

described by Sando and others (2008), and accurate characterization would require additional analyses beyond the scope of this study.

The FLDFRQ3 model uses a Bayesian approach (O'Connell and others, 2002) with a maximum likelihood method (Stedinger and Cohn, 1986). The FLDFRQ3 model allows for specification of uncertainties for magnitudes and timing of hydrologic events and for thresholds derived from paleoflood data that arise due to flow-rate, stratigraphic, and chronologic uncertainties. Additionally, the FLDFRQ3 model allows for specification of uncertainties in the gaged record, with uncertainties assigned (Table 2) on the basis of general reliability of the datasets. For this study, uncertainties of  $\pm 10$  percent were assigned for the most reliable peak-flow records (recent gaged records from locations near the benchmark sites). Progressively larger uncertainties (as much as 33 percent) were assigned for flow values derived using various methods of estimation as described in the previous section "Development of Modern Peak-Flow Chronologies." Especially large flow values generally were assigned uncertainties of  $\pm 33$  or 50 percent, depending on professional judgment regarding factors such as sources of data and extrapolation required for applicability to study reaches.

In the maximum likelihood approach used by the FLDFRQ3 model, especially large flows can be used as constraints, or perception thresholds, on the magnitude and timing of the peak flows. When incorporating perception thresholds for paleofloods, a range of ages can be used. In most analyses, thresholds were based on stratigraphic and geochronologic evidence. In order to be consistent with the input values of the PeakfqSA

**Table 2.** Modern peak-flow chronologies (gaged records) for paleoflood study reaches.

[Shaded cells indicate special computations for the lower Rapid Creek reach, as noted in text. Blank rows signify a gap in the chronology. %, estimated uncertainty, in percent, for use in selected flood-frequency analyses; (H), historical value; --, no data]

| Water<br>year | Spring<br>Creek                                |    | Rapid Creek                                 |    |  |    | Boxelder Creek                                 |    |  |    | Elk Creek                                   |    |
|---------------|--|----|---|----|--|----|--|----|--|----|---|----|
|               |  |    | Lower reach                                 |    | Upper reach                                    |    | Upstream<br>sub-reach                          |    | Downstream<br>sub-reach                        |    |   |    |
|               | Annual<br>peak<br>flow<br>(ft <sup>3</sup> /s) | %  | Annual<br>peak flow<br>(ft <sup>3</sup> /s) | %  | Annual<br>peak<br>flow<br>(ft <sup>3</sup> /s) | %  | Annual<br>peak<br>flow<br>(ft <sup>3</sup> /s) | %  | Annual<br>peak<br>flow<br>(ft <sup>3</sup> /s) | %  | Annual<br>peak flow<br>(ft <sup>3</sup> /s) | %  |
| 1878          | --   | -- | 7,060 (H)                                   | 50 | --   | -- | --   | -- | --   | -- | --  | -- |
| 1883          | --   | -- | 7,900 (H)                                   | 50 | --   | -- | --   | -- | --   | -- | --  | -- |
| 1904          | 493  | 20 | --  | -- | --   | -- | 533  | 10 | 578  | 15 | --  | -- |
| 1905          | 691  | 20 | 2,350                                       | 15 | --   | -- | 559  | 10 | 606  | 15 | --  | -- |
| 1906          | --   | -- | 922   | 15 | --   | -- | --   | -- | --   | -- | --  | -- |
| 1907          | --   | -- | 12,200 (H)                                  | 50 | --   | -- | 16,400   | 33 | 17,700   | 33 | 10,400 (H)                                  | 50 |
| 1915          | --   | -- | 654   | 15 | 566  | 20 | --   | -- | --   | -- | --  | -- |
| 1916          | --   | -- | 217   | 15 | 187  | 20 | --   | -- | --   | -- | --  | -- |
| 1917          | --   | -- | 287   | 15 | 248  | 20 | --   | -- | --   | -- | --  | -- |
| 1920          | --   | -- | 7,540 (H)                                   | 50 | --   | -- | --   | -- | --   | -- | --  | -- |
| 1929          | --   | -- | 870   | 15 | 752  | 20 | --   | -- | --   | -- | --  | -- |
| 1930          | --   | -- | 213   | 15 | 184  | 20 | --   | -- | --   | -- | --  | -- |
| 1931          | --   | -- | 170   | 15 | 147  | 20 | --   | -- | --   | -- | --  | -- |
| 1932          | --   | -- | 747   | 15 | 646  | 20 | --   | -- | --   | -- | --  | -- |
| 1933          | --   | -- | 1,690                                       | 15 | 1,460  | 20 | --   | -- | --   | -- | --  | -- |
| 1934          | --   | -- | 128   | 15 | 111  | 20 | --   | -- | --   | -- | --  | -- |
| 1935          | --   | -- | 479   | 15 | 414  | 20 | --   | -- | --   | -- | --  | -- |
| 1936          | --   | -- | 110   | 15 | 95   | 20 | --   | -- | --   | -- | --  | -- |