Statement of

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Regarding

Oil Shale Development and Research

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Thank you, Mr. Chairman, and members of the committee, for this opportunity to highlight some key environmental issues that must be addressed as Congress and federal land managers consider the possible development of oil shale resources in sensitive and arid western states.

My name is Steve Smith. I live in Glenwood Springs, Colorado, 30 miles from one of America's richer deposits of oil shale and within 100 miles of what is projected to be half the world's supply of oil shale. Over the past nineteen years living there, I have watched the local people, communities, and economy slowly recover and revive from what was the disaster of the last oil shale experiment in our county.

That boom-bust disaster was the result of attempts to move oil shale too quickly with artificial acceleration and unsustainable subsidies. It is essential that Congress and federal land managers learn both from the mistakes of that past and from currently evolving innovations when—cautiously—crafting or implementing oil shale policy and activities.

Basic Facts

I encourage to carefully consider three basic facts:

- Oil shale production technology still is slowly evolving. No technology—or company—is anywhere near being ready to develop oil shale at commercial scale;
- Research into the technical and environmental feasibility of various oil shale technologies is barely begun on federal lands already leased for that research;
- Companies with interest in oil shale already own or have access to extensive amounts of land containing oil shale ore; and
- The climate impacts of oil shale development—both from the use of produced fuel and from the immense amount of energy needed just to produce it—are serious concerns that must be addressed before proceeding with anything approaching commercial scale production.

Oil shale, an important *potential* resource

This possible source of fuels warrants careful consideration, both of its potential contribution and of its potential effects on other important values and resources.

As you know, various provisions of the Energy Policy Act of 2005 direct the Bureau of Land Management:

- to make federal lands selectively available for research and development activities for oil shale and tar sands resources; several such leases have been awarded;
- to analyze, through a programmatic environmental impact statement, the environmental, economic, and social impacts of potential commercial oil shale and tar sands development in three western states; preparation of that PEIS continues; and
- to adopt new regulations for commercial leasing of oil shale and tar sands, and if there is sufficient local interest and support, potentially lease federal public lands for commercial oil shale production.

That is a logical sequence—to research carefully whether public lands should be opened to oil shale development and, if so, how. The pace of that sequence, as imposed by the 2005 Act, is now proving too ambitious and too hasty.

None of the research intended on federal lands leased for that purpose have begun. Indeed, at least two of the research leasing companies with research leases have announced their intention to rewrite their original research leasing proposals or to revise their research plans.

Meanwhile, the PEIS process is moving deliberately but slowly, which is appropriate, considering the large amount of land and water potentially affected and the significant amount of key information that just is not known.

It just makes sense to take all the time needed for a thoughtful review of the research results from the preliminary research leasing program before considering any public lands leasing for commercial oil shale production—and before attempting to craft commercial leasing regulations.

Federal managers, local citizens and their leaders, and the industry itself need additional time to evaluate whether and how well the new oil shale extraction technologies work and how they could affect local economies, communities, and the natural environment so key to both.

Commercial leasing should begin, if it begins at all, *only* if and when technical difficulties of oil shale production are solved and when negative environmental and social effects of commercial development—including climate effects—are fully understood and then avoided or mitigated.

Careful research before considering commercial development

Even recent innovations in oil shale production include many very new ideas and accompanying unknowns. The BLM is currently evaluating five *in-situ* oil shale research and development proposals in Colorado, each using technology that is the first of its kind. Nowhere on the planet has large-scale oil shale development occurred using the *in-situ* techniques being considered in Colorado's Piceance Basin. For all the effort and investment it has expended, the oil shale industry is in its infancy, and each of these is a one-of-a-kind operation.

The BLM should let companies conduct extensive—and long-term—research and development activities—and carefully evaluate the results of that research—before it considers holding a commercial lease sale.

	Technology		Commenced test operations?	Time to commercial decision	Time to initial commercial operations	Time to production growth	Federal Lands (acres)
Chevron	In-situ	ICP - Hot gas frac. (suspended)	NO	10-15 years	12-16 years	>20 years	160
Shell #1	In-situ	ICP - Electrostatic heaters	NO	7-10 years	12-16 years	>20 years	160
Shell #2	In-situ	ICP - Bare electrode	NO	7-10 years	12-16 years	>20 years	160
Shell #3	In-situ	ICP - Nahcolite, then shale (suspended)	NO	7-10 years	12-16 years	>20 years	160
AMSO	In-situ	ICP - Natural gas heat source	NO	7-15 years	12-16 years	>20 years	160
OSEC	Surface retort	ATP rotary retort	NO	Unknown	12-16 years	>20 years	160
Shell Mahogany	In-situ	ICP	YES	7-10 years	12-16 years	>20 years	

Interim production--This sound, cautious approach to—indeed, strategic postponement of—commercial oil shale leasing on public lands does not mean foregoing oil shale energy production. In fact, the potential resource recovery from the BLM research-and-development leases themselves is very large. According to the Plans of Operations submitted with the research lease nominations, the estimated in-place oil shale resources for the 160-acre Colorado tracts are 284 million barrels, 280 million barrels, 300 million barrels, 274 million barrels, and 356 million barrels, respectively. Thus the total resource to be conveyed in the research-and-development leasing program alone is approximately 1.5 billion barrels in place.

We note that this number does not represent the amount of oil that would be recovered, but rather the "resource in place". Because we do not yet know the potential recovery rate for the development methods proposed by research lessees, it is difficult to estimate the number of barrels that could actually be recovered. At a 70% recovery rate, which might be possible with the newer *in situ* processes, these research leases stand to deliver over 1 billion barrels of oil over their life, which would represent a substantial domestic supply.

In addition, the companies holding research leases have already nominated 4,960 acres of federal land preference rights adjacent to each of the research lease tracts. Once they demonstrate the viability of their technology, the BLM can confer the additional acres for development. Until and unless experimental leases can definitively demonstrate high rates of recovery and effective environmental protections, larger tracts should not be offered for what would be speculative commercial leasing.

Commercial leases offered later in time also will be likely to generate greater returns to the federal treasury. This view was supported by the Congressional Budget Office (CBO) when it evaluated legislative proposals to mandate large-scale oil shale and tar sand leasing in the next five years. The CBO found that because the technology to successfully develop shale has not yet been developed, bonus bids for commercial leases would be insignificant over the next five years.

In addition, CBO found that any increased receipts from early lease sales would be offset by forgone receipts from sales that would otherwise occur later, when the technology has been developed, as well as by administrative costs. Leases will simply be more valuable when potential lessees know what they will be able to do on them.

Extensive undeveloped oil shale resources are already in private hands—If oil shale and tar sands were a commercially viable resource to substitute for more traditional fossil fuels, surely some of the extensive oil shale and tar sands resources already in private hands would be under commercial development. They are not.

Oil shale and tar sands resources in private hands are extensive within the Green River Formation. For example, according to an April, 2006 Department of Energy Report, approximately 3,000,000 acres of oil shale and tar sands resources are in non-federal ownership in Colorado, Utah and Wyoming, and hold in-place reserves of approximately 360 billion barrels of oil equivalent (DOE, Office of Naval Petroleum and Oil Shale Reserves, "National Strategic Unconventional Resource Model," April, 2006, p. 6).

Several prominent companies either own outright or control large oil shale or tar sands resources, according to both federal government and industry sources. For example,

* ExxonMobil owns 50,000 acres of oil shale lands in Colorado's Rio Blanco and Garfield counties alone;
* Red Leaf Resources controls oil shale leases of about 16,500 acres on Utah state lands;
* Great Western Energy, LLC owns or controls oil shale leases on 16,500 acres of state lands in Uintah County, Utah;
* Millennium Synfuels, LLC controls approximately 34,000 acres of oil shale leases in Utah;
* Royal Dutch Shell owns 36,000 acres of oil shale lands in Rio Blanco and Garfield counties Colorado ;
* The Oil Shale Exploration Company controls over 45,000 acres of oil shale lands in Colorado.

These six companies control over 200,000 acres of oil shale and tar sands resources, but none of these companies have moved forward with any plans to commercially exploit the resources under their control.

Moreover, at least some of the oil shale resources in private hands have been characterized by the United State Geological Survey as among the richest in the Piceance Basin in terms of barrels of oil equivalent per acre. For instance, at a hearing before the Senate Subcommittee on Mineral Resources Development and Production of the Committee on Energy and Natural Resources held on October 16, 1987, regarding the patenting of 82,000 acres of old oil shale claims, testimony was presented regarding USGS estimates that 42 billion barrels of recoverable oil equivalent were present within the 82,000 acres patented. Royal Dutch Shell, though not an original patentee, acquired a substantial proportion of those 82,000 acres of patented oil shale claims, which

apparently comprise the lion's share of its holdings in the Piceance Basin. Shell, though carrying out a robust research program, has not moved to commercial production of these resources. According to the same hearing record, between 1920 and 1980 the federal government issued patents on over 345,000 acres of oil shale claims in Colorado, Utah, and Wyoming. None of these claims are in commercial production.

It seems to us that before the Congress lifts the current moratorium on commercial oil shale and tar sands leasing—which could result in the imprudent transfer of additional tens of thousands of acres of oil shale and tar sands resources into the hands of companies that already posses large inventories of these resources—it should find out more about the status and nature of the extensive oil shale and tar sands resources already in private hands. The USGS likely has information in its possession describing the nature of these resources, since much of it apparently derived from patents issued prior to the late 1980s. It would be prudent for Congress to find out from the companies holding these extensive private resources why they are pressing to acquire more federal resources, when they have not found it opportune to develop that which they already possess.

Protecting the environment and climate

Even as technological improvements advance, however, researchers and policymakers must fully consider and integrate into the oil shale equation the protection of our communities, our water, our wildlife, our clean air, and the scenic beauty of this region, as well as a better understanding and avoidance of climate impacts from this potential industry.

The public lands in question, in northwest Colorado, northeast Utah, and southwest Wyoming, certainly have large energy potential. Those lands already are producing unprecedented volumes of oil, natural gas, and coal for regional and national energy needs, and they contain a very large theoretical volume of additional energy from oil shale.

Those same public lands also include integrated and critical wildlife habitat, popular hunting and other recreation opportunities, water supplies for local agriculture and communities, and astounding scenic wonders. For all its energy potential, the oil shale country must be considered in the larger context of natural and public values. Correspondingly, any energy policies affecting those lands must protect those other, more enduring and more complex values and the region's tourist- and recreation-dependent communities that relay on those natural features.

Energy inputs—The amount of energy needed, as an input, to make oil shale production work is immense. Traditional, above-ground retorts must heat mined and pulverized oil shale to 900 degrees Fahrenheit, consuming 40% of the energy value produced from the shale itself. Even in the new *in-situ* heating technique, underground electric heaters must bring the ore to 700 degrees Fahrenheit and hold there for up to four years!

The Rand Corporation's report, *Oil Shale Development in the United States, Prospects and Policy Issues*, prepared for the U.S. Department of Energy last year, notes that oil shale production of 100,000 barrels per day (less than one half of 1% of U.S. daily oil consumption), using the so-far most advanced *in-situ* underground heating retort technique, would require 1.2 gigawatts of dedicated electric generating capacity. That equates to construction of a dedicated power plant equal in size to the largest coal-fired plant now operating in Colorado. Such a plant cost of about $3 billion to build and would consume five million tons of coal each year, producing ten million tons of green house gases

A 500,000 barrels-per-day industry—the scale projected by some oil shale enthusiasts—would require five such plants, 6 gigawatts of new electric power, an amount equal to that generated from all of Colorado's existing coal-fired power plants.

Although some small amount of that electric generation might be fueled by natural gas, a by-product of the *in-situ* process, most of it likely would be fueled by the abundant coal supplies in the vicinity, prompting additional technological challenges in providing carbon sequestration and particulate air pollution control.

Water—The region underlain by oil shale is notably arid, with relatively low annual rainfall, and existing over-commitment of existing water supplies and facilities. Against that dry backdrop, the Rand report cites the Office of Technology Assessment's projection that traditional oil shale operations require between 2.1 and 5.2 barrels of water to produce one barrel of shale oil product. While the new in-situ processes may require relatively less water, the Rand report notes that "considerable volumes of water may be required for oil and natural gas extraction, post-extraction cooling, products upgrading and refining, environmental control systems, and power production."

The BLM projected in 1996 that oil shale (by traditional methods) would reduce the annual flow of the White River by up to 8.2 percent and "would result in the permanent loss or severe degradation of nearly 50% of BLM stream fisheries."

More recently, local water agencies have estimated that a 500,000 barrels-per-day oil shale industry itself would require 25,000 acre-feet of water annually, either from new sources or diverted from existing uses, noting that such supplies of water adequate for the newer oil shale extraction technologies might not be available and, even if they are, might not remain available in a changing global climate.

Additional water would be needed for domestic and municipal uses in response to significant growth in population centers near the oil shale production areas.

All of these water factors should be—and are not—thoroughly analyzed in the PEIS and other comprehensive reviews to provide information essential to decisions about the possibility and timing of commercial-scale oil shale leasing and development.

Air quality—The Rand report notes that there were no publicly available analyses regarding how modern pollution control systems could be incorporated into oil shale production facilities, and that further studies would be needed to determine the extent to which nonpoint-source air emissions (i.e. dust and off-gassing) from both surface and in-situ operations could be prevented or controlled. Rand also found that no studies of the cumulative impacts of oil shale development on air quality had been reported since the 1980s. Because so much has changed in terms of air-quality regulations, mining and process technologies, and pollution-control techniques, the earlier air quality analyses were found to be no longer relevant. Rand characterized available studies on air quality effects of oil shale development as "so out of date, it is not possible to provide an analytically based estimate of the extent to which air quality considerations will constrain the technology profile, pace of development, and ultimate size of an oil shale industry."

Additional air quality study and modeling must be completed before making decisions about commercial oil shale production.

Climate impacts—Each of these factors—energy inputs, water use, air pollution—exacerbate impacts on the global climate in a spiraling, interrelated cycle.

As energy production increases to power oil shale development, corresponding significant releases of greenhouse gases would contribute to a reduction in water supplies, either reducing the amount of water available for oil shale production and energy generation or requiring diversion of even more water from other uses.

As agriculture is by far the largest user of water in northwest Colorado, loss of irrigated cropland and soil cover may contribute further to the climate change cycle.

Increasing global temperatures would increase demand for domestic electricity consumption, either competing with power production for oil shale or requiring still more power generation, with still more greenhouse gas emissions, etc.

These dynamics stack on top of the direct climate impacts that would result from the burning of oil shale fuels themselves.

As noted, the energy required to extract oil from shale will likely result in the generation of huge quantities of green house gas emissions. The 6 new gigawatts of electricity needed to power that 500,000 barrels production level could generate up to 60 million additional tons of carbon dioxide per year—according to EPA data, that would be a 45% increase in the carbon dioxide emitted by all existing electric utility generating units in 2005 in Colorado, Wyoming, and Utah combined.

Due to the required energy inputs, the fuels derived from oil shale would have a carbon footprint that is substantially higher than conventional fuels. Researchers at the University of California reviewed the global warming contribution of the leading oil shale extraction technologies, as well as the emissions released when the fuel is burned, and found that the fuels derived from shale would lead to substantially greater carbon

emissions than from conventional fuels. For example, the Alberta Tackuk Processor, an above-ground extraction technique now being pursued by Oil Sands Exploration Company (OSEC) on a federal research and development lease, produces between 37.5 and 40.8 grams of carbon equivalent per unit of delivered energy, compared to an average of 25 grams of carbon equivalent for conventional fuels.

None of these climate impact factors—primary or secondary—are adequately addressed in the current PEIS process, if addressed at all. More complete analysis of these factors must be completed before informed decisions about commercial-scale oil shale leasing or production can be honestly or effectively contemplated.

All of these factors must be thoroughly and thoughtfully analyzed in the pending programmatic EIS and used as the basis for decisions about where oil shale activities will be allowed, and where they would not be appropriate and so will *not* be allowed, and at what pace development should proceed.

Conclusion: go slow, go carefully

Oil shale holds a potential contribution to our energy supply. Researched carefully, developed prudently, and considered in the important contexts of communities, recreation, and the beauty and natural environment of these wondrous states, it might be able to make that contribution without destroying longer-term resources and values. We do not know enough at present, however, to conclude that it can be done safely or efficiently.

Congress and federal land managers should, in careful consultation with states and local communities, learn from the oil shale research leasing program *before* beginning any commercial leasing or commercial production on public lands.

The oil shale will be there when we are ready to develop it in a truly sustainable and environmentally sound manner. We should not venture too fast until we are.

I invite your questions on that document, on my comments today, and on any other opportunity that we may have to help with your work and consideration.

Thank you again for this opportunity to address the committee.