there's good potential there, especially with the high possibility of it being wet gas". Range has drilled two more wells and is in the permit review process for one more, all within Crawford County. Those numbers are not just more good news for regional companies like Universal Well or Moody & Associates, local companies are looking to take advantage as well.

Down on the banks of the French Creek, where the railroad used to have its train yards and car shops, where once upon a time men were unloading and loading rail-cars, repairing and painting engines, there is what remains of the once prosperous Bessemer & Lake Erie railroad company—a large brick building that has been renovated into a business park. Occupying the two former rail buildings of the Bessemer Commerce Park are Precision Manufacturing Institute (PMI), Universal Well Services, and among others, the Economic Progress Alliance. The executive director of the Economic Progress Alliance is Mark Turner. Their mission: To improve the quality of life in Crawford County by promoting, facilitating and supporting viable economic development opportunities. They own 7 separate industrial sights, most of which they have either partially or fully redeveloped into quality industrial and commercial space for lease. They haven't limited themselves to just renovating the dilapidated skeletons of the areas large manufacturers, however. Turner is looking to the future.

"We are looking into what type of infrastructure we might be able to accommodate for the oil and gas industry". Specifically, they are looking at fracking operations. "There are two things that are essential to this industry: source water for hydraulic fracturing, and water treatment for the waste water". Turner and the Alliance found that they might be in a position to develop those resources for the incoming fracking industry. For one, "We own the Keystone Region Development Park in Greenwood Township".

During World War II, the federal government chose this location, just south of Meadville, to manufacture TNT. The site is located just south of the Geneva Swamp, Pennsylvania's largest wetland, a relatively untainted swamp of nearly 6 thousand acres. The development of TNT uses a great deal of water, so much in fact that the government installed 17 separate water wells into the park. They all tap into the same aquifer, an enormous underground lake that runs from the southern portion of Crawford County all the way down to Pittsburgh. In fact, that is why the government located their TNT manufacturing operation there in the first place, because of the unlimited access to water. For the Spring of 2001, a national manufacturer of office furniture from Iowa, HON Industries planned to construct an 125 thousand square foot facility at the park with an investment of 27 million dollars and a proposed 250 new employees within three years, but with an economic downturn in 2000-2001, the company decided not to build. Some years

later, a Tires-to-Energy plant proposed to occupy part of the site and take advantage of the KOZ designation, which makes the site exempt from state and local taxes. However, seeing as how the power plant would have a large impact on the nearby wetland and would produce a substantial amount of air pollution, it has met with continued resistance from a grassroots organization called CARE. Since purchasing the site in 1999, Turner and the Alliance have funneled hundreds of thousands of dollars into the site, which has only fed Turner's disappointment in not being able to successfully market the location to the area's next large manufacturer.

So far, Turner and the Alliance have rehabilitated 1 of the 17 water wells located at the Keystone Development Park. "Now, we are in the process of getting permitting from the DEP to develop the well to supply oil and gas. They told us 3 weeks." It's been 4 months since they first submitted the permit to the DEP. Turner says he understands, though. "It's a process the DEP is going through, it's reasonable. They develop new questions for us every day". He described the processes he had to go through: geological analyses, well analyses, well design… "I don't know, if I were selling water to any other industrial customer, there wouldn't be any regulation at all". Turner talked about how the process of fracking is a valid concern, but the concern seemed to develop a lot of questions for him and DEP, questions that nobody seemed to have answers for. "Our aquifer is located along Geneva marsh. There's concern that drawing from the aquifer could lower the level of the marsh. Will there be adverse impacts? Will the water be pumped out with pipelines, or will it be trucked?"

As for the other side of the infrastructure question, the question that it is getting harder and harder to answer now that the DEP says operators can't take their waste water to water treatment plants for disposal—what to do with the anywhere from several hundred thousand to several million gallons of waste fluid that flow back out of a well after it's been fracked. "The industry is trying to determine right now, do you treat frack water onsite or can there be a consolidated treatment plant where we should take our water for to be recycled". This is a concern just as much for operators as its for Turner. Why is Turner interested in this question?

"We happen to own a former water treatment facility with above ground tanks that can hold 5 million gallons of sewage. Can these be utilized for the industry? " The Geneva Marsh, on its eastern end flows into a small stream. This stream wanders here and there, through

patches of woods and farmland until it flows down the bank and into the French Creek. Just there, where the stream runs into the river, there is a boat launch. On the opposite bank, set back a little from the shore is a gravel pit—a sand and gravel mine. From there, upriver some 11 miles, just on the outside of the Meadville City lines; there it is, the other part of the Alliance's plan. Those large cylindrical drums and deep concrete depressions that for now only hold stagnate water and the boughs of weed-choked vegetation, climbing over the walls, creeping between the grooves of structures that were engineered "when men were men…"

"We're thinking yes…We're making that asset known to operators and we're seeing some interest".

Step 4. Extract

"Tool and Die Capital of the World" at once inspires visions of an industrial metropolis. Towering smokestacks, colossal corrugated steel structures, trains that roll through town, their tow of graffitted cars never ending, smog that can be brushed away with the hand, grim men in oil-stained jump suits, their eyes askance, steel-bridges, concrete buildings poured into molds, cranes skimming the water's edge, picking at mountains of coal from floating platforms: noise, smoke, iron, concrete—all these images instantly come to mind. Most people know this sort of industrial work camp doesn't exist anymore. Notwithstanding, the image is a tantalizing one, appealing to some gothic sense of beauty that we all maintain. With these images in mind, someone visiting Meadville might feel a little let down.

Meadville's tool and Die shops are scattered around the area and most of them are small, locally owned operations. The only large manufacturers left in town are Channellock and Dad's Pet Food[56]; their factories are across the river in Kerrtown, pressed up against the city lines on the slopes of Radio Hill. Once upon a time Talon Zipper used to have its main manufacturing base within the Meadville's city lines. People in the area are still proud of this claim to fame, many people are almost eager in their proclamation "the zipper was invented here". Talon maintained several factory buildings and was, for almost 9 decades, the very symbol and heart of Meadville. Then it started downsizing operations in the 1992. 2 years later, they had sold or scrapped their last piece of machinery and they shut down their last operating plant. In an article from the Meadville Tribune that covered the final closing, one resident couldn't believe it. "It's almost impossible to realize it isn't there anymore. Talon did an awful lot for Meadville. It was Meadville"[57]. In a gesture of goodwill—a farewell present before moving its headquarters to North Carolina, they gifted their last building, Plant 7, to the Meadville Redevelopment Authority. Talon's main plant, a 250 thousand square foot gray-brick structure tucked above Meadville on Neisson Hill, is currently the location of some executive offices—but it was recently purchased by the county as a potential location for an expansion of county district courts. A large portion of the site, a multi-story masonry building known as Building C, was demolished in 2012 because it had lost structural integrity over the years.

Across the French Creek is a small, low-lying grid of square, narrow homes known as the 5th Ward. It is located in the floodplain of the French and Cussewago Creek; one can still see the water stains left behind on the stone foundations of many houses. The area used to flood regularly until a series of dam projects retained the flow of Cussewago Creek and Mill Creek, a feeder of the French Creek that literally runs underneath the city of Meadville. Nobody seems to pay much mind to the 5th Ward—it is one of the poorer neighborhoods in city yet it is almost completely ignored by city development plans which tend to focus on the city's downtown. Storefronts are empty downtown but whole buildings are abandoned in the 5th ward. At one end of the neighborhood, next a series of baseball diamonds, there are walking trails that wind throughout the woods that abut the French Creek. People like to come down the trails and swim here. If one walks farther down the trails, however, you eventually come to a chain-link gate. The gate is locked. One can see towering above the trees the massive brick buildings that make up the Crawford Business Park. Just on the other side of the fence, shrouded in weeds and difficult to distinguish from piles of refuse—crumbling concrete, bricks, broken glass, twisted steel, the fluffy piles of decaying insulation, spools and spools of tubing—is the water treatment plant that Turner wants to turn into a frack-fluid recycling center.

In his humble manner, Waite was quick to declare the existence with him of a personal sense of optimism about the potential effects of oil and gas development. "Now that we have this secure source of cheap energy we will see a 'reshoring' of manufacturing jobs to this area. I think we will see a return of heavy industry." This cheap source of energy which is "so fundamental to a robust economy," according to Waite, would offset higher labor costs, for which many manufacturers originally left the country. The benefits of cheap energy are compounded when available on a local scale. So, for example, in Meadville, "If you are a local manufacturer and you can obtain gas directly from producers, at a cheaper than market price, you have a huge advantage over other national competitors". Waite supported his argument by pointing through the wall, out to some nearby hills where glass bottle manufacturers used to be present in abundance near Meadville. "Those manufacturers left because of cheaply produced aluminum cans, but they also left because of an increase in national energy prices." Indeed, Waite's claims for the future are not just wild conjecture. A recent article published in The Economist called

"Reshoring Manufacturing: Coming Home" found that due to increases in labor costs abroad, rising shipping costs, and decreasing costs at home, it is evident that there is and will continue to be a steady increase in manufacturers returning or choosing to stay in the states. According to the article, falling natural gas prices are part of the reason why domestic manufacturing costs are decreasing, relating that "PricewaterhouseCoopers, an accountancy firm, reckons that these lower American energy prices could result in 1m [one million] more manufacturing jobs as firms build new factories"[58]

Deb Eckelberger, business outreach coordinator with the Titusville Redevelopment Authority, pointed to Shell's proposed ethane "cracker" in Beaver County, the benefit of which she sees in not just in the direct employment generated in western PA (the cracker is thought to produce 10 thousand construction jobs) but that the lion's share of growth will come out of the "cracker's" steady production of ethylene, essential to the production of "all kinds of plastics, manufactured goods and chemicals"[59]. That steady stream of cheap and local ethylene would benefit a lot of the area's current manufacturers. In addition to the "cracker," Eckelberger's vision for Titusville's economic future lay in the creation of pipelines and compressor facilities, which represent long-term infrastructure, as well as in Compressed Natural Gas (CNG) for transportation purposes. She was quick to point to Clarion, where according to Eckelberger, 3 CNG fueling stations have already been proposed along Interstate Route 80. All of these institutions represent the long-term goals of the Redevelopment Authority of Titusville, but for 2 years now, the Authority has been working to attract all kinds of businesses related to oil and gas development.

Eckelberger sat at a glossy desk in small windowless conference room. On the walls were black and white photos of prominent local figures—Rockefeller the oil magnate being one—long since dead, that once had offices in this stoic brick building, complete with a Victorian styled roof and tall, floor to ceiling windows. She motioned through the wall, down the street, to a building that at one time housed the Board of Trade, in which the price of oil was determined every day during the beginnings of the industry. Similar to Meadville, Titusville lost its main source of employment in the 1980s when the bulk of its secondary steel manufacturers left. The community was left to pick up the pieces—one of those pieces being a huge industrial facility much like that of Avtex which had to be cleaned up and retrofitted for modern use—and

since, the area has come to rest upon a diversity of smaller industries of which timber, steel, plastics and short line rail, vestiges of a long tradition, play no small part. "When Cytemp (a steel products manufacturer in the area) left, community leaders didn't want one large employer anymore". In line with that philosophy, the Redevelopment Authority has been able to rent out space in its industrial park to 26 different businesses with over 300 employees, and more recently, it has started to attract oil and gas related businesses to its refurbished historical downtown space; of restaurant/brewery of local fame, the Blue Canoe is the first floor tenant. Although Eckelberger's vision—which tends to be the vision of many institutions that go under the title, Chamber of Commerce—is at times light and airy ("We understand that the industry will do on their own what they need to protect the rivers and streams" and "With every well comes 150 new jobs"), it is a vision that at least maintains some higher vision of the future, that in which the community attains a vibrancy that it hasn't seen in decades. "I see the long term. The drilling companies are here and gone but I'm looking at end-use businesses whose associates will bring their families, join our community groups and become a part of our area".

When it comes to the industry professionals however, exempting Waite, there seems to be an unofficial rule of airing on the side of caution when it comes to visions of tangible future growth. Roger Willis, the president of Universal Well Services, saw a lot of growth in ability to offer high-paying blue collar jobs due to increased demand of services from the oil and gas shale boom in the region. Like the Steptoe attorneys and paralegals, these jobs were mostly filled by people from the area. Nevertheless, aside from making obscure references to potential growth in manufacturing, which could benefit in the application of abundant, cheap and local natural gas and the potential for truck fleets, like those of garbage and waste-management companies, to make the switch to CNG, Willis feigned from showing any optimism for large amounts of growth in the area. In his opinion, it was the locating of sustained institutions that has the biggest impact on a community. "Williamsport was once a depressed community; it was a lot like Meadville", but the reason why Williamsport saw such a drastic and lasting economic boon is because they were the first localities that out-of-state producers, like Range and Cabot, tapped, and therefore they have become the de-facto regional headquarters for these producers. Powell, the office manager from Steptoe agreed: "From an administration point of view, the large oil and gas companies have already set up their regional headquarters; those are where the high-paying and lasting jobs are. Not only did they locate their offices there, but the local suppliers they drew

upon and what little of the local labor force they directly employed came to constitute their suppliers for the broader region as well. "Even if drilling were to come to the Meadville area in a huge way, these producers would use their existing bases of support to supply them." In short, the effect on the Meadville community, apart from benefitting from gas royalties and a cheap source of natural gas, would be minimal and temporary.

If this is actually the case and oil and gas development, outside of certain aforementioned benefits, will only have a temporary impact on the local economy, what are the effects of gas-drilling in an area where such development is thought to be sustained, such as Williamsport? Vincent Matteo, president and CEO of the Lycoming County/Williamsport Chamber of Commerce first complained about the media attention: "I'm so sick of talking about it. I've been approached by so many reporters. Someone interviewed me for Japanese television. The whole thing is crazy."[60] But Matteo is not really complaining or, at least he doesn't think the molestations from some reporters spoil the huge economic benefits from what he attributed to be oil and gas development in the region. In fact, Matteo was part of a larger county task force, much like the one that Crawford has now, that tried to conscientiously attract companies. 5 or 6 years ago, they went down to Fort Worth, Texas and "We were very successful. 115 companies established themselves in the area, including Range Resources and Anadarko's regional headquarters". And they worked hard to try and attract these businesses to Williamsport. At one point "we were going to the hotel bars where the land men (leasing agents) were hanging out. It was tough to figure these guys out". But the hard work eventually paid off and changes to the area started to take hold on their own. Of these changes, Matteo mentioned a buy-up of available land, the construction of 5 hotels, several new dry-cleaner businesses, a new barbershop, some new apartments, new retail shops and 2-3 new urgent care facilities as well as skyrocketing of rental prices, a huge increase in medical services, an increase in traffic, a slight increase in children enrolled in school, and although he reported no increase in crime rates, Matteo reported that there was a considerable rise in prison population, "however it is consistent with the overall population increase that we have had as a result of the shale boom".

As perhaps every mining town knows, every boom seems to have its bust, and although the recent decrease in gas prices and the resultant abatement in drilling activity doesn't necessarily constitute a "bust," it does represent at least a temporary cycle of bonanza and the

resulting plateau. Waite attributed the recent plateauing of drilling activity, during which gas prices fell down below 3 dollars last year, to "depressed natural gas prices and a constantly changing and confusing regulatory process in PA, of which Act 13 and recent changes to Chapter 78 (which prescribes oil and gas regulation in PA) play a part". Matteo also referred to a change of focus of the industry to the building of infrastructure, like gas pipelines, before existing wells could start producing again and new wells could be drilled. Nevertheless, Matteo doesn't see the plateauing of drilling activity as posing a serious threat to Williamsport's economy. Although he referenced some "cutbacks" in recent new employment that occurred in the local drilling-supplier sector as well as a 15% drop in occupancy rates in hotels over the last 6 months (he thought the hotel building went a little overboard), Matteo already predicts another increase in employment in anticipation of new growth. Although gas prices are currently near rock-bottom, the U.S. Energy Information Administration predicts a slight, but steady increase in natural gas prices over the next couple years. Waite, for his part, predicts that drilling will "ramp up again," although he doesn't know exactly when. He sees as reason for this eventual revamping of oil and gas development a shift to those areas where wet gas, which is increasing in value, is present in the shale (so far southwest PA and Ohio have proven to produce wet gas). In addition to this, an increase in the demand of gas, contingent upon the recovery of the economy, is in order for the plateau to once more turn into an incline.

On the night of December 11th, 1972, Albert G. Ruff, manager of the Meadville plant of American Viscose Corporation addressed the Meadville Kiwanis Club. He had a message for Meadville, and that message had been reverberating ever since the railroad made its debut in the area in 1856. Essentially, the message as this: manufacturers, large corporations, could be relied upon for the economic and social well-being of the community. To convince the reputable men of the Kiwanis Club, he used his own business as an example; he talked about the positive impact of the large acetate manufacturer on the Meadville community. He talked about the 17 million dollars spent by the factory in Meadville and Western Pa—expenses made on employment ($14 million in wages), energy ($1.6 million in coal, $350 thousand each on natural gas and electricity), hospital bills ($805 thousand), local taxes ($106 thousand) and the comparatively small, but nevertheless important, 20 thousand dollars in local charitable

contributions[61]. The Viscose Plant (which later became the Avtex facility), when it was originally planned for construction in Meadville in 1930, was considered at the time to be the "largest industrial proposition in the past 4 years in any community" in the United States.[62] The plant employed over "2 thousand men, women and girls" and produced nearly 200 thousand pounds of synthetic yarn in a single year, 18 percent of the total acetate yarn produced in the world. At its height, the facility had over 3,000 employees. In a "poor year" in 1971, the company moved 100 freight cars and 3 thousand trucks per month. The plant's onsite coal generated power plant produced a level of electricity that would have matched 75% of the greater Meadville area demand; its on-property wells produced three times the amount of water that Meadville needed on a daily basis[63]. Ruff closed out his speech, making his message clear: "Multiply the impact of this one FMC plant by more than 100 throughout the country and add it to the many other companies, both larger and smaller, and your begin to visualize why I say corporations are good citizens".

The kind of environment that Ruff brings to mind is a relic of the past however, and many of those corporations he was talking about, those "good citizens," revoked their citizenship for brighter pastures long ago. Meadville is no longer a center of heavy manufacturing (Channel Lock, the last remaining heavy manufacturer, has over 400 employees[64] whereas the largest employer in Meadville is the Meadville Medical Center, with 1,400 employees); the confluence of rail lines that used to play a major role in Meadville's economy are ghostly and many rail bridges slowly rust over the French Creek. Talon, the locally famed 'inventor of the zipper' is no longer around, their last plant closed in 1994. Avtex Fibers (originally American Viscose) stopped producing rayon and acetate yarn from its spindles years ago and many less prominent industries that depended on these manufacturers for existence went bust. Many of Meadville's large industries "went south" in the 1980s, the term being especially appropriate since many manufacturers moved or consolidated to factories below the Mason-Dixon line or abroad, where it was cheaper to operate in the face of new trade laws and increased energy costs.

When the Avtex facilty closed down the local community did what a lot of local communities did when large manufacturers abandoned shop, they bought the facility to try and retrofit it for new use. In 1990, after the 300 acre grounds (33 acres of which was under roof) of the facility had been gathering dust and broken windows for five years, the site was declared a

state superfund site. That essentially meant that the grounds of facility were extremely contaminated and an extensive cleanup was in order. So that's what the DEP did, they ordered FMC (who occupied the facility from 1963 to 1976) to clean up the site. The 7 million dollar cleanup was finished in 1996, but this wasn't the only activity that was going on at the old Avtex building. Crawford County, Vernon township, and the City of Meadville cooperated under the leadership of the Crawford County Redevelopment Authority and Economic Progress Alliance (then known as the Meadville Area Industrial Commission) to purchase the plant for 500,000 dollars (the facility was appraised at $11 million), spending an additional 1.2 million dollars to provide retrofits[65] in 1989. They opened the Crawford County Industrial Park (now the Crawford Business Park) in 1996 and part of the facility was soon occupied by Andover Industries, a plastic manufacturer that eventually went bust in 2005, abandoning 250 employees and one quarter of the facility's 900 thousand square footage. But the facility's 70 and plus year history wasn't over yet.

The facility now houses 32 different businesses—from precision tool manufacturers, to a food packing and distributing company, to executive offices. Those businesses employ some 1,000 employees. The Economic Progress Alliance has put in 11 million dollars in grant money, as well as millions more of rental and borrowed income into the rehabilitation of the facility since 1996. The rehabilitation of the facility is a well-known success story—the efforts of the Economic Progress Alliance earned awards from the International Economic Development Council, Restoration Industry Association, and the National Association of Development Organizations—and such success is expected to continue into the future. By 2030, it is expected the Business Park will house an additional 1,000 employees in 20 to 30 new businesses in this sprawling space[66]. The numerous stand-alone brick and mortar buildings that still remain unoccupied in this park—towers that loom over the French Creek with broken windows and debris scattered about—will soon be either renovated or demolished, and the transformation of heavy manufacturing plant to modern multi-use business park (complete with its own food court and YMCA satellite facility) will be finished.

One enters the Crawford County Business Park and immediately is located in a small vaulted room. A diagram on the wall says that it is supposed to serve as a lounge, a resting place for the occupants of the building to sit and contemplate the old. There are a couple of glass

tables with circular wooden wheels protruding from the center of them. They appear to be some relic left over from Avtex; it looks as if one of the wheels held spools of yarn on its dowels. On the one wall are newspaper articles scanned from the collections of the Crawford County Historical Society and framed in glass. They depict community sponsorship—weekly fabric sales held out front of the building, a community picnic on Avtex's lawn. On another wall is a mural depicting the eternal industrialist, man, fiddling with some machine. Next to this mural is an unmarked door that leads into a long and cavernous hallway.

Down the hallway are the tenants that occupy the building. There are placards every now and then demarking doors that lead to some tenant of the building. Universal Well is there. Through the square window in the door one can see some valves being assembled. There is an oddly shaped tank in the back of the room. In the cafeteria all the walls on one side are decorated with snapshots of the nascent oil industry when it started 30 miles from here in the late nineteenth century, photos depicting oil rig after oil rig dominating the landscape for miles. All the walls on the other side of the cafeteria are decorated with large blown-up images of Universal Well's operations: one depicts a brigade of tanker trucks with clouds of exhaust gathering on the ground like mist and men in the foreground assembling a Christmas tree; another one depicts an oil rig alone on a giant plain—there are snow-capped mountains in the background, the landscape is breath-taking. One can tell it is nowhere near Appalachia.

Walking down this hall, one gets the sense that they are headed to some deep and dark unknown cavity of the world. You think, 2,000 blue collar workers walked down this hallway—this conveyor belt—every single day for over 50 years, heading to their workstations, earning their dollar. The overhead lamps flicker on as your presence triggers a sensor. You can hear the sound of your footsteps resounding down the hall for hundreds of feet, echoing every step you take with a repetitive murmur. Even after walking for some time you still can't see the end of the corridor, but you know it is there, just as surely as you know that as large as this building is, it can only fit so many tenants.

Afterword

According to the US Energy Information Administration (EIA), total US natural gas production rose from roughly 24 trillion cubic feet in the year 2000, or 2% of domestic natural gas production, to almost 30 trillion cubic feet in 2012. Almost all of that increase in production can be attributed to extraction of natural gas from shale wells. When the EIA started charting production of natural gas from shale wells in 2007, production in that sector has since quadrupled, from less than 2 trillion cubic feet in 2007 to 8.5 trillion cubic feet in 2012. In 2010, that equated to 23% of total domestic gas production in the US, and that number is only expected to increase. In the year 2035, the EIA projects gas production from shale formations to be 13.6 trillion cubic feet, or nearly half of total US natural gas production[67].

If you were to ask any oil and gas expert 10 years ago if they thought a significant portion of US natural gas would come from tight shale formations deep in the earth, they probably would have laughed. Nevertheless, natural gas from deep shale has allowed the US to go from a projected status of declining production to its current status of increasing production. By 2016, the US is projected to be a net exporter of Liquefied Natural Gas (LNG) and an overall net exporter of natural gas by 2021.

The ability to economically produce large volumes of natural gas is only about ten years old. It started when recent improvements in drilling technology led to the combination of hydraulic fracturing, the injection of a highly pressurized slurry of water, sand and chemicals into shale formations in order to fracture the tightly compressed rock thereby releasing its gas, with directional drilling, the ability of remotely operated drill-bits to turn on a 90 degree angle and continue the drilling process along a horizontal plane.

The production of shale gas in the United States is therefore a huge issue, but it is also a highly debated one. The benefits of the drilling 'boom' in recent years are widely considered to be essential not just to the country's energy future, but also to its economic future as well. An industry supported report by IHS Global Insight claims that in 2012, the oil and gas shale industry supported 1.7 million jobs (of which 20% are from direct employment, the rest from indirect and induced employment) nationwide and contributed 62 billion dollars from federal, state and local taxes as well as federal royalty revenues[68]. Although these figures are widely contested, they are nevertheless indicators of some substantial growth in the economy and clearly

point to the huge amount of optimism that surrounds this industry, a powerful phenomenon when viewed in light of the heavy blow taken by the American psyche with the 2008 recession.

Despite the large amount of economic activity estimated currently and expected in the future from shale oil and gas production, there is still a huge amount of contention when it comes to the potential environmental impacts induced by this industry. With the BP Oil Spill in 2010 and a nearly universal consensus in the scientific community that global climate change is occurring from human induced carbon emissions, the public scrutiny surrounding the environmental effects of increased oil and gas development has risen to a fever pitch. Nevertheless, the natural gas boom has also been called a key 'bridge fuel' that could be an important step in weaning the United States off of petroleum and coal toward more renewable sources of energy. Electricity generation from natural gas when used in efficient combined-cycle power plants can emit less than half as much carbon dioxide into the atmosphere as coal combustion. According to the EIA, the abundance of cheap natural gas has resulted in a displacement of coal-fired power to natural gas fired power, with power generation from natural gas rising 21 percent from 2011 to 2012 while generation from coal in this same time period decreased by 12 percent.

Whether increased oil and gas development using unconventional methods (I am referring to those unconventional methods using hydraulic fracturing and horizontal drilling specifically) represents an immutable beacon of economic prosperity and the sure road to a healthy environmental future is far from a sure thing however and by no means is has such a consensus been reached in any locality. Some studies even ascertain that natural gas extraction from shale formations could have a larger greenhouse impact than oil or even coal[69]. The reality is that we are still in the infant stages of the development of a resource with huge uncertainty surrounding the quantity and the effects—economic, social and environmental—of extracting it.

This uncertainty is no less palpable in a region of Northwest Pennsylvania that expects to be bearing the full brunt of development in the coming years. In Meadville and the surrounding area of Crawford County, there is already a general consensus that their region will be one of the next for the development of its shale resources. In response to the first unconventional well being drilled in Crawford during the summer of 2012, the county organized an oil and gas task force to "assess the influx of additional people and a potential economic boom if natural gas drilling takes off within the county"[70]. A landowner group has also started in the area in

response to the heavy amount of leasing that has taken place, primarily by a leasing agent known as Seitel Data Inc. Assistant director of the county's planning commission and a member of the task force's subcommittee on planning and community development and relations, Arlene Rodriguez mentioned in an interview that "They're coming in slowly, but they're coming in"[71].

Crawford County sits above both the Marcellus and Utica Shale, but it is from the Utica Shale, given its thicker constitution, that would be extracted. In fact, one well within county lines, the Lippert Well, has already been drilled and fracked and is currently producing near the confluence of Crawford's two pipelines, whereas two more shale wells in southern Crawford County, the Swepi LP and the Halcon 1H, have been drilled. One more well in Greenwood township is currently in the permitting process. Some people, especially those who work for or own industries that directly benefit from the oil and gas industry, see the incoming development as a godsend for a place that has been in steady decline since heavy manufacturing left the area in the 1980s. There has been no serious response, as of yet, that indicates people in the area are vocally opposed to the development. Articles in the Meadville Tribune seem to maintain a gleeful disposition to the "increased natural gas drilling activity" that "is happening now in Crawford County"[72]. Public officials, although discussing the future impacts, seem to have a business as usual perspective on the issue. In the words of Gary Johnson, zoning administrator for Meadville, "It's going to come and go, and then it's going to be gone, and we just have to make sure it doesn't mess things up too badly in one way, and to capture as much as we can, all the wealth locally"[73]. One of the county commissioners, Francis Weiderspahn says he's confident that the community will have sufficient time to prepare for what's coming: "We haven't been hit yet…[but] we foresee a gradual scale of development"[74].

Whether this is true or not, only time will tell. The purpose of my illustration of the current extent and potential effects of oil and gas development in the Meadville area is not to predict the future. Such is impossible. More important to me is that Meadville and the surrounding area take an active role in creating a future that they want for themselves. From what I gathered in my conversations with key stakeholders in the region, people seem to think that oil and gas development is not a choice, rather it is an uncontrollable variable that most think, by and by, will probably occur. The notion that oil and gas development is unavoidable is just as disconcerting as it is untrue. It is the right of communities, largely unclaimed in the United States unfortunately, to take an active part in their own future. Not necessarily planning

for the future, but working with people to shape the future. I believe that Meadville, if it so chooses, can have a vision. I also believe that Meadville, if it works hard enough, can achieve that vision, whatever it may be. This is not the job of a single individual or even a single organization like the city or county government, rather it must be a concerted action of multiple stakeholder groups, each representing a constituency, to come together and create connections. Such connections are not only useful in times of crisis, such as when a large economic keystone of the community is lost or an important resource of the community is destroyed, but they are also integral to a community's ability to navigate the future. It is true that we may not be able to predict the future, but *we can* create it.

Notes

Preface

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Introduction

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Chapter 1

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[24] McGraw, Seamus. *End of country: Dispatches from the frack zone.* New York: Random House, 2012.

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[26] According to the PUC, in 2012 the fees for an unconventional operation in its first year of operation were 50 thousand dollars per well.

[27] Author's interview with Arlene Rodriguez, November 27, 2012.

[28] Author's interview with Gary Johnson, November 19, 2012.

Chapter 2

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[34] The information that has been sealed in non-disclosure agreements between drillers and plaintiffs in cases of groundwater contamination has been reported to be a major obstacle in the ability of researchers, regulators and reporters to carry out a more reliable report on the actual relation between hydrofracturing and groundwater contamination. See: http://www.nytimes.com/2011/08/04/us/04natgas.html?pagewanted=all&_r=0; http://stateimpact.npr.org/pennsylvania/2012/12/07/appeals-court-agrees-with-newspapers-in-sealed-fracking-case/

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The study found that although some concentrations of methane were found in water wells not close in proximity to drilling activity, the concentrations of methane found in drinking water wells in close proximity to drilling activity (<1kilometer) were substantially higher, and the chemical signatures of methane found in groundwater in close proximity to drilling activity were consistent with chemical signatures of methane found deep in the earth's crust, that methane being extracted from shale wells. No fluids associated with hydraulic fracturing were found to be present in samples of drinking water from any wells. The study did not make any claims as to how that methane ended up in groundwater, although it referenced issues of faulty cement casing and possible communication from hydraulic fractures. Although many letters were published disputing the findings of Osborn et al, (see: Davies, Richard J. "Methane contamination of drinking water caused by hydraulic fracturing remains unproven." *Proceedings of the National Academy of Sciences* 108.43 (2011): E871-E871; Saba, Tarek, and Mark Orzechowski. "Lack of data to support a relationship between methane contamination of drinking water wells and hydraulic fracturing." *Proceedings of the National Academy of Sciences* 108.37 (2011): E663-E663; and Schon, Samuel C. "Hydraulic fracturing not responsible for methane migration."*Proceedings of the National Academy of Sciences* 108.37 (2011): E664-E664), many of these letters were based on misunderstandings of the studies original findings. The authors of the original study quell do a good job of quelling the challenges posed to the findings of their study in two replies that were published. For a reply based on challenges concerning how the authors interpreted the significance of their results, see Osborn, Stephen G., et al. "Reply to Saba and Orzechowski and Schon: Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing." *Proceedings of the National Academy of Sciences* 108.37 (2011): E665-E666. For a reply to challenges on the authors' presentation of migration through hydraulic fractures as possible cause of methane contamination, see Jackson, Robert B., et al. "Reply to Davies: Hydraulic fracturing remains a possible mechanism for observed methane contamination of drinking water."*Proceedings of the National Academy of Sciences* 108.43 (2011): E872-E872.

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location was rural, there was no immediate danger for many people. Dramatic explosions related to gas drilling like these are rare phenomena, but they do happen. Information on the gas geyser incident in Union Township sourced from: Detrow, Scott. "Perilous Pathways: How Drilling Near An Abandoned Well Produced a Methane Geyser". Stateimpact. October 9, 2012.

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Chapter 3

[42] According to the 2011 Annual Financial Report of Paterson-UTI Energy, Inc., parent company of Universal Well Services. The parent company, UTI energy, provides mobile drill rigs for use by extraction companies and its total earnings for 2011, including those of Universal Well and a similar company that provides pumping services in Texas and Oklahoma (Universal Well services the Appalachian region) were in the billions of dollars. See financial report here: https://dl-web.dropbox.com/get/Public/Comp%20document/Comp%20sources/Patterson-UTI%20Energy%202011%20Annual%20Report.pdf?w=AADIaKV3z2IVsPZYcRQGB29Pae-NpJ4A8vKyqeiGMwyRnQ. Accessed: 3/26/2013.

[43] For more information on the history of drilling, see Moore, W. D. I. I. I. "Ingenuity sparks drilling history." Oil and Gas Journal75.35 (1977).

[44] For more on the history of oil, see: Maugeri, Leonardo. *The age of oil: the mythology, history, and future of the world's most controversial resource*. Praeger Pub Text, 2006.

[45] Williamoson, Harold F. and Daum, Arnold R. *The American Petroleum Industry: the Age of Illumination, 1859-1899.* Evanston, Illinois: Northwestern University Press, 1959

[46] Black, Brian. *Petrolia: The Landscape of America's First Oil Boom.* Baltimore, Maryland: Johns Hopkins University Press, 2000.

[47] Information on abandoned wells garnered from: Detrow, Scott. "Perilous Pathways: Behind The Staggering Number Of Abandoned Wells In Pennsylvania." 10/10/2012. Npr. Accessed 2/24/13.

[48] "Pennsylvania Hydraulic Fracturing State Review". STRONGER: September, 2010. http://67.20.79.30/sites/all/themes/stronger02/downloads/PA%20HF%20Review%20Print%20Version.pdf. Accessed 3/27/13.

Among the review's other recommendations were that DEP consider extending the area of which pre-drilling water samples are drawn; finalize its rulemaking to require casing and cementing plans to be submitted in the permitting process; secure

provisions by which medical personnel can gain access to chemical information in the case of medical emergency related to hydraulic fracturing; require operators to notify the DEP within 24 hours of intent to frack a well; and that procedures for inspecting construction for containment pits be considered and secondary containment requirements be established for tanks used in fracking.

[49] The proposed overhaul is part of an in an update to Title 25 Pa. Code Chapter 78, the state's procedures and rules for activities associated with oil and gas production. The proposed update is outlined in the "Summary of Proposed Conceptual Changes (with brief justifications) and is currently in the process of review by state panels. Aummary available here: http://files.dep.state.pa.us/OilGas/BOGM/BOGMPortalFiles/OilGasReports/2012/TAB%20MEETINGS/Ch78SubchCSummaryFINALDRAFT8-07-12.pdf

[50] Concurrent with this distrust of the DEP and other state agencies, the federal regulatory environment surround fracking has also seen a lot of criticism. In 1988, the EPA exempted oil and gas "E&P" (exploration and production) wastes from regulation as hazardous wastes under the Resource Conservation and Recovery Act (RCRA) . These exempt "E&P" wastes include produced water, drilling fluids and drill 'cuttings;" any waste that has "come from down-hole" or any waste that has "been generated by contact with the oil and gas." All fluids involved in the fracking process are therefore exempt from regulation as hazardous wastes. The exemptions continued, when in the 1990s the EPA decided that the Underground Injection Control program (established by the Safe Water Drinking Act of 1974), which prohibited any "underground injection," didn't apply to hydraulic fracturing because its principle objective was not the placement of fluids, but resource recovery. The interpretation stood unchallenged until 1995, when a series of litigations resulted in a court instructing the EPA to require state regulatory agencies to regulate fracking under the Safe Water Drinking Act. When some debate around fracking started to occur on the national stage and in Congress in the early 2000s, the EPA initiated a study on hydraulic fracturing in coal bed methane extraction, publishing their report in 2004 that stated there was no "confirmed evidence that drinking water wells have been contaminated by hydraulic fracturing fluid injection into coal bed methane wells." And that "further study is not warranted at this time." Although the study drew heavy criticism from outside as well as within the agency, less than a year later, based on years of debate and partly based on EPA's findings, Congress passed the Energy Policy Act of 2005, which exempted hydraulic fracturing from the Safe Water Drinking Act (SWDA).

[51] Urbina, Ian. "Regulation lax and gas wells' tainted water hits rivers". New York Times: 2/26/11. http://www.nytimes.com/2011/02/27/us/27gas.html?ref=drillingdown&_r=0. Accessed: 3/27/13.

[52] For more complete discussion on this issue, see article by Pittsburgh Post-Gazette: Hopey, Don. "Lawmaker challenges Pennsylvania DEP's reporting of gas well water safety". Pittsburgh Post-Gazette: 11/2/12. http://www.post-

gazette.com/stories/local/state/lawmaker-challenges-pa-deps-reporting-of-gas-well-water-safety-660238/. Accessed: 3/27/13.
[53] See: http://www.followthemoney.org/press/ReportView.phtml?r=455
[54] "Pennsylvania second follow up review". State Review of Oil and Natural Gas Environmental Regulation (STRONGER): August, 2004. http://67.20.79.30/sites/all/themes/stronger02/downloads/Pennsylvania%20Follow-up%20Review%208-2004.pdf. Accessed: 3/28/13.
[55] Author's interview with Brian Hill, March 18, 2013.

Chapter 4
[56] According to the Economic Progress Alliance of Crawford County, Channellock is the 8th largest employer in the county; Dad's Pet Food (now known as Ainsworth Pet Nutrition) the 12th. Together the employ over 500 persons.
[57] "Talon company all zipped up". The Meadville Tribune: March 6, 1994.
[58] "A growing number of American companies are moving their manufacturing back to the United States." The Economist: special report. January 19, 2013. http://www.economist.com/news/special-report/21569570-growing-number-american-companies-are-moving-their-manufacturing-back-united. Accessed: 3/13/13.
[59] Author's interview with Deb Eckelberger, March 6, 2013.
[60] Author's interview with Vincent Matteo, conducted over the phone, February 6, 2013.
[61] "Viscose Place in Community Outlined." Meadville Tribune: Dec. 12, 1972.
[62] "Greatest Industrial News in Meadville History." Evening Republican: March 16, 1928.
[63] "Meadville's FMC outlet has its banner changed." Meadville Tribune: May 7, 1973.
[64] Employment information taken from Channel Lock's website: http://www.channellock.com/experience.aspx#
[65] "Joint Effort Results in Purchase Plans for Vacant Avtex Facility." Meadville Tribune: March 23, 1988.
[66] Myers, Valerie. "Crawford Business Park continues to grow in Vernon Township." Crawford County News: 3/1/13. http://www.goerie.com/article/20130301/GOCRAWFORD0101/303019971/Crawford-Business-Park-continues-to-grow-in-Vernon-Township. Accessed: 3/8/13.

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[67] Energy Information Administration, Annual Energy Outlook 2013, Early Release. http://www.eia.gov/forecasts/aeo/er/pdf/0383er%282013%29.pdf. Accessed 3/24/13.
[68] IHS Global Insight. America's New Energy Future: The Unconventional Oil and Gas Revolution and the US Economy, Volume 1: National Economic Contributions. October 2012. http://marcelluscoalition.org/wp-content/uploads/2012/10/IHS_Americas-New-Energy-Future.pdf. Accessed: 3/24/13.
[69] According to Ingraffea's calculations, natural gas from shale gas formations could have up to twice the carbon footprint of coal. See: Howarth, Robert W., Renee

Santoro, and Anthony Ingraffea. "Methane and the greenhouse-gas footprint of natural gas from shale formations." *Climatic Change*106.4 (2011): 679-690.

[70] "Gas drilling comes to county." Meadville Tribune. http://meadvilletribune.com/x1303504547/Gas-drilling-remains-of-soldier-come-to-county. Accessed: 3/24/13.

[71] Author's interview with Arlene Rodriguez on November 27, 2012.

[72] Gushard, Keith. "State's gas boom comes to town with first Utica Shale well in county." The Meadville Tribune: 7/20/12. http://meadvilletribune.com/x471604555/States-gas-boom-comes-to-town-with-first-Utica-Shale-well-in-county. Accessed: 3/24/13.

[73] Author's interview with Gary Johnson on November 19, 2012.

[74] Author's interview with Francis Weiderspahn, Jr., March 1, 2013.