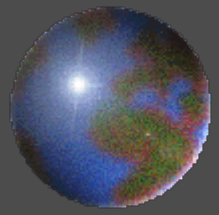

Lesson 8: Flow Regime Assessment

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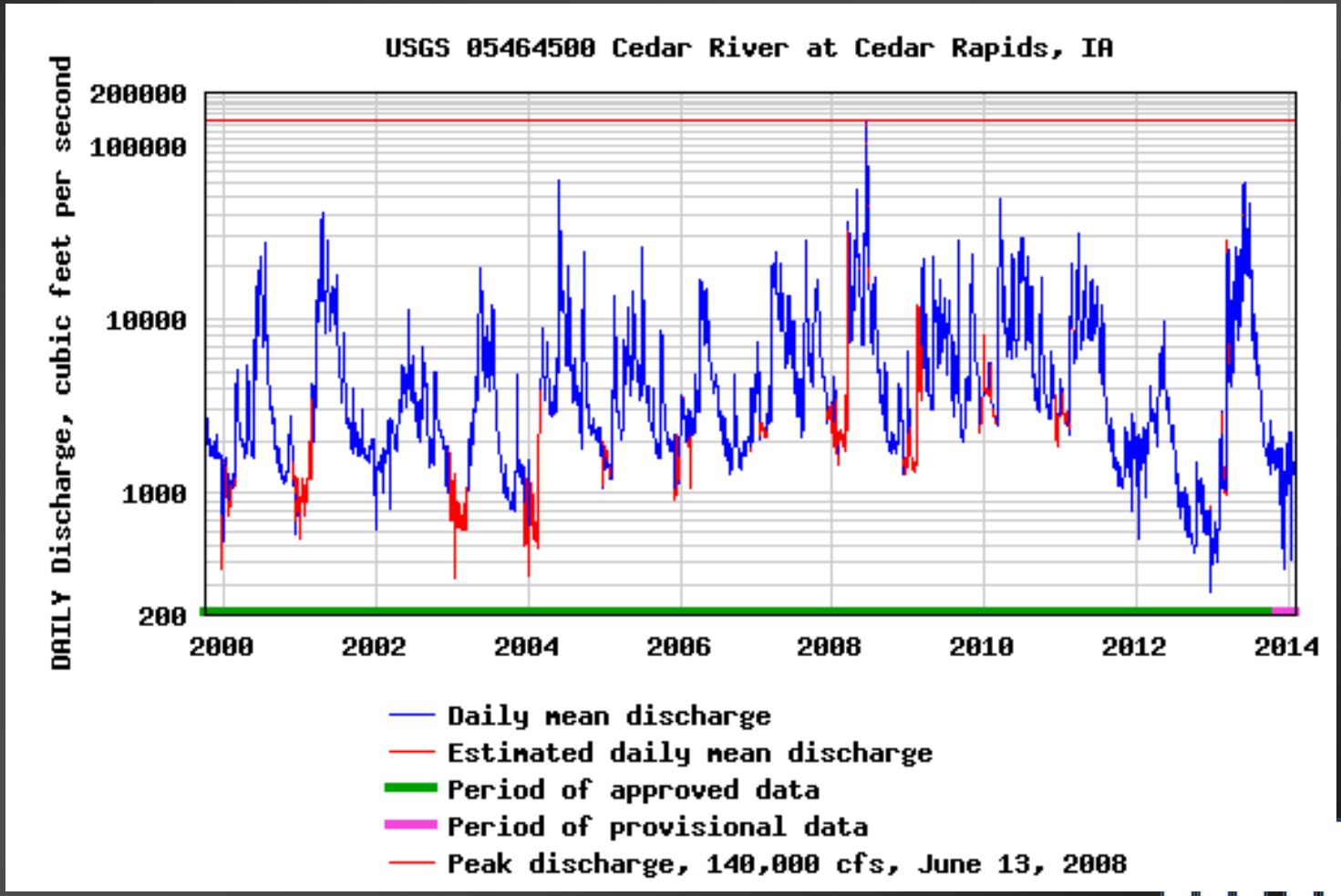
Cedar River at Cedar Rapids



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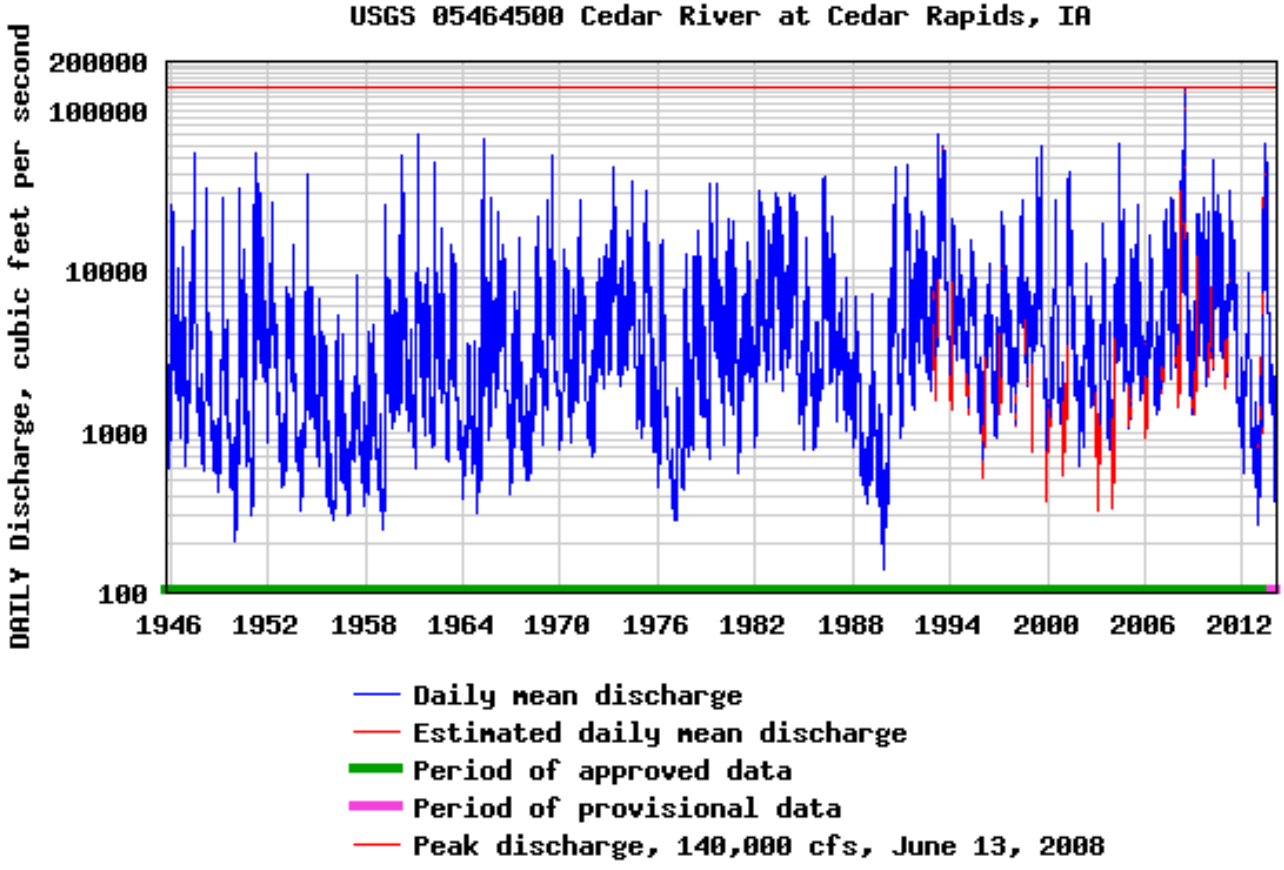
Cedar River at Cedar Rapids



River flow varies on time scales of hours, days, seasons, years, and longer

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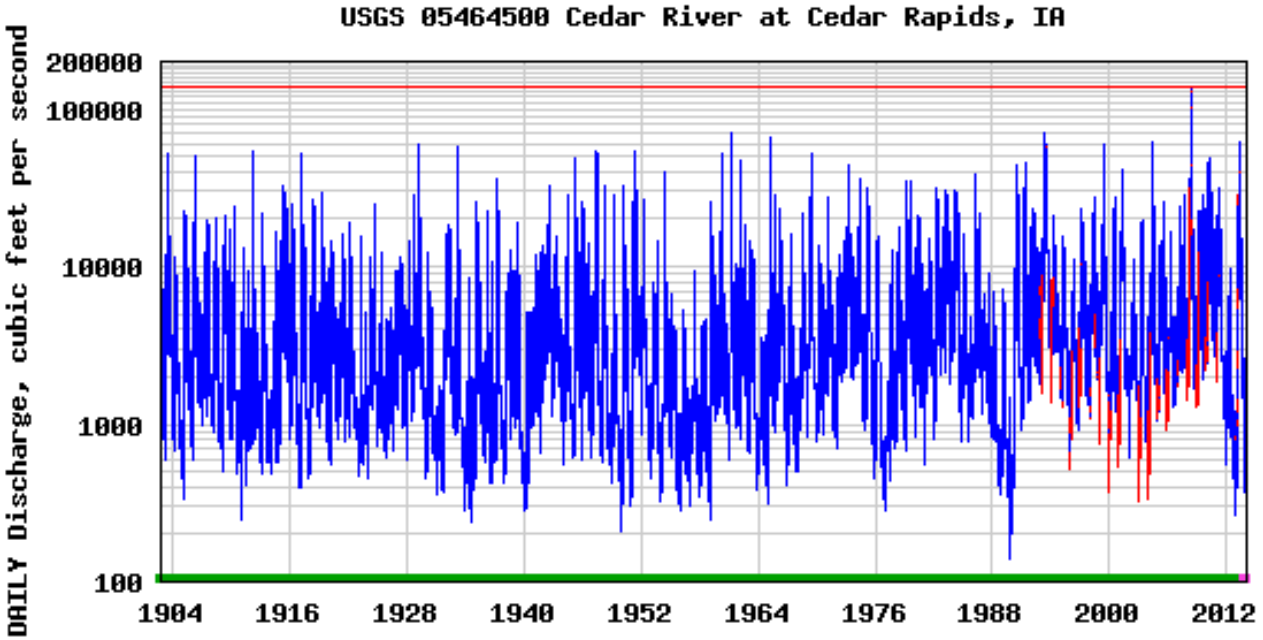
Cedar River at Cedar Rapids



River flow varies on time scales of hours, days, seasons, years, and longer

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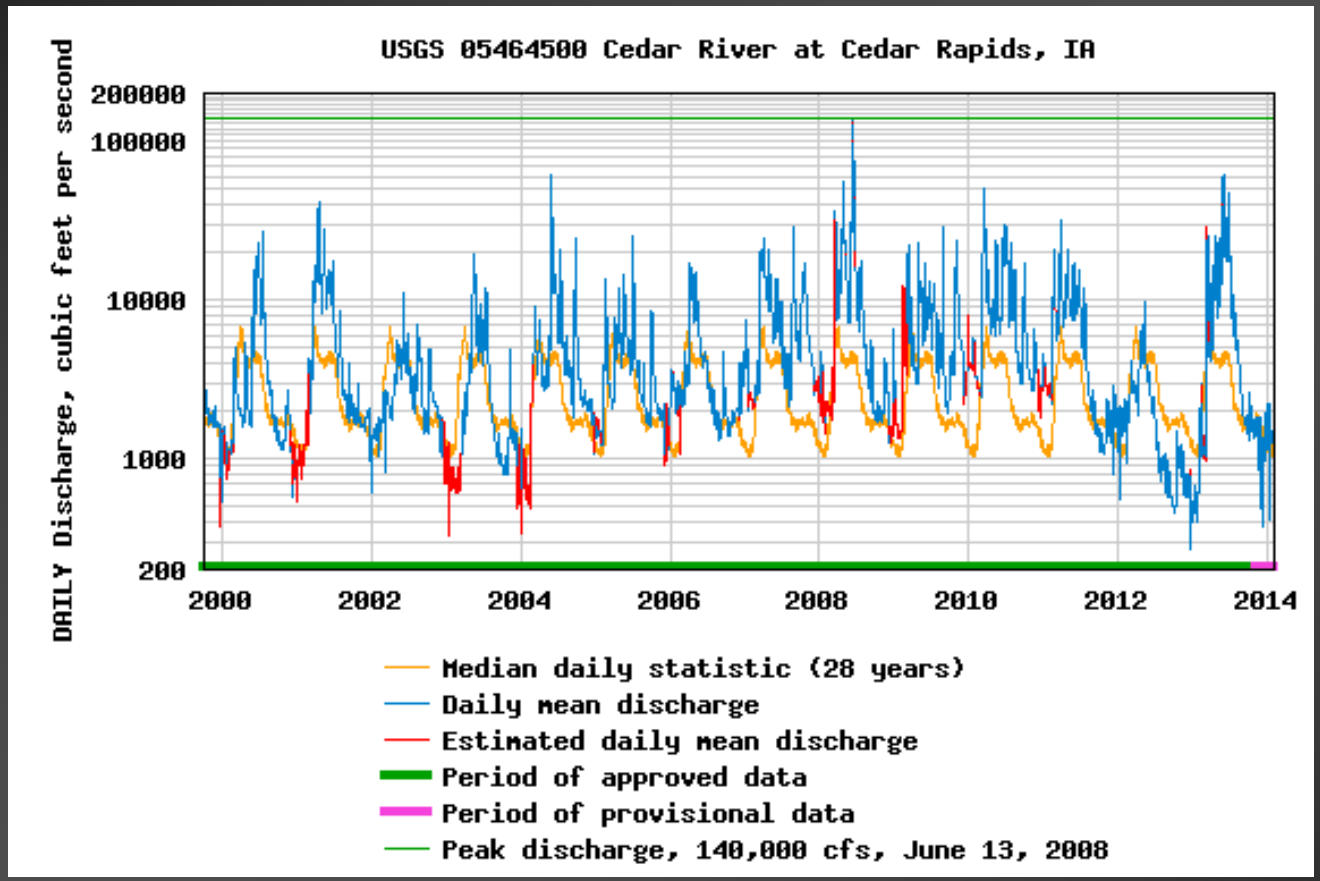
Cedar River at Cedar Rapids



Daily flow comparison with median daily flow (from 28 years of stream-gage record)

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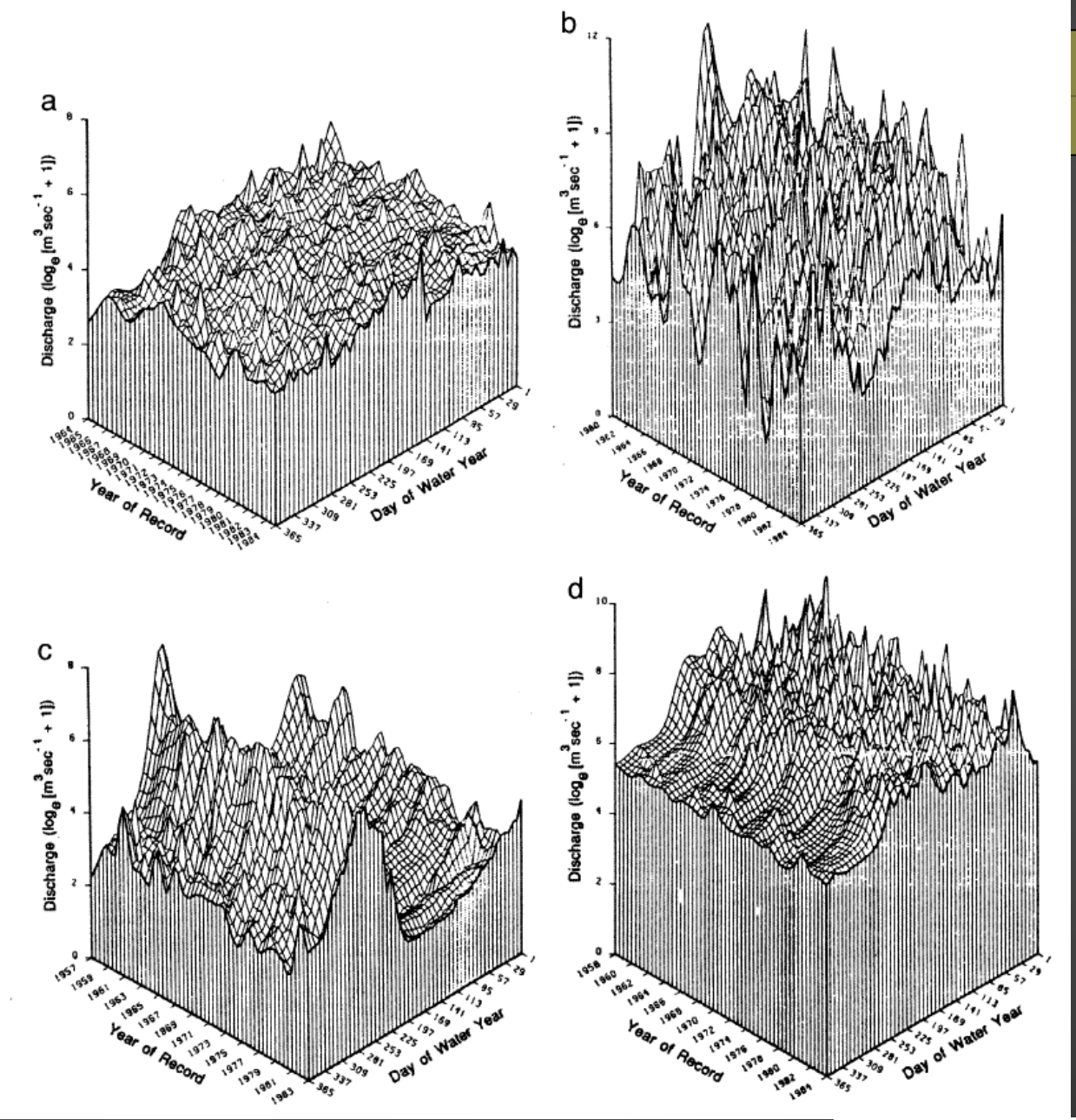


Figure 2. Flow histories based on long-term, daily mean discharge records. These histories show within- and among-year variation for (**a**) Augusta Creek, MI, (**b**) Satilla River, GA, (**c**) upper Colorado River, CO, and (**d**) South Fork of the McKenzie River, OR. Each water year begins on October 1 and ends on September 30. Adapted from Poff and Ward 1990.

Flow regimes of North American rivers. Height of histogram bar is proportional to fraction of annual streamflow occurring in month. Numbers under histograms are average flow in $m^3 s^{-1}$ (left) and mm yr^{-1}. From Riggs and Harvey (1992), used with permission.

TABLE 10-8

Major Impacts of Water-Resource-Management Activities on River-Flow Regimes. [See Poff et al. (1997).]

Activity	Magnitude-Frequency	Timing	Duration	Rate of Change
Damming[a]	Reduced variability (WS, FC); Reduced peak flows (FC)	Altered (WS, FC, HP)	Reduced periods of inundation (FC)	Rapid fluctuations (HP)
Diversion	Reduced flows; Reduced variability	Altered		
Urbanization and drainage	Increased variability; Increased peak flows		Reduced periods of floodplain inundation due to stream entrenchment	
Levees and channelization	May increase downstream peak flows		Reduced periods of floodplain inundation	
Ground-water pumping	Reduced low flows			
Deforestation	Increased variability; Increased peak flows; Reduced low flows			

[a]WS = water supply; FC = flood control; HP = hydropower.

USGS 05464500 Cedar River at Cedar Rapids, IA

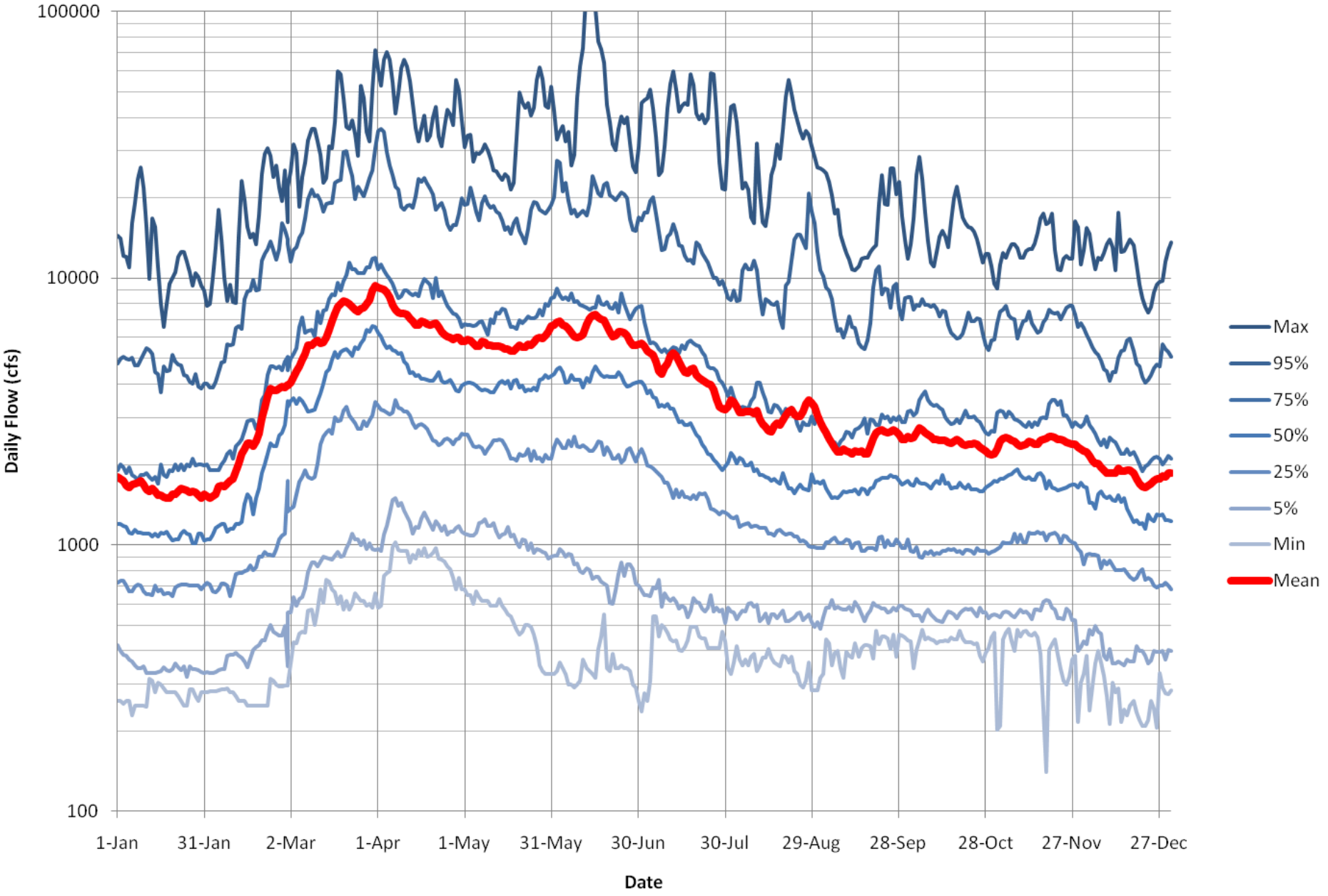
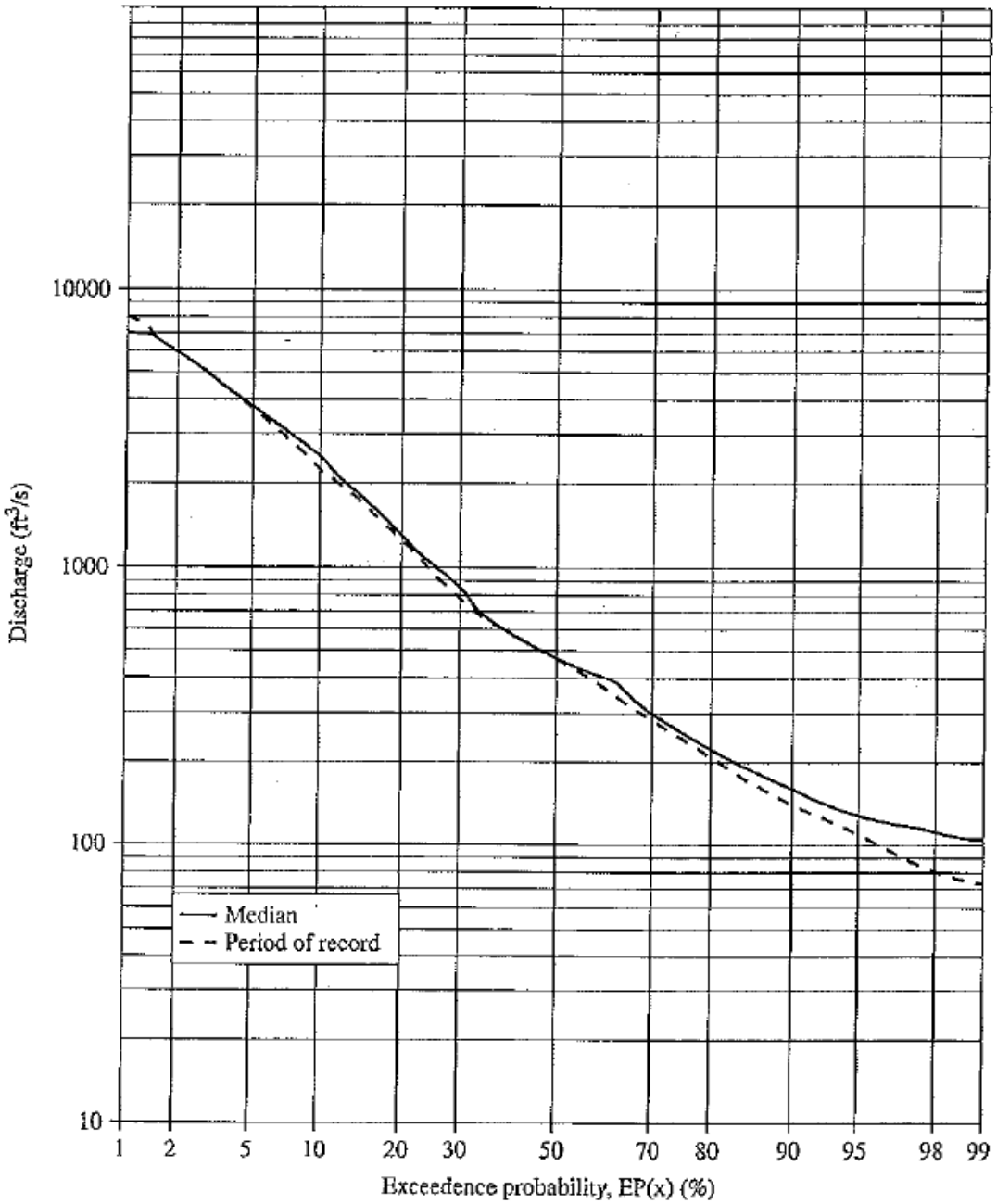


FIGURE 10-11
Period-of-record and median annual flow-duration curves (FDCs) for the White River at West Hartford, VT. The two curves coincide above $q_{.50}$, but the median FDC gives higher low flows. Note that the mean flow (890 $ft^3 s^{-1}$) is exceeded only 28% of the time and that $q_{.95}$ (124 $ft^3 s^{-1}$) is only about 14% of average flow.



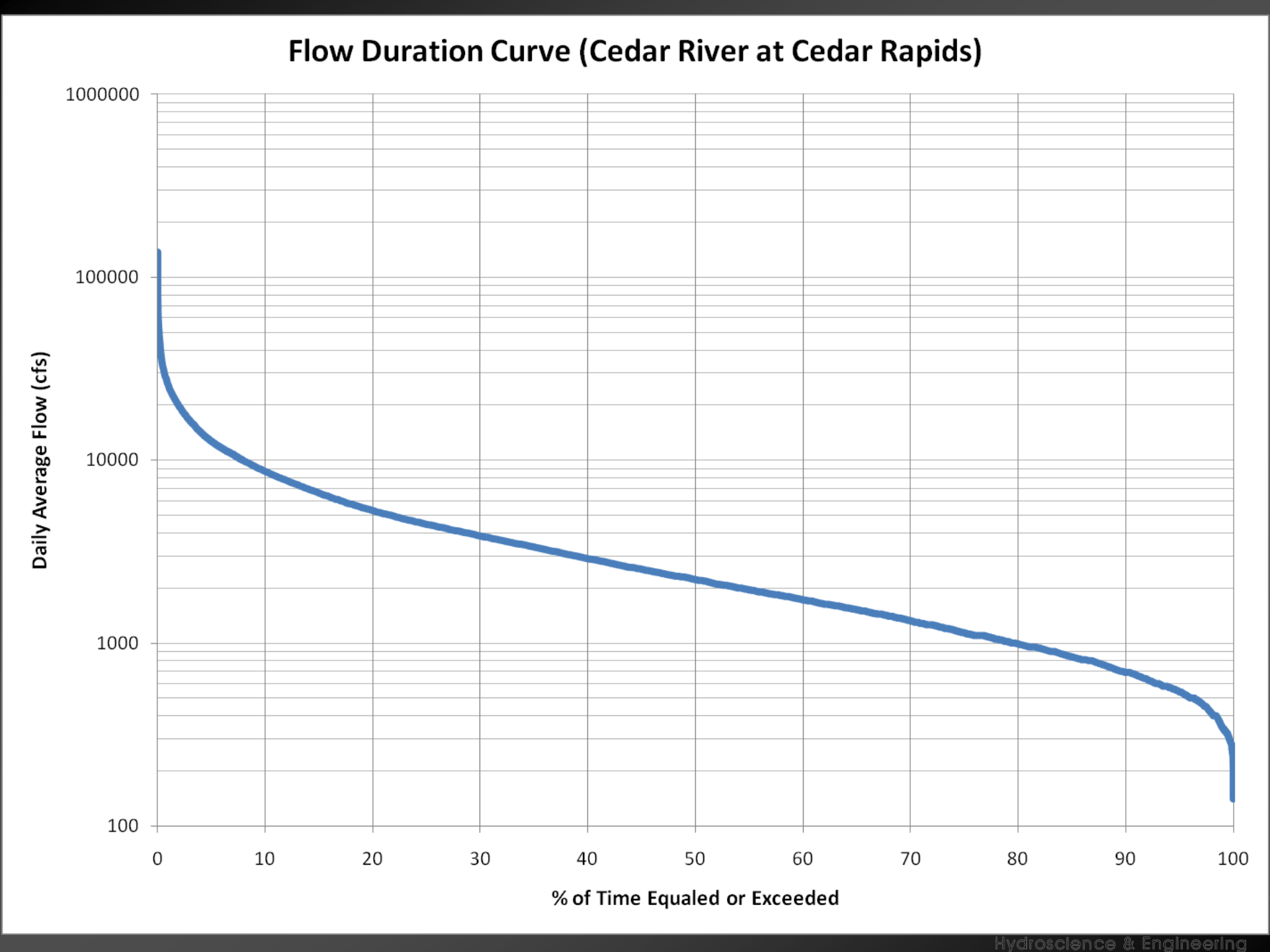
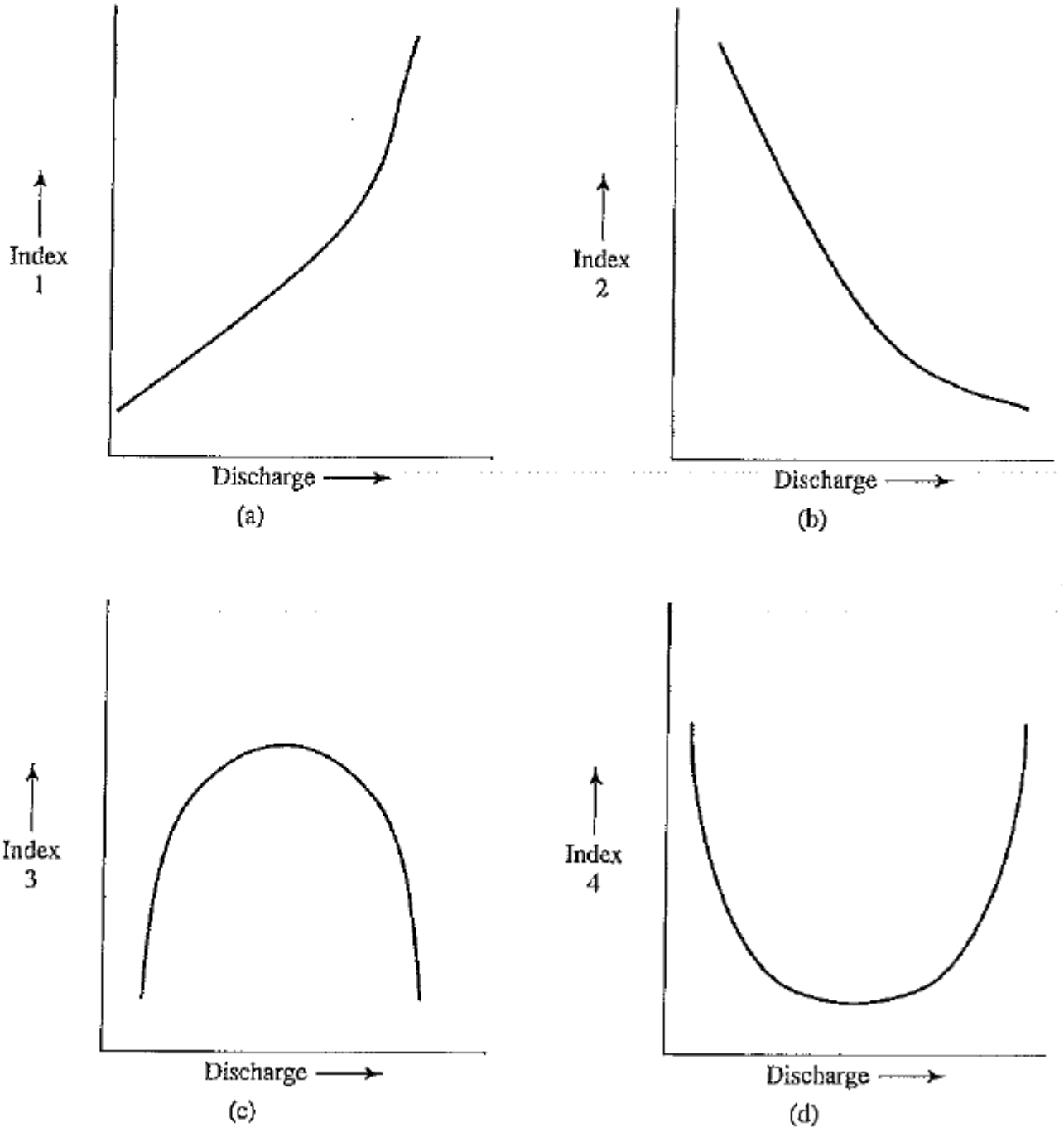

Flow Duration Curve (Cedar River at Cedar Rapids)
1000000
100000
10000
1000
100
Daily Average Flow (cfs)
0
10
20
30
40
50
60
70
80
90
100
% of Time Equaled or Exceeded

FIGURE 10-12
General forms of relations between water-resource indices and discharge: (a) monotonic increasing; (b) monotonic decreasing; (c) non-monotonic convex; (d) non-monotonic concave.



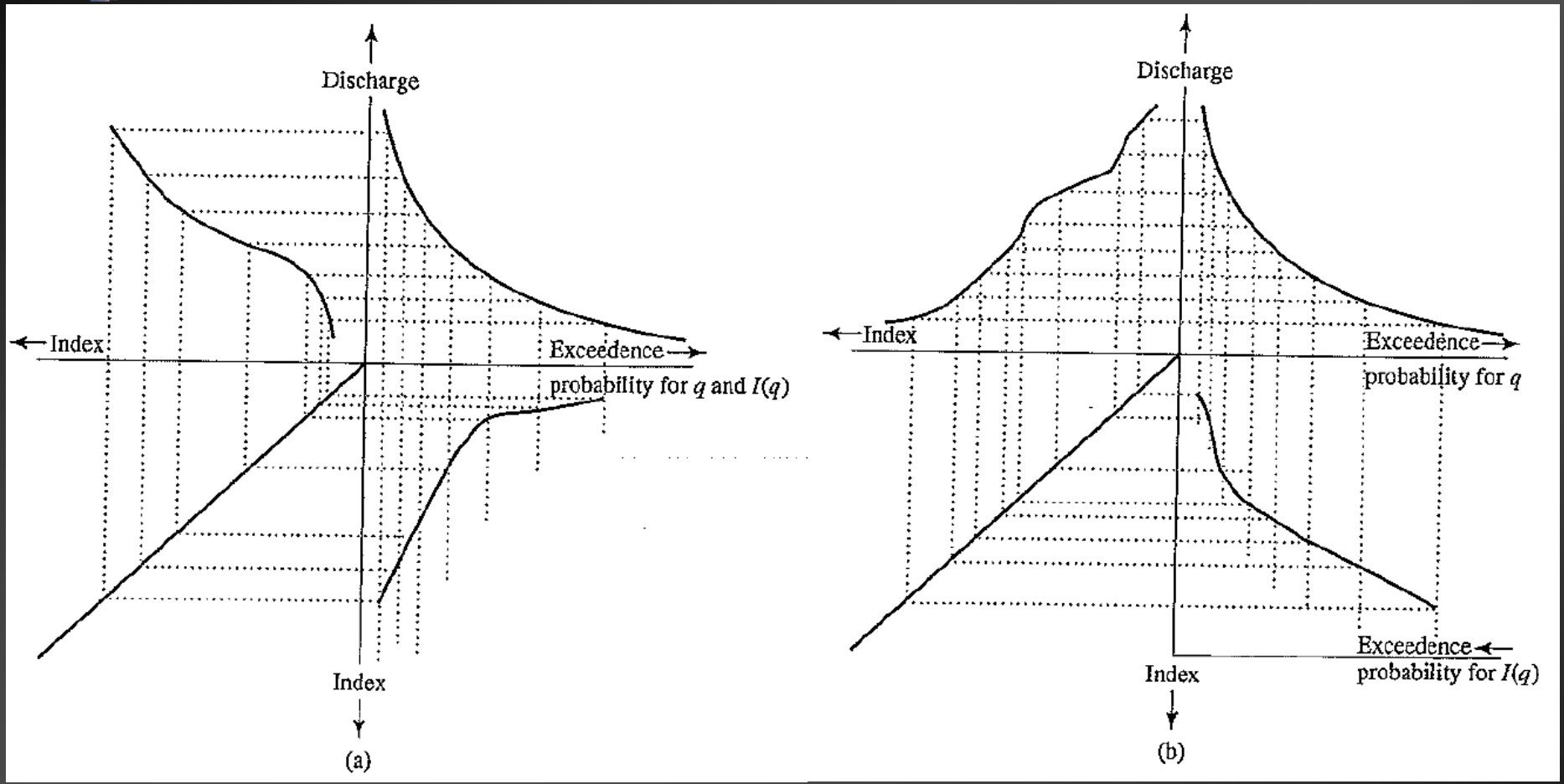


FIGURE 10-13
Graphical construction of a water-resource-index duration curve for (a) monotonic-increasing index; (b) monotonic-decreasing index. See text.

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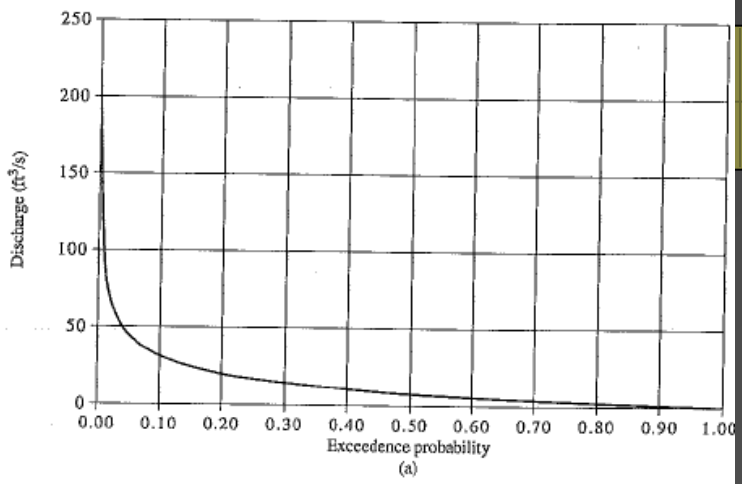
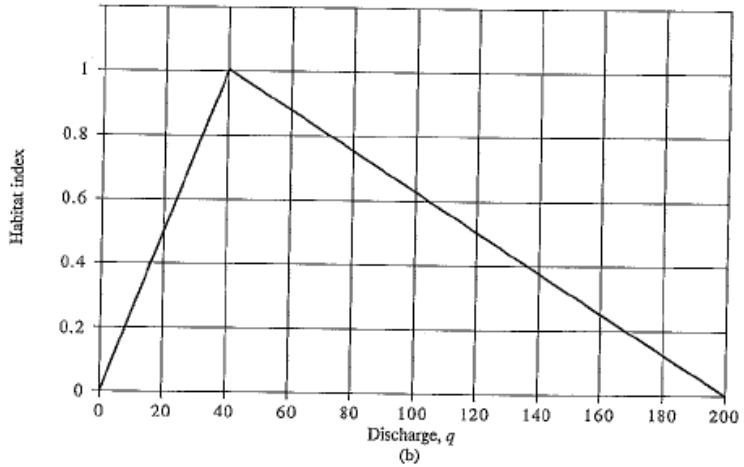
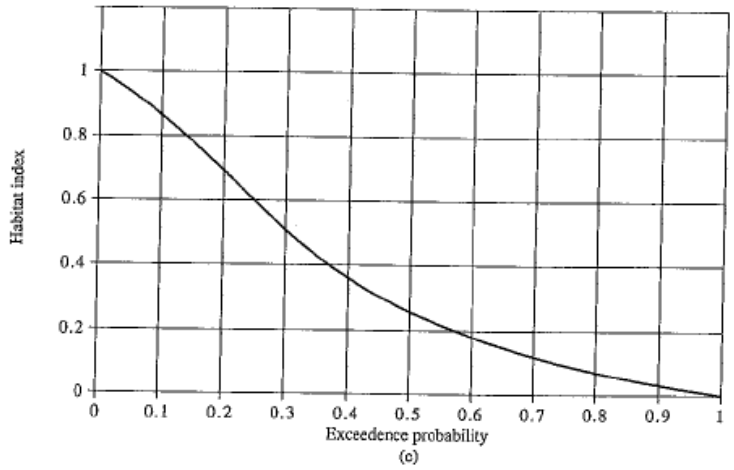
FIGURE 10-15
Example illustrating construction of a WRIDC for a non-monotonic (convex) stream-habitat water-resource index via the Monte Carlo method (Box 10-4). (a) Typical FDC (arithmetic scales); (b) relation between habitat-suitability index and discharge [$I(q)$]; (c) WRIDC.







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