10.3 **Research needs for development of Piceance Basin oil shale**

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The enormous size of the Piceance Basin oil shale resource (1.5 trillion bbl or about 100 Prudhoe Bays) and potential future importance to U.S. domestic energy supplies (about a 200 year supply of oil at the current level of demand) provide a strong impetus for timely research into how to best extract the resource and to minimize negative environmental impacts. Several hundred thousand bbl have been produced in the past, mostly to test retorting methods and the suitability of oil for various uses. Critical research is needed on the potential to extract several co-products that could equal or exceed the oil value. Much of the detailed research needed is process-related; however, there is a universal need for research towards maximizing resource recovery efficiently, recovery of co-products, and minimizing degradation of air, water and soil quality. A real possibility exists that a future emergency will require the rapid development these resources. Without more thorough research, rapid development is almost certain to result in inefficient recovery, wasted resources, and environmental damage.