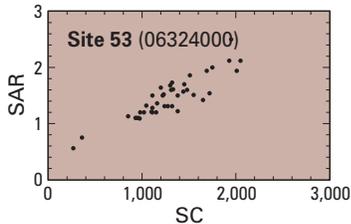


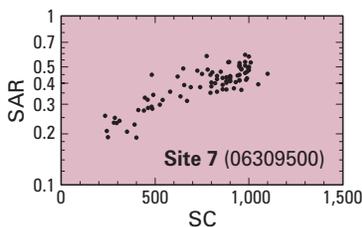
Relations between Specific Conductance and Sodium-Adsorption Ratio

The combination of specific conductance and SAR is used to determine the suitability of water for irrigation. The suitability is not a single number but rather a dynamic relation. For general reference, a specific conductance near 2,000 microsiemens per centimeter at 25 degrees Celsius, and an SAR greater than 10 would represent a high sodium hazard (Hem, 1985). Graphs shown in figure 6 depict the relations between specific conductance and SAR at the eight selected monitoring sites. Sites potentially affected by oil-field brine discharged into Salt Creek are plotted with two time periods: pre- and post-February, 1990. The linear patterns in the data indicate that regression equations can be established for specific conductance and SAR. A regression equation is a mathematical relation between two constituents where one measured constituent is used to predict another unmeasured constituent. This relation generally is site specific and can change over time if stream chemistry changes. Because specific conductance can be monitored remotely and instantaneously, regulators looking for changes in stream SAR values have the option of monitoring specific conductance as a surrogate for SAR and having nearly instantaneous, continuous records of this calculated SAR approximation.

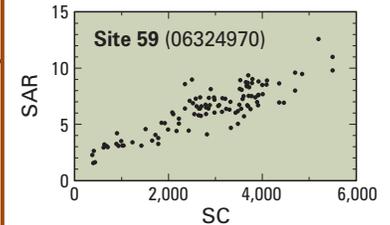
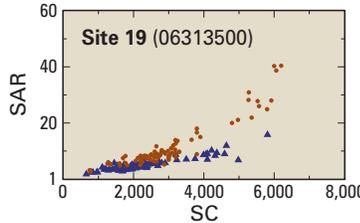
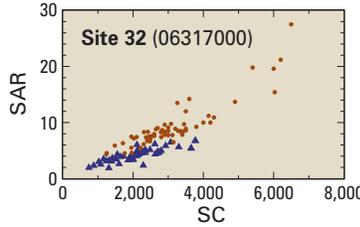
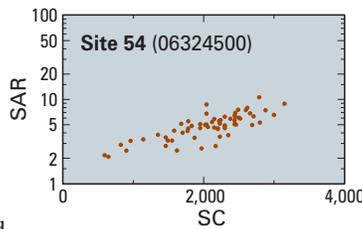
Only pre-February 1990 SAR data are available for the Powder River at Moorhead, Mont.; therefore, changes in the relation resulting from changes in the oil-field brine discharges to Salt Creek cannot be determined.



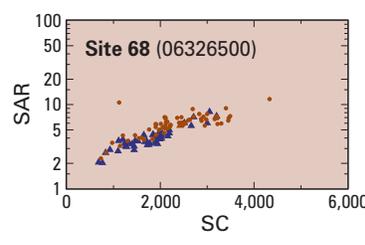
SAR values measured in Clear Creek are generally less than 2 and correlate well with specific conductance.



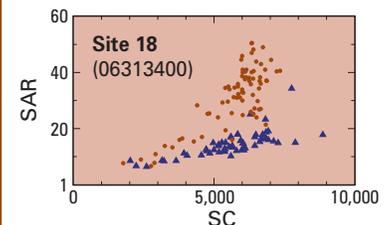
SAR values are all less than 1 on the Middle Fork Powder River. A good mathematical relationship between SAR and specific conductance is apparent.



SAR values for water from the Little Powder River site range from about 2 to 13. A strong specific conductance-SAR relation is apparent at this site.



The Powder River near Locate, Mont. represents the cumulative mix of all the basin's waters, and the relation between SAR and specific conductance at site 68 shows little difference between pre- and post-February 1990 data.



The relation between SAR and specific conductance is different for the pre- and post-February 1990 time periods for sites on Salt Creek (site 18) and the Powder River (sites 19 and 32). Using pre-February 1990 data in a regression to predict SAR from specific-conductance measurements made today would most likely over-predict SAR. This observation indicates a notable change in the ionic composition of waters in Salt Creek, presumably resulting from the change to subsurface injection of oil-field brine.

EXPLANATION

- 1981–2000
- Pre–February 1990
- ▲ Post–February 1990

Figure 6. Specific conductance and sodium-adsorption ratio (SAR) for selected sites in the Powder River Basin, Wyoming and Montana, 1981-2000 (SC = specific conductance in microsiemens per centimeter at 25 degrees Celsius).