



COLORADOSCHOOLOF**MINES**

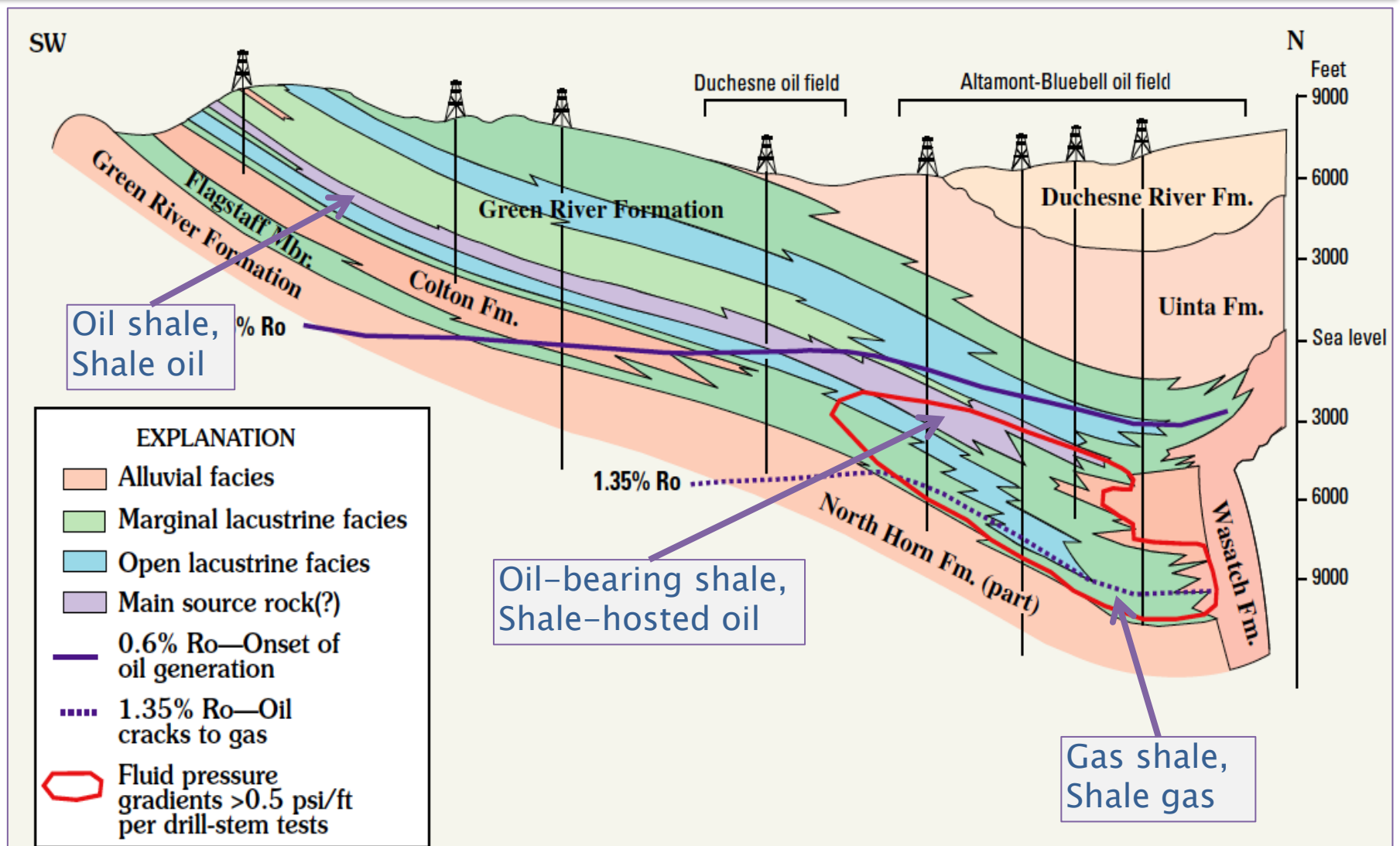
Fracturing Some Myths about Oil Shale



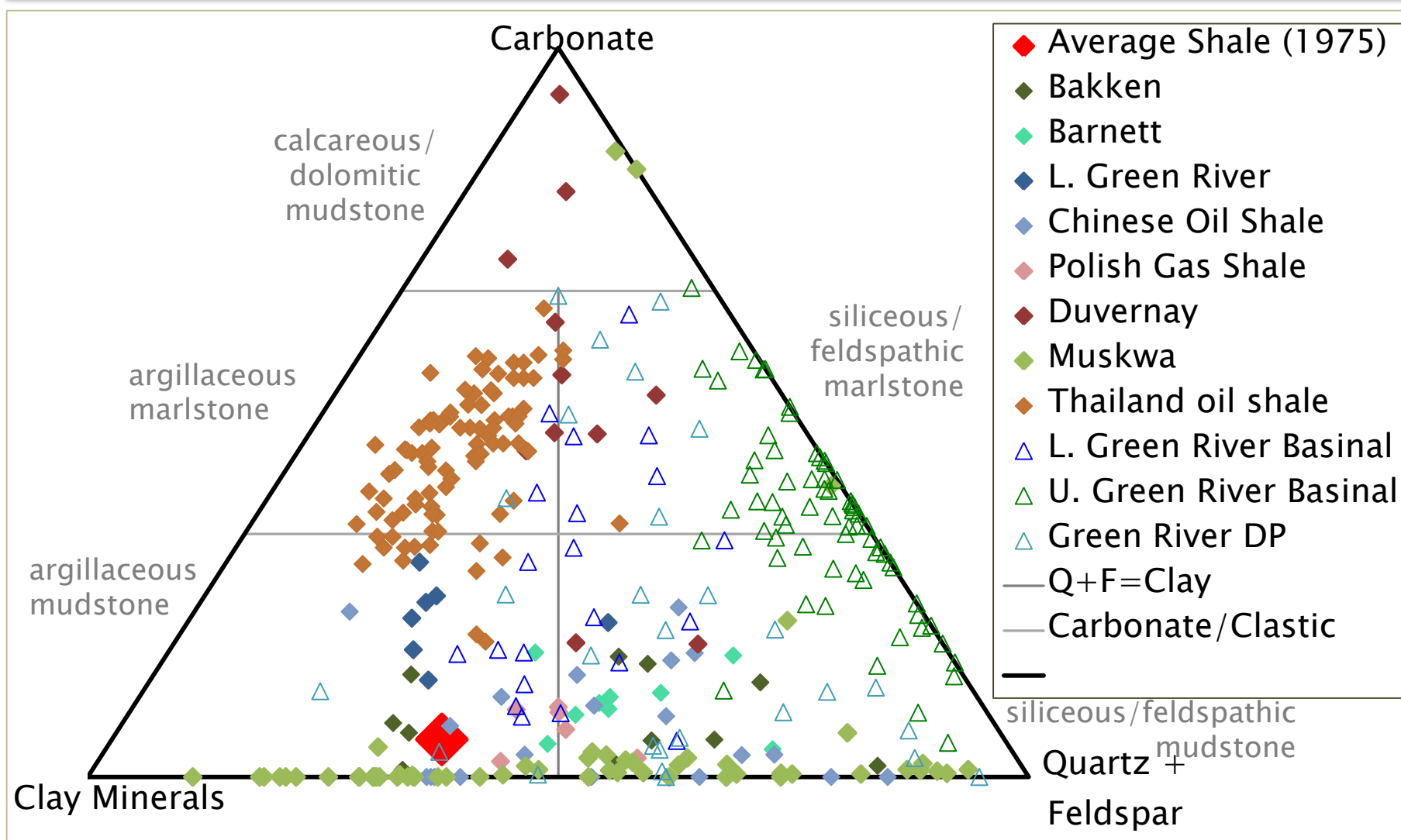
Dr. Jeremy Boak, Director
Center for Oil Shale Technology and Research
Colorado School of Mines
June 19, 2012



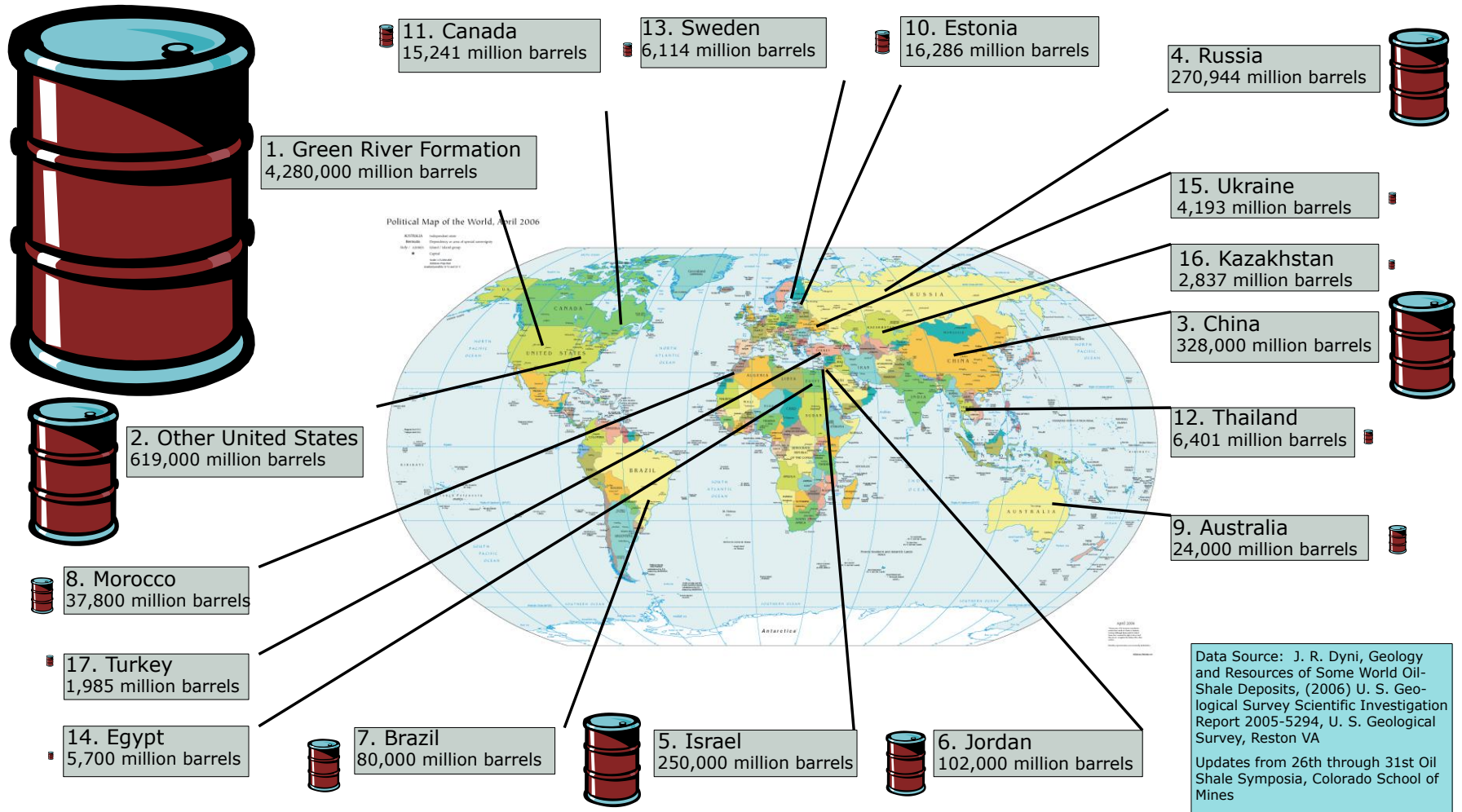
Oil-shale, oil-bearing shale and gas shale



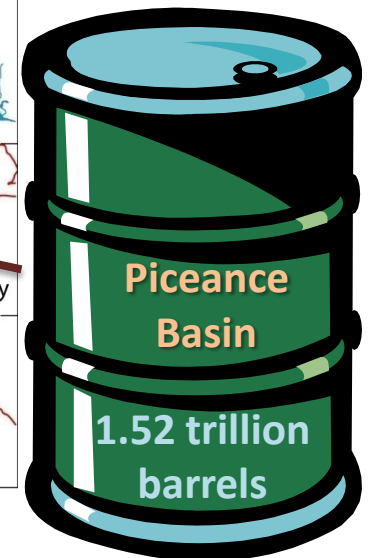
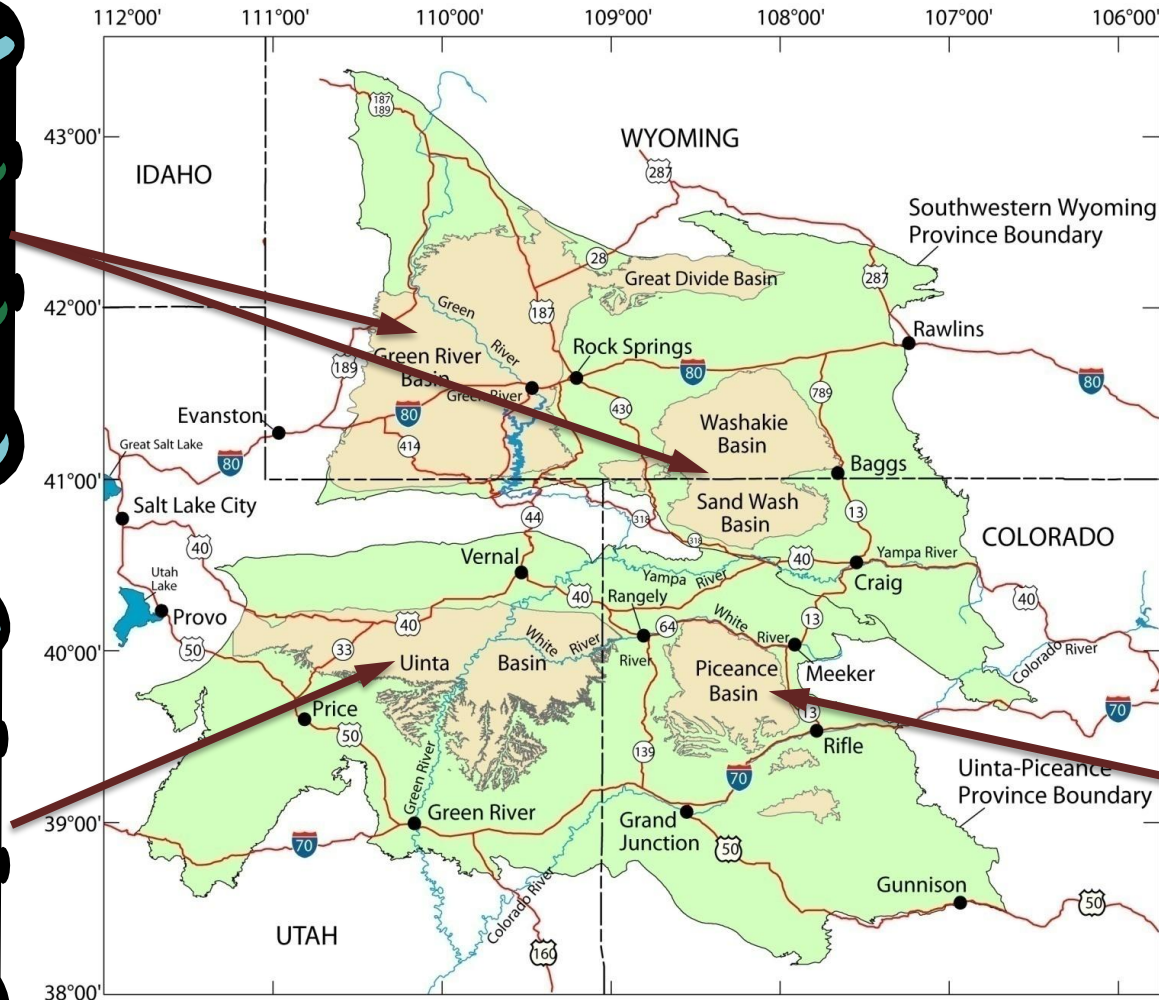
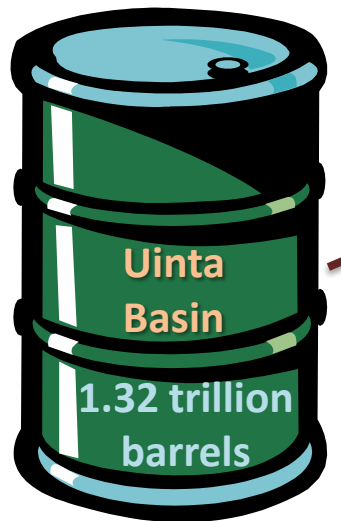
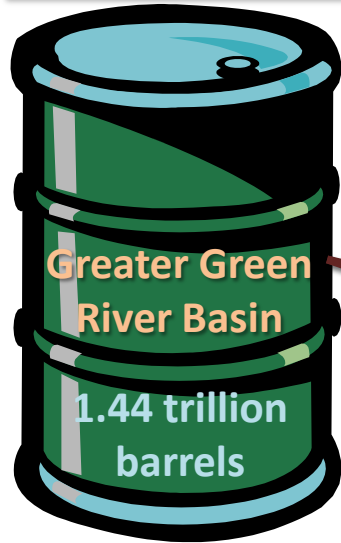
Shale composition is diverse



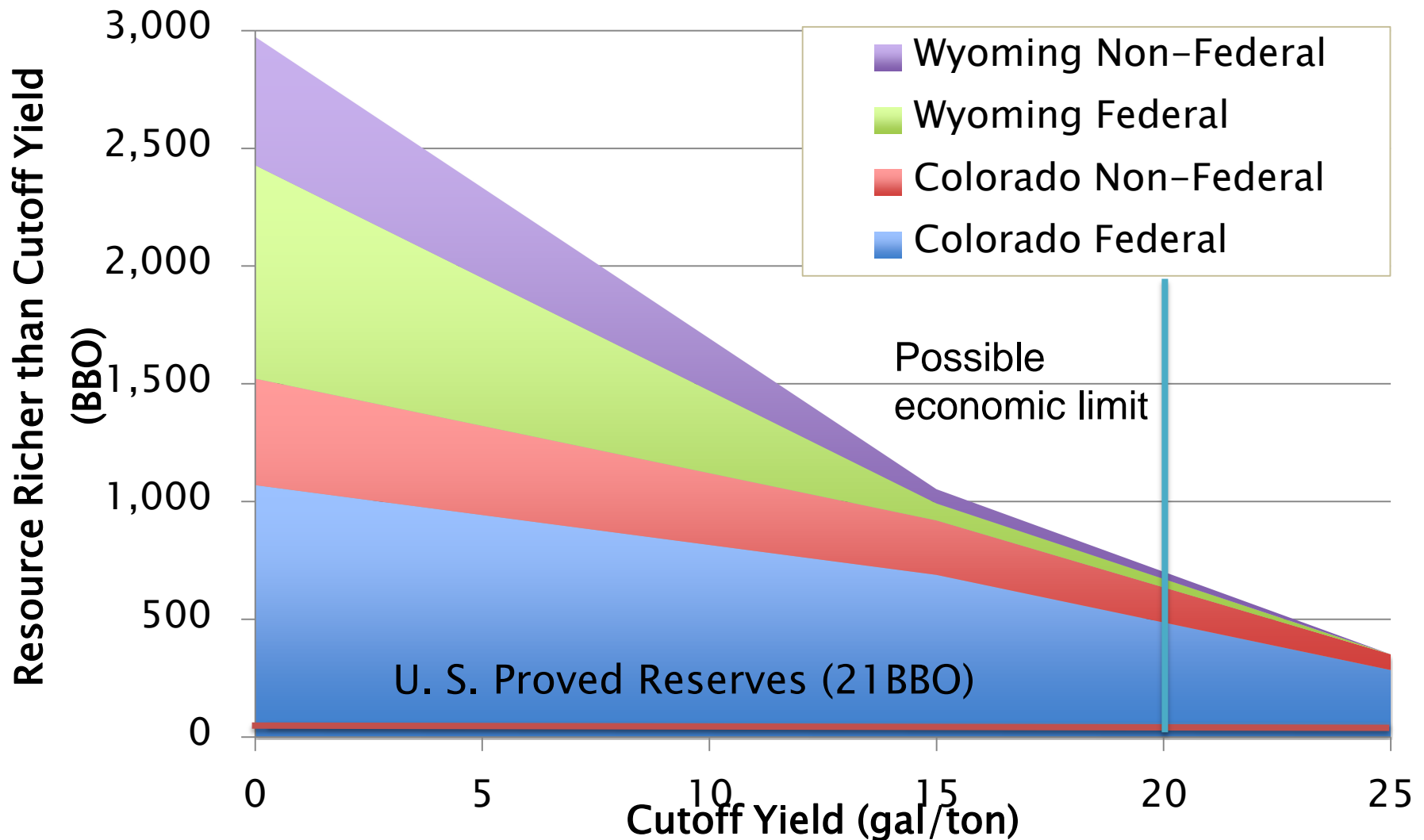
Global Oil Shale Resource Estimates



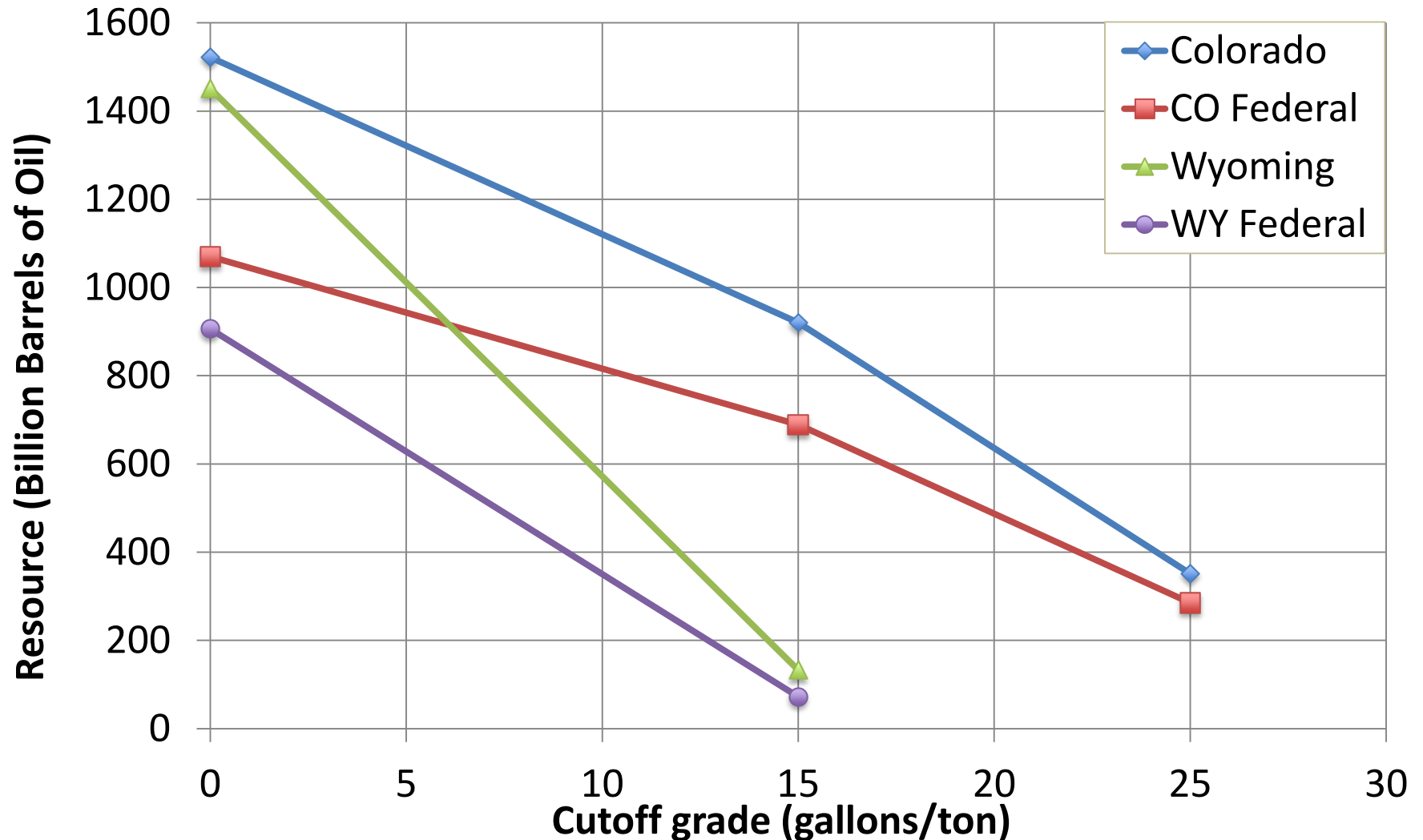
Oil Shale Resources of Green River Formation



Colorado Federal land is the ballgame



Green River Formation oil shale resources





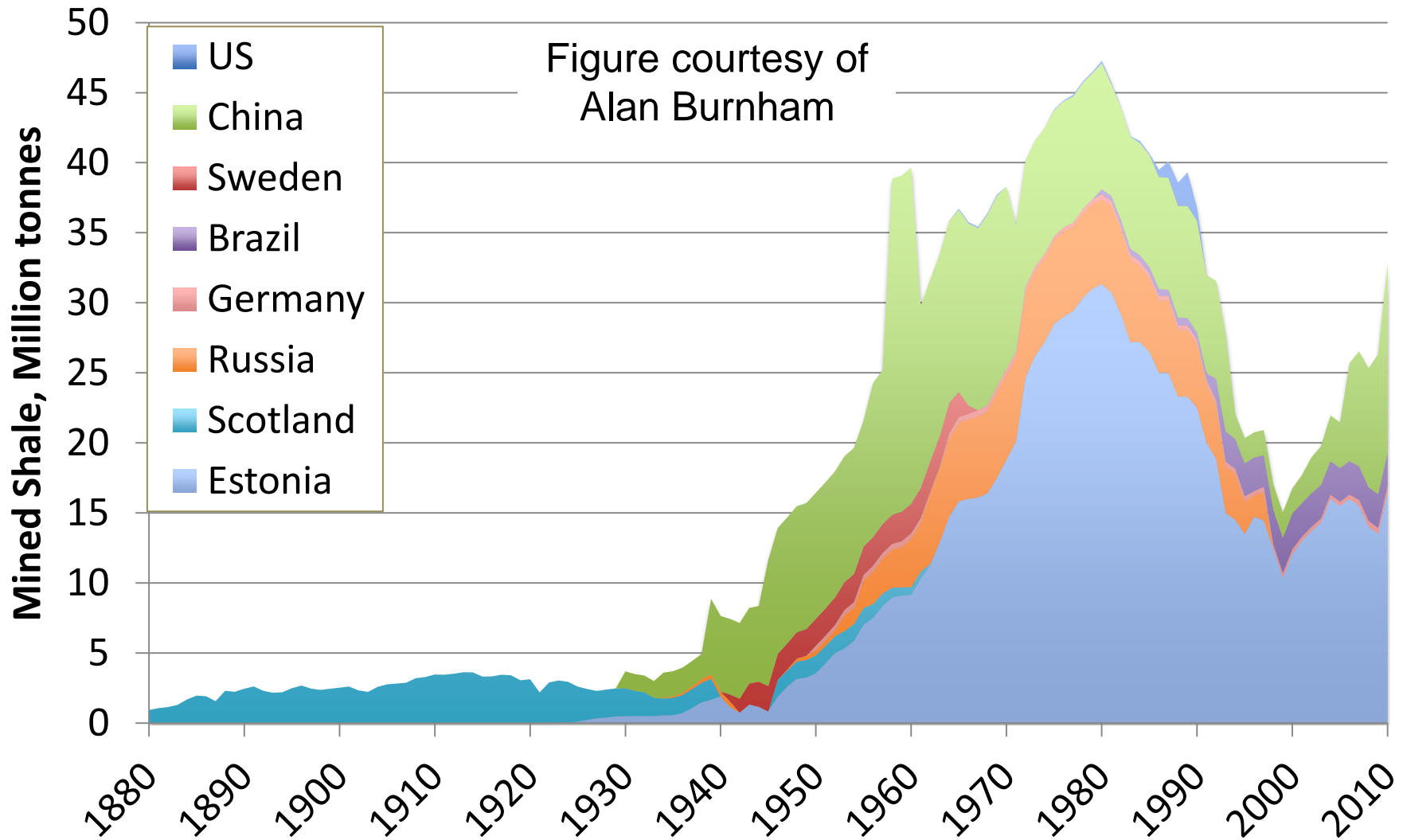
The Center for Oil Shale Technology & Research

& The Colorado School of Mines

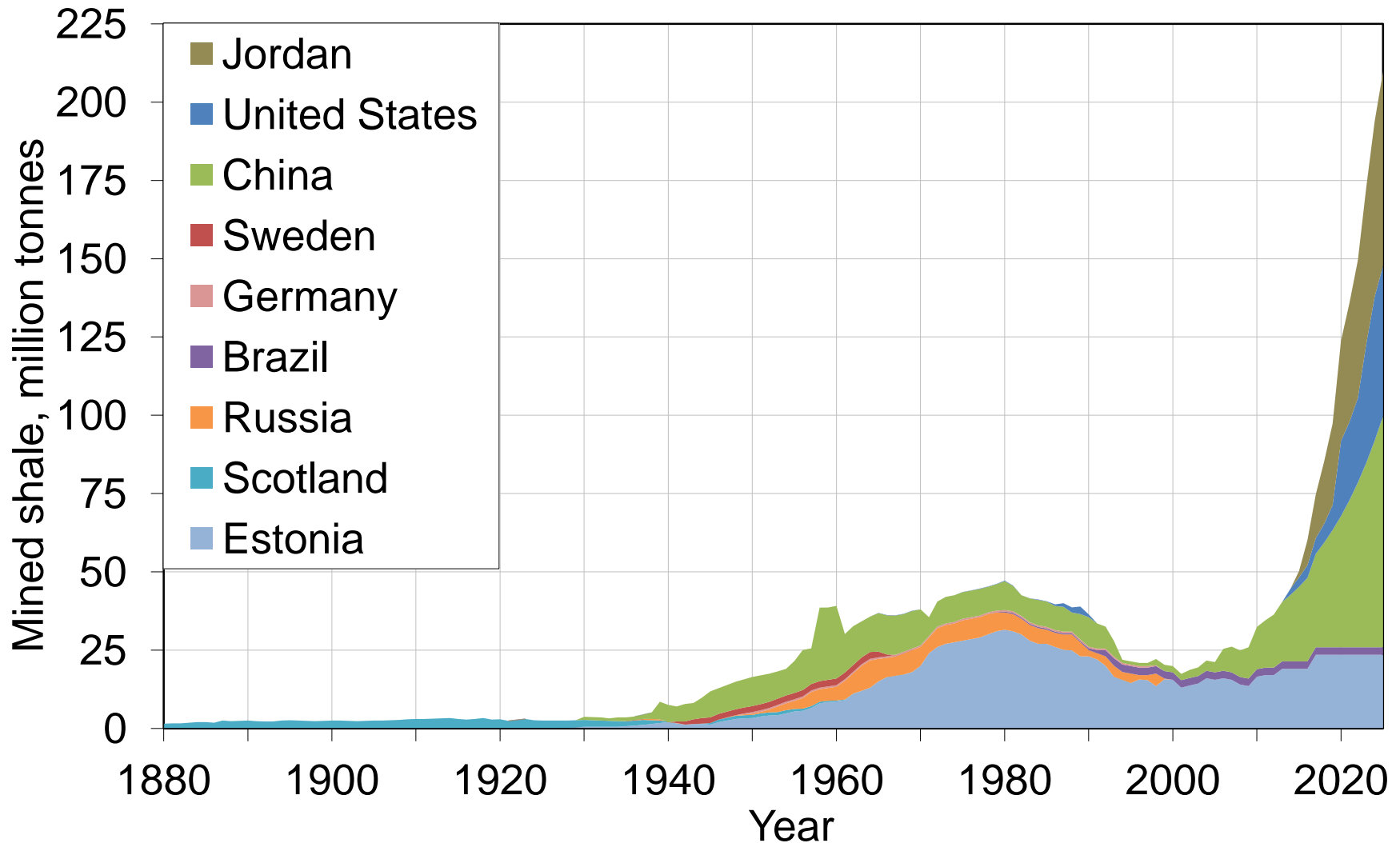
31st Oil Shale Symposium

October 17-21, 2011

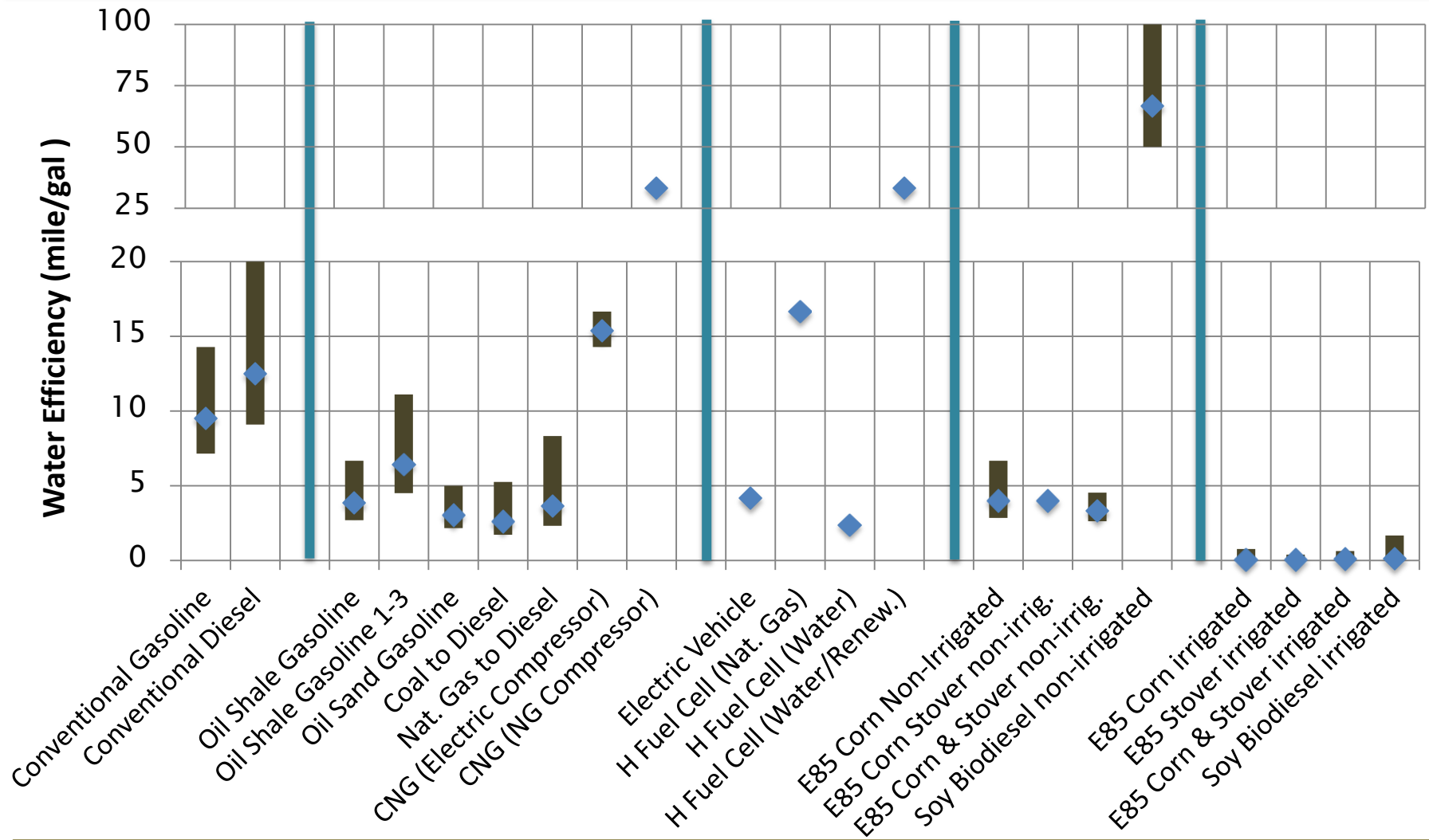
at the Cecil H. & Ida Green Center, Colorado School of Mines, Golden, Colorado



Projected Global Oil Shale Production



Water Efficiency of Various Fuels



Source: King, C. W., and M. E. Webber, (2008) *Water Intensity of Transportation*, Environmental Science & Technology, vol. 42, no. 21, p. 7866-7872

Relative Water Usage



1-3 barrels water per barrel of oil from oil shale

Source: AMEC. *Energy Development Water Needs Assessment, Phase II Final Report*. Prepared for the Colorado River Basin Roundtable and the Yampa/White River Roundtable. January 2012.

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4-8 barrels water per 2-liter bottle of sweetened cola

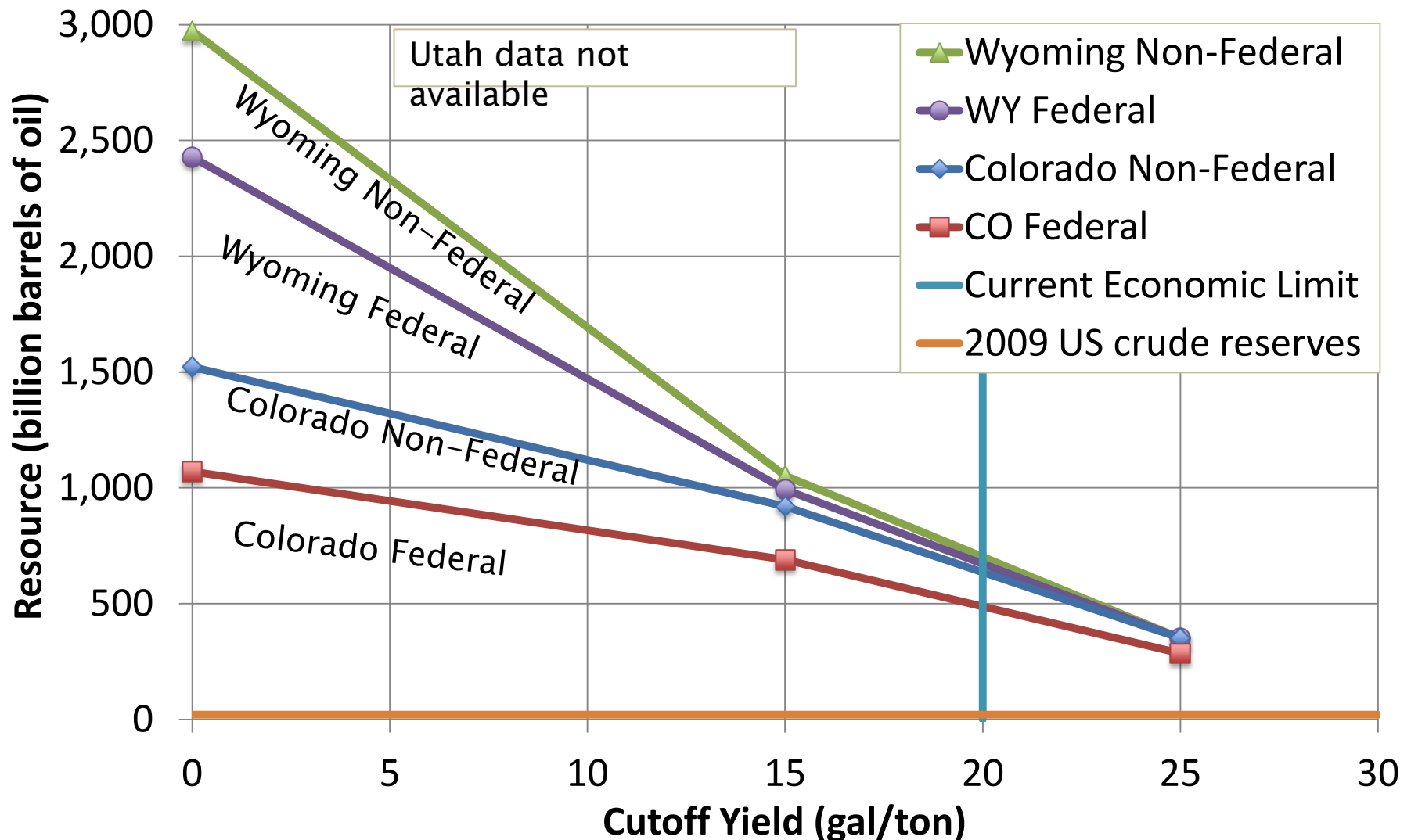
Source: Ercin et al., (2011) *Water Resources Management* 25:721–741

COSTAR and the Oil Shale Symposium

- Center for Oil Shale Technology and Research (COSTAR)
 - ExxonMobil and Total members
 - Integrated Geological Framework & Rock Mechanics tasks
 - Open to new partners
- <http://www.costar-mines.org/>
- 32nd Oil Shale Symposium
 - Symposium – October 15–17, 2012
 - Field Trip – October 18–19, 2012

BACK-UP INFORMATION

Green River Formation oil shale resources



Definitions

Kerogen: a mixture of organic chemical compounds that make up a portion of the organic matter in sedimentary rocks. It is insoluble in normal organic solvents because of the huge molecular weight (upwards of 1,000 daltons) of its component compounds. The soluble portion is known as ***bitumen***. When heated to the right temperatures in the Earth's crust, (*oil window* ca. 60–160 ° C, *gas window* ca. 150–200 ° C, both depending on how quickly the source rock is heated) some types of kerogen release crude oil or natural gas, collectively known as hydrocarbons (fossil fuels). When such kerogens are present in high concentration in rocks such as shale they form possible source rocks. Shales rich in kerogens that have not been heated to warm temperature to release their hydrocarbons may form oil shale deposits.

The name "kerogen" was introduced by the Scottish organic chemist Alexander Crum Brown in 1912.

– <http://en.wikipedia.org/wiki/Kerogen>

Definitions

- ***Oil shale***: fine-grained immature organic-rich mudstone, marlstone and siltstone, commonly of lacustrine or marine origin
- ***Shale oil***: the liquid hydrocarbon produced by pyrolysis in a retort.
 - BEILBY, G. T. (1897) Thirty Years' Development in the Shale Oil Industry. J. Soc. Chem. Ind., 18, 876886.
 - IRVINE, R. (1894) Shale Oil Industry. J. Soc. Chem. Ind., 13, 1039–1044.
 - TAYLOR, A. (1873) On Bitumen, Oil Shales and Oil Coals. Edinburgh Geol. Soc. Trans., 2, 187189.
 - VALENTINE, G. A. (1890) Carbonaceous Mineral or Oil Shale from Brazil. South Wales Inst, Eng. Proc., 17, 20–28.
- ***Oil-bearing shale***: fine-grained mature organic-rich mudstone, marlstone and siltstone that contain liquid hydrocarbons
- ***Shale-hosted oil***: oil produced from oil-bearing shale, generally through hydraulically fractured wells
- ***Gas shale***: fine-grained mature to overmature organic-rich mudstone, marlstone and siltstone that contain natural gas
- ***Shale gas***: gas produced from gas shale, generally through hydraulically fractured wells