

Colorado's oil shale deposits are once again the focus of potential development, intensifying the need to quantify the potential impacts to already limited water supplies. Development would require the use of large quantities of water – perhaps as much as 3-4 barrels of water for each barrel of shale oil for direct use, plus additional water for indirect demands, such as electricity generation and an increased population. Given the magnitude of development the U.S. Department of the Interior's Bureau of Land Management (BLM) projects is one-day feasible, as much as 378,000 acre-feet of water could be required annually to support oil shale development, more than the Denver Metro area uses each year.

The possible development and use of substantial water for oil shale production raise important considerations for Colorado because of their potential to adversely affect some existing water uses and many expected future water uses. Companies with an interest in oil shale development own enormous portfolios of water rights. While there is great uncertainty with respect to the manner in which these rights will be developed and used, the consequences of such development are unquestionable.

Among the many likely changes in the use of Colorado water resulting from oil shale development are changes in existing irrigated agriculture, limitations on existing and planned water development for the Front Range and the West Slope, and likely limitations on other water development for new uses on the West Slope. While these general impacts are relatively easy to project, it is harder to identify the exact development scenarios and the resulting impacts on a given water right or a specific project.

This report helps frame these and other issues central to the many technical and policy questions posed by oil shale development. The report:

- Projects water requirements associated with oil shale development.
- Identifies all major water rights currently owned by energy companies that could be used for oil shale development in Colorado, as well as conditional rights that could be exercised in the future. Rights are grouped by basin, source, point of diversion, and diversion amount.
- Analyzes legal and hydrological issues of the Colorado River Basin that affect future development of Colorado's allocation under the 1922 Colorado River Compact and subsequent 1948 Upper Basin Compact.
- Explains how the Upper Colorado River Endangered Fish Recovery Program affects and limits additional consumptive uses of water in the mainstem Colorado River.

In order to meet the significant water demands associated with oil shale development, oil companies as well as water supply districts have secured hundreds of water rights through western Colorado. They have established conditional water associated with more than 200 separate proposed structures, such as reservoirs and pipelines in the Colorado and White River Basins, which could potentially be developed in support of oil shale production. Many of these rights

were established in the 1950s and 1960s, and collectively would enable the direct diversion of more than 10,000 cubic feet per second (cfs) of water and the storage of more than 1.7 million acre-feet (af). In addition, energy companies have acquired full or partial ownership of more than 100 existing irrigation ditches with decreed rights to divert more than 650 cfs in the two basins in proximity to the shale deposits.

ExxonMobil owns the most rights: 49 conditional claims and ownership in 48 irrigation ditches. Most of its rights are located in the White River Basin. Shell holds 31 conditional rights in the two basins and has purchased ownership in 5 irrigation ditches. It is now in the process of securing rights on the Yampa River. Chevron holds 28 conditional rights and ownership in 24 irrigation ditches, all located in the Colorado River Basin. Its Unocal subsidiary owns absolute rights to another 48 wells and springs, as well as ownership in 13 ditches in this basin. OXY USA holds conditional rights for 22 proposed structures in the Colorado River Basin. Tosco holds 17 conditional rights and ownership in 14 ditches in the White River Basin. The Colorado River Water Conservation District holds conditional claims to store over 900,000 af of water at locations in the two basins that could serve oil shale development.

In addition to quantifying water rights, the report raises a number of important issues that could disrupt traditional uses of water in Colorado:

- 1. Impacts on agriculture:** Energy companies own large portions of the water rights historically used to irrigate lands in the region. Many of these rights date back to the late 1800s and early 1900s. As pre-Colorado River Compact rights, these diversions would not be affected by a call placed against the Upper Basin states. Additionally, most of the associated water still remains in irrigation use as energy companies lease back the water to ranchers. Should oil shale development move beyond the research phase, many, if not all, of these rights would be changed in use, and the lands historically irrigated would be taken out of agriculture. The result would be a dramatic transformation of land and water uses in these areas.
- 2. Impacts on junior users:** A second and less obvious outcome of oil shale development would be the displacement of some existing uses by new oil-shale-related uses with senior priorities. Conditional water rights for oil shale development date back to the 1950s. Should these rights be placed into use, they would be senior to all existing uses from the same source of water with subsequent priority dates, thereby affecting rights used both in western Colorado and in Colorado's Front Range. Development would also affect some existing uses established under more junior water rights and would potentially limit much other planned water development from sources on Colorado's West Slope — including plans to take additional water to the Front Range.
- 3. Restrictions under the 1922 Colorado River Compact:** An important uncertainty facing future water development in western Colorado is the legal availability of water for development under the 1922 Colorado River Compact and associated laws and requirements. Water development could be constrained by obligations under the compact, as increased consumption would also increase the risk of “call” by the Lower Colorado Basin states against the Upper Basin.
- 4. Impacts on endangered fish:** The ultimate extent of new water development is also subject to constraints associated with the Upper Colorado River Endangered Fish Recovery Program. At issue is the continued survival of four species of fish found only in this basin. The U.S. Fish and Wildlife Service has determined that additional depletions of the Colorado River Basin's water would jeopardize the continued existence of these species and any new water development —whether for oil shale or otherwise — must satisfy substantial program requirements intended to protect and recover them.