Identification of the Ordinary High-Water Mark of the Snake River, Western Idaho, USA

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Abstract: Studies were conducted to determine ownership of over 200 islands in the approximately 120-mile reach of the Snake River within the Deer Flat National Wildlife Refuge (DFNWR). At the time of statehood in 1890, the State of Idaho acquired ownership of all submerged lands of the navigable portions of the Snake River up to the ordinary high water mark (OHWM) under the Equal Footing Doctrine. The island ownership studies were conducted in two phases: (1) determination of the OHWM along the reach and identification of those islands that are wholly below the OHWM, and (2) collection and analysis of stratigraphic, pedologic, sedimentologic, pollen and \(^{14}C\) data to determine the age of the various stratigraphic layers that make up the portions of the islands above the OHWM. The OHWM has been defined in a variety of court cases dating back to at least 1851, and these cases generally indicate a three-pronged test for field determination of the OHWM involving the character of the soil and vegetation, and the value of the soil for agricultural purposes. While the tests may appear to be relatively clear-cut, they can be very difficult to apply consistently in the field. The project team used an innovative approach to identify the OWHM along the reach by making field identifications at 147 individual points, using a survey-grade global-positioning system (GPS) to accurately determine the elevation and horizontal locations of the points, and then correlating the field identified elevations with modeled water-surface profiles. The field team consisted of a geomorphologist, a hydraulic engineer, and a plant ecologist because the field tests involve evaluation of the local hydraulic effects on the substrate along the channel banks, identification of plant species and the physical characteristics of the zone in which they normally grow, and evaluation of the value of the area for agricultural purposes. The water-surface elevations were developed using one-dimensional hydraulic analysis with recently collected bathymetric and topographic data, and calibrated to measured water-surface elevations at numerous discharges and locations along the reach. The field-identified OHWM’s correlated very well with a consistent discharge within each geomorphically distinct subreach. The resulting water-surface profile provided a reasonable method of identifying the OWHM at locations where a field determination could not be made.