

**IMPACTS OF OIL AND GAS ACTIVITY ON WATER RESOURCES IN THE SOUTH PLATTE BASIN OF
COLORADO**
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Abstract: Watersheds in the arid west are becoming more water stressed as resources are being allocated, and sometimes oversubscribed, to a range of regional uses. These uses include municipalities, agriculture, recreation, industry and riparian flow. An additional water user becoming more prevalent in semi-arid regions is unconventional energy development (i.e. hydraulic fracturing). Quantifying water use for hydraulic fracturing of shale gas has rarely been studied on a basin-wide scale. The South Platte watershed, located in northeastern Colorado, encompasses the Denver-Julesburg basin, including the Niobrara shale formation. There has been extensive unconventional energy development in this region over the past several years, suggesting that water use for oil and gas development has also increased as a result of increased hydraulic fracturing activity. The South Platte watershed also experiences high water withdrawals for agriculture and municipalities, as well as recreation, riparian flow and industry. This thesis quantifies water consumption for hydraulic fracturing in Colorado on a state, basin, county and city scale and explores any production variables that might influence this water use (i.e. lateral length, economics, operator, formation). Produced water is also quantified in order to explore re-use scenarios. In addition, future water availability is projected for the South Platte basin with changes in population, climate, agriculture and energy production to determine if there will be sufficient supply for the increasing water demands in the basin. Downscaled climate projections are employed to quantify the potential range of water availability in the basin under multiple scenarios, and observe whether or not, and to what extent, climate may impact management decisions at the basin level.