

Appendix 10—Score Sheet for Categorizing Watershed Sensitivity and Resilience and Scoring Values

This appendix provides the data form (A.10.1) and information needed to determine the relative sensitivity and resilience category of the focal watersheds. Identifying information recorded on the data form includes the date, observer, watershed name, and the watershed code in the Great Basin watershed database.

The scores recorded on the form are obtained from the general watershed characteristic data form (A.4.1), the geomorphic data form (A.6.1), and the riparian vegetation data form (A.7.1). One score is entered for the watershed characteristics that were determined in the office, and one score is entered for each stream reach (1 = high, 2 = mid, 3 = low, 4 = additional) that was sampled in the field.

The factors controlling watershed sensitivity and resilience are those that have been shown to influence watershed responses to disturbance. These include certain watershed characteristics, stream channel sediment size and availability, and the dominant riparian vegetation type. To obtain the control values for each reach, (1) the values for the watershed characteristics are summed, (2) the values for sediment size and availability for each reach are summed, and (3) the two sums are added together for each reach.

The response values are those that provide evidence of incision and evidence of avulsion. Values for evidence of incision and avulsion are summed to provide subtotals for each reach. Simple indices are then calculated to help evaluate sensitivity to incision and avulsion. Mathematically, the indices are calculated as follows:

Incision Sensitivity Index = $(\Sigma \text{ of controlling factors}/10) * \Sigma \text{ of subtotal evidence of incision}$

Avulsion Sensitivity Index = $(\Sigma \text{ of controlling factors}/10) * \Sigma \text{ of subtotal evidence of avulsion}$

As the values for the controlling factors increase, potential runoff and potential to transport available sediment by the generated runoff increase. Thus, larger values indicate a higher potential for incision and avulsion. The subtotal of the evidence for incision and avulsion provides insights into the magnitude and frequency with which these processes occurred in the past. The controlling factors are divided by 10 to limit the effects of the controlling factors on the observations of past incision or avulsion within the watershed.

The incision and avulsion sensitivity indices determined for the individual reaches represent distinct watershed segments within the watershed. These indices can be calculated for the entire watershed or the basin types within the watershed based on the percentages of the distinct watershed segments that each sampled reach represents. The data needed for these calculations are in form A.4.1.

Typical scoring values of watershed characteristics, sediment availability and size, evidence of incision, and, evidence of avulsions and avulsion channels for each watershed sensitivity/resilience category are in table A.10.2. The values provided are those most commonly observed (median) for the watershed sensitivity/resilience category, with the possible range of values in parentheses. To determine the watershed sensitivity/resilience category, the incision and sensitivity indices calculated in form A.10.1 are compared to those in table A.10.2 to determine the watershed sensitivity/resilience category. Information on incision and avulsion sensitivity and the sensitivity/resilience category for the basin types and watershed as a whole is used to inform conservation and restoration strategies within the watershed (table 6).

Form A. 10.1–Score Sheet for Watershed Sensitivity and Resilience		Date: _____			
Observer:		Database Code:			
Watershed Name:		Basin Type(s) (A ₁ , A ₂ , B, C):			
Vegetation Type(s) (circle): Subalpine-montane conifer (SC); <i>Populus tremuloides</i> (PT); Cold willow (CW); <i>Betula occidentalis</i> (BA); Warm willow (WW); Cottonwood (CT); <i>Artemisia</i> (AR); Meadow (MD)					
General Watershed Characteristics – Form A.4.1					
Mean Annual Precip (mm)	1=<350; 2=350-475; 3=475-600; 4=>600				
Watershed Area (km ²)	1 = <10, 2 = <10-25, 3 = 25-50, 4 = >50				
Basin Connectivity (%)	1 = <80, 2 = 80-90, 3 = 90-95, 4 = >95				
Past Debris Flows (# of flows)	0 = 0-10; 1 = 10-20; 2 = 20-40; 3 = >40				
Fan Influence	0 = basin wide, 1 = regional, 2 = localized, 3 = none				
Watershed characteristics sum					
Geomorphic and Riparian Vegetation Characteristics – Forms A.6.1 and A.7.1					Reach Scores
Reach 1 = high, 2 = mid, 3 = low, 4 = additional					1 2 3 4
Sediment Size and Availability					
Bank/Valley Sediment Size	1 = gravel/boulders, 2 = mixed coarse/fines, 3 = fines				
Bed Clast Immobility (% of bed)	1 = >75%, 2 = 50-75%, 3 = 10-50%, 4 = <10%				
Dominant Vegetation	1=woody species, 2 = mixed woody/grasses/forbs, 3 = grasses/forbs				
Bar Frequency (#)	0 = none, 1 = few (1-2), 2 = common (3-4), 3 = many (>4)				
Bar Extent (% of bed)	0 = none to 10%, 1 = 10-20%, 2 = 20-30%, 3 = >30%				
Gravel Bars on Valley Floor	0 = none, 1 = few (1-2), 2 = common (3-4), 3 = many (>4)				
Sediment size and availability sum for each reach					
Control subtotal (watershed characteristics + sediment size & availability) for each reach					
Evidence of Incision					
Knickpoints (#)	0 = none, 1 = few (1-2), 2 = common (3-4), 4= many (>4)				
Knickpoint Height (cm)	0 = none, 1 = 0-25 cm, 2 = 25-50 cm, 3 = >50 cm				
Insert Terraces (#)	0 = none, 1 = few (1), 2 = common (2-3), 3 = many (>4)				
Incision Depth (m)	0 = none, 1 = 0-1 m, 2 = 1-2 m, 3 > 2 m				
Bedrock Outcrops (% of bed)	0 = extensive, 1 = localized, 2 = none				
Headcut Height (m)	0 = none, 1 = 0-1, 2 = 1-2, 3 = >2				
Reduced Riparian Extent	0 = none, 1 = 1-10%; 2 = 10-30%, 3 = >30%				
Riparian Plants Only in Trench	0 = none, 1 = little, 2 = common, 3 = widespread				
Incision evidence subtotal for each reach					
Evidence of Avulsion					
Anabranching Channels	0 = none, 1 = few, 2 = common, 3 = many				
Gravel Filled Channels	0 = none, 1 = few, 3 = common, 3 = many				
Gravel Aggradation/Debris Dams	0 = none, 1 = few, 2 = common, 3 = many				
Abrasion-adapted Plants	0 = none, 1 = few, 2 = common, 3 = many				
Avulsion evidence subtotal for each reach					
Reach Incision Sensitivity Index: (subtotal of controls/10) * subtotal of incision evidence					
Reach Avulsion Sensitivity Index: (subtotal of controls/10) * subtotal of avulsion evidence					
Average of All Reaches within Basin type: Incision Sensitivity = _____ Avulsion Sensitivity = _____ (Based on percentage of the watershed or basin type that each stream reach represents)					

Table A.10.2–Typical scores for watershed, stream channel, and riparian ecosystem characteristics for the five watershed sensitivity/resilience types. Values are those most commonly observed for each type with the possible range of values in parentheses.

	Flood-dominated	Armored	Fan-dominated	Deeply incised	Pseudo-stable
	(A1)	A2 B (rare)	B	B or C	B or C
Parameters	<i>General Watershed Characteristics</i>				
Mean Annual Precipitation	2 (1-3)	2 (2-3)	3 (3-3)	2 (2-3)	3 (2-3)
Basin Type	2	1 (1 or 3)	3	3 (3 – 4)	3 (2 – 3)
Basin Area	3 (2-3)	2 (1-4)	3 (2-3)	4 (2-4)	2 (1-3)
Basin Connectivity	3	3 (1-3)	1 (1-2)	3	3 (2-3)
Past Debris Flow Activity	0	3 (1-3)	0 (0-1)	1 (0-1)	0 (0-4)
Fan Influence	1	2 (1-2)	1 (1-4)	2 (2-3)	2 (1-3)
<i>Geomorphic and Riparian Vegetation Characteristics</i>					
Sediment Size and Availability					
Bank/Valley Sediment Size	2	1	2 (2-3)	3	3
Bar Frequency	3 (2-3)	1 (0-2)	2 (1-3)	2 (0-3)	2 (0-3)
Bar Extent	3 (2-3)	1 (1-2)	2 (1-3)	2 (1-3)	2 (0-3)
Bed Clast Immobility	4	1 (1-2)	3	4 (3-4)	4
Gravel Bars on Valley Floor	2	0 (0-1)	1 (0-1)	0	0 (0-2)
Vegetation Relation to Sediment	1(1-2)	1 (1-2)	2 (1-3)	2 (2-3)	2 (2-3)
Control Subtotals	21-27	11-26	17-28	19-31	16-34
Evidence of Incision					
Knickpoints	2	1	2 (1-2)	2 (1-3)	2 (0-3)
Knickpoint Height	2	1	2	2 (1-3)	0 (0-3)
Inset Terraces	1	1 (0-1)	1 (0-2)	2 (0-3)	1 (0-2)
Incision Depth	0	1 (1-2)	2	2	1 (0-3)
Bedrock Outcrops	1	0 (0-2)	2	2	2 (0-2)
Headcut Height	0	0	0	0 (0-3)	1 (0-3)
Reduced Riparian Extent	0	1 (0-2)	1 (0-2)	1 (0-3)	1 (1-3)
Riparian Plants Only in Trench	1 (1-2)	0	2 (2-3)	3 (3-4)	2 (2-4)
Incision Evidence Subtotal	8-9	4-11	10-19	11-26	4-26
Evidence of Avulsion					
Anabranching Channels	3	0	1 (0-1)	0	0 (0-1)
Gravel Filled Channels	3	0	1 (0-1)	0	0 (0-1)
Gravel Aggradation/Debris Dams	3	0	1 (0-1)	0	0 (0-1)
Abrasion Adapted Plants	3 (2-3)	1 (1-2)	1 (1-2)	1(1-3)	1 (0-3)
Avulsion Evidence Subtotal	11-12	1-2	1-5	1-3	0-6
Incision Sensitivity Index	20 (17-24)	11 (4-29)	29 (17-53)	42 (21-81)	29 (6-88)
Avulsion Sensitivity Index	30 (23-32)	2 (1-5)	9 (2-14)	3 (2-9)	2 (0-20)

