

## **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 = ( $\Sigma$  of controlling factors/10) \*  $\Sigma$  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 <sub>1</sub> , A <sub>2</sub> , 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) |                                                                   |                                                         |  |  |                      |
| <b>General Watershed Characteristics – Form A.4.1</b>                                                                                                                                                                  |                                                                   |                                                         |  |  |                      |
| Mean Annual Precip (mm)                                                                                                                                                                                                | 1=<350; 2=350-475; 3=475-600; 4=>600                              |                                                         |  |  |                      |
| Watershed Area (km <sup>2</sup> )                                                                                                                                                                                      | 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             |                                                         |  |  |                      |
| <b>Watershed characteristics sum</b>                                                                                                                                                                                   |                                                                   |                                                         |  |  |                      |
| <b>Geomorphic and Riparian Vegetation Characteristics – Forms A.6.1 and A.7.1</b>                                                                                                                                      |                                                                   |                                                         |  |  | <b>Reach Scores</b>  |
| Reach 1 = high, 2 = mid, 3 = low, 4 = additional                                                                                                                                                                       |                                                                   |                                                         |  |  | <b>1   2   3   4</b> |
| <b>Sediment Size and Availability</b>                                                                                                                                                                                  |                                                                   |                                                         |  |  |                      |
| 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)          |                                                         |  |  |                      |
| <b>Sediment size and availability sum for each reach</b>                                                                                                                                                               |                                                                   |                                                         |  |  |                      |
| <b>Control subtotal (watershed characteristics + sediment size &amp; availability) for each reach</b>                                                                                                                  |                                                                   |                                                         |  |  |                      |
| <b>Evidence of Incision</b>                                                                                                                                                                                            |                                                                   |                                                         |  |  |                      |
| 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                  |                                                         |  |  |                      |
| <b>Incision evidence subtotal for each reach</b>                                                                                                                                                                       |                                                                   |                                                         |  |  |                      |
| <b>Evidence of Avulsion</b>                                                                                                                                                                                            |                                                                   |                                                         |  |  |                      |
| 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                           |                                                         |  |  |                      |
| <b>Avulsion evidence subtotal for each reach</b>                                                                                                                                                                       |                                                                   |                                                         |  |  |                      |
| <b>Reach Incision Sensitivity Index: (subtotal of controls/10) * subtotal of incision evidence</b>                                                                                                                     |                                                                   |                                                         |  |  |                      |
| <b>Reach Avulsion Sensitivity Index: (subtotal of controls/10) * subtotal of avulsion evidence</b>                                                                                                                     |                                                                   |                                                         |  |  |                      |
| <b>Average of All Reaches within Basin type:</b> Incision Sensitivity = _____ Avulsion Sensitivity = _____<br>(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.

|                                                                  | <b>Flood-dominated</b>                          | <b>Armored</b> | <b>Fan-dominated</b> | <b>Deeply incised</b> | <b>Pseudo-stable</b> |
|------------------------------------------------------------------|-------------------------------------------------|----------------|----------------------|-----------------------|----------------------|
|                                                                  | (A1)                                            | A2<br>B (rare) | B                    | B or C                | B or C               |
| <b>Parameters</b>                                                | <b><i>General Watershed Characteristics</i></b> |                |                      |                       |                      |
| 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)              |
| <b><i>Geomorphic and Riparian Vegetation Characteristics</i></b> |                                                 |                |                      |                       |                      |
| <b>Sediment Size and Availability</b>                            |                                                 |                |                      |                       |                      |
| 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)              |
| <b>Control Subtotals</b>                                         | 21-27                                           | 11-26          | 17-28                | 19-31                 | 16-34                |
| <b>Evidence of Incision</b>                                      |                                                 |                |                      |                       |                      |
| 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)              |
| <b>Incision Evidence Subtotal</b>                                | 8-9                                             | 4-11           | 10-19                | 11-26                 | 4-26                 |
| <b>Evidence of Avulsion</b>                                      |                                                 |                |                      |                       |                      |
| 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)              |
| <b>Avulsion Evidence Subtotal</b>                                | 11-12                                           | 1-2            | 1-5                  | 1-3                   | 0-6                  |
| <b>Incision Sensitivity Index</b>                                | 20 (17-24)                                      | 11 (4-29)      | 29 (17-53)           | 42 (21-81)            | 29 (6-88)            |
| <b>Avulsion Sensitivity Index</b>                                | 30 (23-32)                                      | 2 (1-5)        | 9 (2-14)             | 3 (2-9)               | 2 (0-20)             |

## **Appendix 12—Examples of the different watershed types, their diagnostic indicators and observed ecological integrity**

This appendix provides illustrations of the different watershed types and their characteristics based on field observations in the Great Basin geographic regions. The watershed resilience and resistance category and basin type (A<sub>1</sub>, A<sub>2</sub>, B, C) are given, the diagnostic indicators are provided, and the observed ecological integrity is discussed.

**Figure A.12.1**—A flood dominated watershed (Basin Type A<sub>1</sub>) in North Willow Creek, Utah.



### **Diagnostic Indicators**

**Upper reach** — Large clasts, relatively low flows, and fairly stable, single-channel system. Losing stream with riparian obligate trees and shrubs in overstory and mesic meadow vegetation adjacent to channel.

**Middle and lower reaches** — Anabranching (multi-channel) pattern with numerous filled or partially filled paleochannels that cover most of the valley floor; abundant mobile sediment; flood-prone regime indicated by overbank flows; vegetation dominated by riparian shrubs and trees adapted to flooding and abrasion; aggradation upstream of large woody debris.

**Ecological integrity** — Upper and middle reaches have road crossings in nearby reaches and have moderate ecological integrity. Lower reach is adjacent to a road that impinges on the stream and has lower ecological integrity. Photographs by authors.

**Figure A.12.2**—An general example of an armored watershed (Basin Type B).



### **Diagnostic Indicators**

**Upper and middle reaches** - Many channels possess large clasts and boulders eroded from glaciofluvial terrace; channel bed exhibits few, low height knickpoints formed by boulders; channel incision is limited; boulders covered by biofilm indicated limited transport; very little bank erosion; limited bars indicates sediment supply was low. Vegetation typically is characterized by woody types with herbaceous vegetation adjacent to the stream. Photographs by authors.

**Figure A.12.3—An armored watershed (Basin Type B) in Cassia Creek, Idaho.**

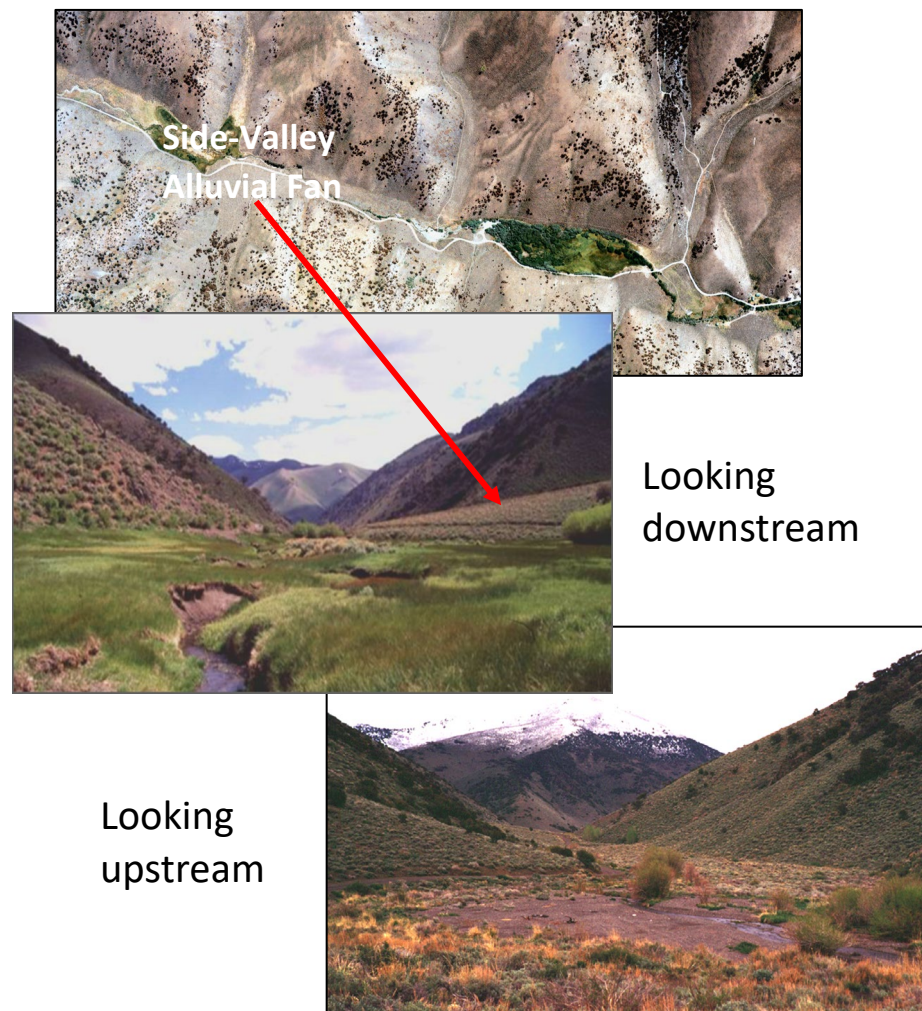


### **Diagnostic Indicators**

**Upper, Middle, and Lower Reaches** – shallow channel characterized by limited bank erosion, rare knickpoints and limited, localized incision; no terrace features; bed materials consist of large gravel and boulders covered in biofilms (algae) indicative of limited transport; few gravel bars indicating sediment supply is limited; no overbank gravels or flood debris; woody types with meadow types in understory and adjacent to the stream.

**Ecological integrity** – relatively high due to channel stability and few current anthropogenic disturbances. Roads and road crossings impinge on the stream in some locations; livestock grazing does not appear to be affecting the vegetation. Photographs by authors.

**Figure A.12.4**—A fan dominated watershed (Basin Type B) in Upper Kingston Canyon, Nevada.

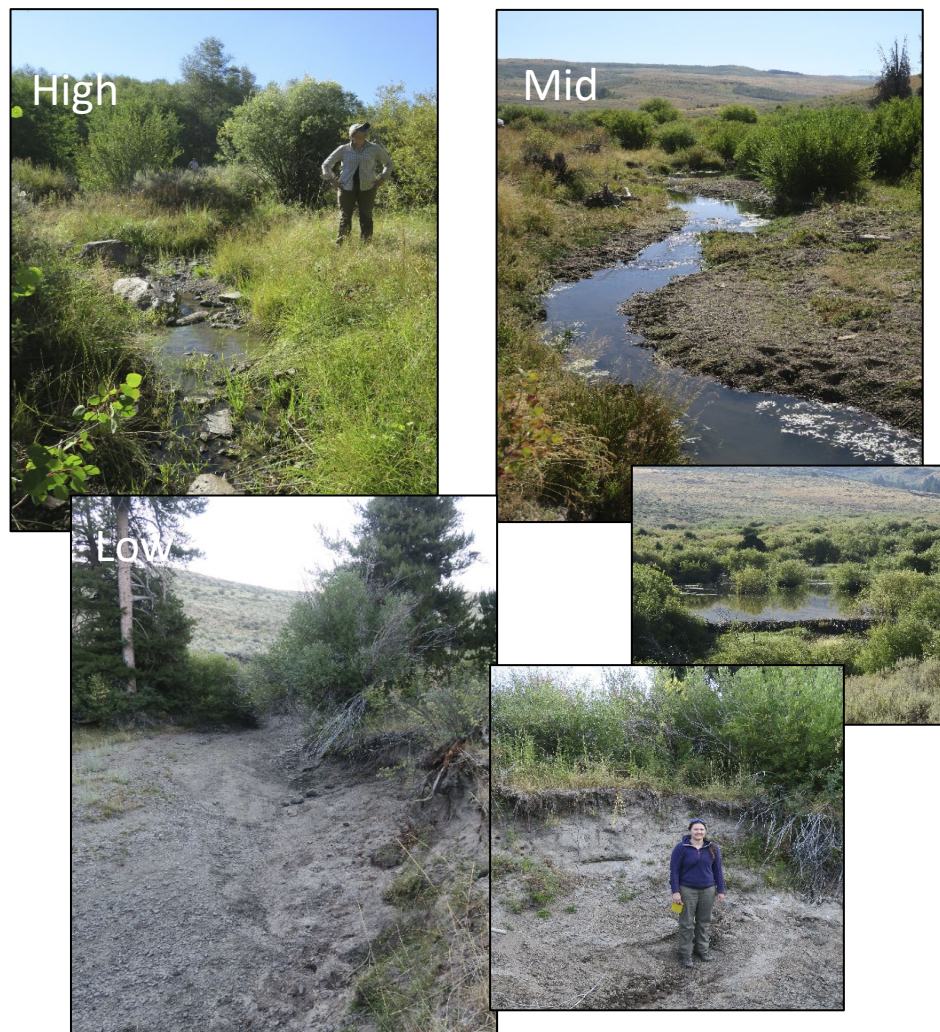


### Diagnostic Indicators

**Upper and middle reaches** — classified as separate basin type from downstream reach; valley characterized by large side-valley fans that extend across valley floor and have been truncated; longitudinal profile of valley and channel bed characterized by stepped morphology; localized gravel deposits both up and downstream of fan, associated with rare avulsion events; localized inset terraces that extend from upstream margin of fan and terminate farther upstream in migrating headcut; meadow complexes upstream of fan locally drained by relatively minor, but long-term channel incision that is controlled by the erosion of large fan materials in channel bed.

**Ecological integrity** — ecological integrity is moderate to high. Ongoing incision is resulting in near channel drying within the meadow and encroachment of upland species; livestock grazing is not having an influence currently. Photographs by authors.

**Figure A.12.5**—A deeply incised watershed (Basin Type C) in Shoshone Creek, Idaho.



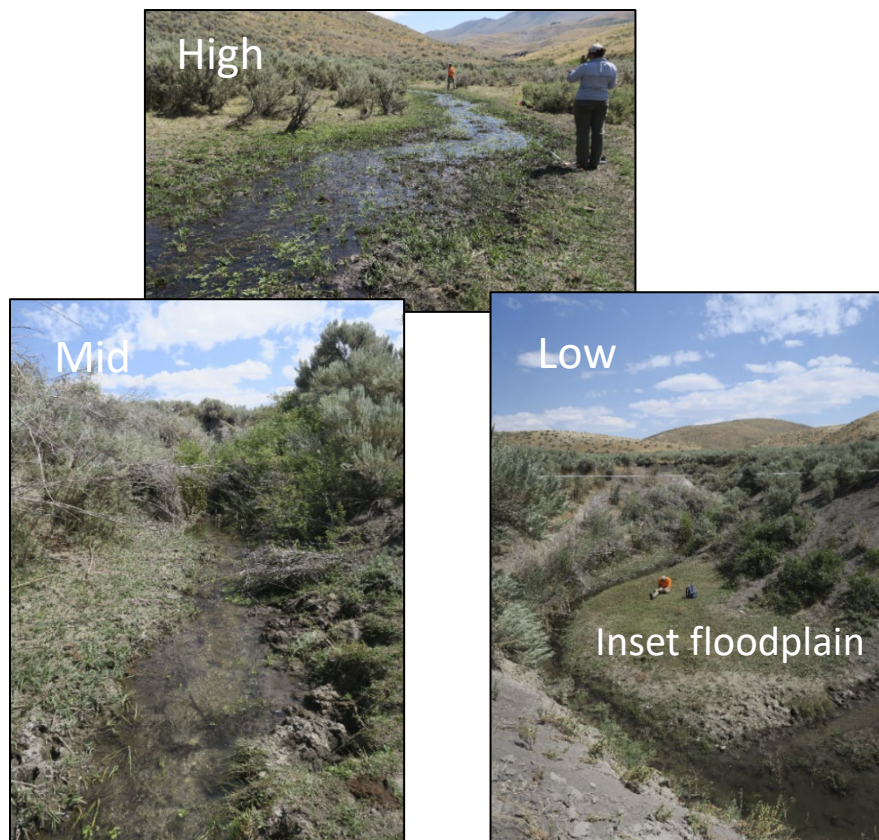
## Diagnostic Indicators

**Upper reach** — Relatively low flows, fine sediments intermixed with large clasts, and fairly stable channel. Losing stream with riparian obligate trees and shrubs in overstory and wet to mesic meadow vegetation adjacent to channel.

**Middle and lower reaches** — Relatively high spring flows, fine sediments, and an incising channel that lowered the channel bed below the valley floor. Vegetation dominated by meadow vegetation types intermixed with willows adjacent to channel and upland trees and shrubs on the floodplain.

**Ecological integrity** — Upper reach has high ecological integrity. Middle and lower reaches are adjusting to past floods (1980s) that removed beaver dams and resulted in significant erosion in the vicinity of the dams and downstream. Photographs by authors.

**Figure A.12.6**—A deeply incised watershed (Basin Type C) in Coon Creek, Nevada.



### Diagnostic Indicators

**Upper reach** – Shallow, discontinuous channel on valley floor; discontinuous channel reaches characterized by fine, mobile sediment, and small knickpoints; sediment supply as indicated by bars is limited; wet to mesic meadow vegetation adjacent to channel and upland shrubs on the floodplain.

**Middle** – Deep v-shaped channels formed in fine-grained cohesive sediments that terminate upstream in headcuts; headcut migration indicated by recent bank failures; fine sediments that allow near-vertical walls; limited sediment availability as indicated by few bars or bed sediments. Vegetation dominated by meadow vegetation types and nonnative invasive species adjacent to channel and upland shrubs on the floodplain.

**Lower reach** – Deeply incised channel (>7m) with stable inset floodplain at bottom of trench; channel walls consist of fine-grained, cohesive, stratified sediments of varying age; bank failures common on outside of bends; large meadow complexes have been drained; mesic and dry meadow vegetation in trench.

**Ecological integrity** - Upper reach has low ecological integrity due to a large knickpoint (2 m) in a lower reach and improper cattle grazing. Middle and lower reaches have low ecological integrity due to incision and active geomorphic and vegetation change. Also, the stream bank, stream channel, and riparian vegetation are impacted by improper cattle grazing. Photographs by authors.

**Figure A.12.7**—A pseudo-stable watershed (Basin Type B) in Muncey Creek, Nevada.



### **Diagnostic Indicators**

**Upper, middle and lower reach** – Abundant, mobile sediment on hillslope was mobilized by debris flows following wildfire; debris flows characterized by levees and deposition on side-valley fans; axial valley characterized by wide spread channel and valley floor aggradation; aggraded reaches separated by deep incision that followed localized channel aggradation; side-valley fans have historic debris-flow deposits. Losing reaches with woody riparian vegetation reestablishing.

**Ecological integrity** – Riparian corridor has relatively low ecological integrity largely due to instability of the stream channel and low abundance of riparian vegetation. Photographs by authors.

## **Appendix 11—Score Sheet for Rating Ecological Integrity and Description of the Rating Variables**

This appendix provides the data form (A.11.1) and information needed to determine the ecological integrity of the focal watershed. Identifying information recorded on the data form includes the date, observer, mountain range, watershed name, and the watershed code in the Great Basin watershed database.

The general watershed characteristics determined in the office (form A.4.1) and the data in the score sheet for assessing watershed sensitivity and resilience (form A.10.1) are used to complete the assessment of general geomorphic characteristics. The reach summaries from the riparian vegetation data collected in the field (form A.7.1) are used to complete the assessment of general vegetation characteristics. The scores for the disturbance assessment are derived from the reach-scale disturbance data collected within the watershed (form A.8.1).

Ecological integrity can be evaluated for the individual sampled reaches and the entire watershed. High scores for a particular category (geomorphic, vegetation, disturbances) indicate reduced ecological resilience and low ecological integrity.

|                                                                                                                                                                                                                      |                                                  |                 |   |  |                                                                                                    |   |   |   |   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|-----------------|---|--|----------------------------------------------------------------------------------------------------|---|---|---|---|
| <b>A.11.1–WATERSHED ECOLOGICAL INTEGRITY</b>                                                                                                                                                                         |                                                  | Date:           |   |  |                                                                                                    |   |   |   |   |
| Observer:                                                                                                                                                                                                            |                                                  | Database Code:  |   |  |                                                                                                    |   |   |   |   |
| Mountain Range:                                                                                                                                                                                                      |                                                  | Watershed Name: |   |  |                                                                                                    |   |   |   |   |
|                                                                                                                                                                                                                      |                                                  |                 |   |  |                                                                                                    |   |   |   |   |
| <b>Watershed Type:</b><br>(A <sub>1</sub> , A <sub>2</sub> , B, C)                                                                                                                                                   |                                                  |                 |   |  |                                                                                                    |   |   |   |   |
| <b>Watershed Sensitivity and Resilience Type</b> (from A.10.1 and A.10.2): _____<br>(Flood dominated, Armored, Fan-dominated, Deeply-incised, Pseudo-stable)                                                         |                                                  |                 |   |  |                                                                                                    |   |   |   |   |
| <b>Ratings:</b> High scores for a category (geomorphic, vegetation, disturbances) indicate reduced ecological resilience and low ecological integrity. These can be evaluated at both the reach and watershed scale. |                                                  |                 |   |  |                                                                                                    |   |   |   |   |
| Reach 1 = high, 2 = mid, 3 = low, 4 = additional                                                                                                                                                                     |                                                  |                 |   |  | <b>REACH</b><br><table border="1"> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> </table> | 1 | 2 | 3 | 4 |
| 1                                                                                                                                                                                                                    | 2                                                | 3               | 4 |  |                                                                                                    |   |   |   |   |
| <b>Parameter</b>                                                                                                                                                                                                     | <b>Scores</b>                                    | <b>Score</b>    |   |  |                                                                                                    |   |   |   |   |
| <b>General Geomorphic Characteristics – Forms A.4.1 and A.10.1</b>                                                                                                                                                   |                                                  |                 |   |  |                                                                                                    |   |   |   |   |
| Debris Flow Activity                                                                                                                                                                                                 | 0 = none, 2= slight, 3 = moderate, 4 = large     |                 |   |  |                                                                                                    |   |   |   |   |
| Active or Recent Channel Incision                                                                                                                                                                                    | 0 = none, 2= local, 3 = moderate, 4 = widespread |                 |   |  |                                                                                                    |   |   |   |   |
| Recent Avulsions Preventing Stabilization                                                                                                                                                                            | 0 = none, 2= local, 3 = moderate, 4 = widespread |                 |   |  |                                                                                                    |   |   |   |   |
| <b>Sum of Geomorphic Characteristics =</b>                                                                                                                                                                           |                                                  |                 |   |  |                                                                                                    |   |   |   |   |
| <b>General Vegetation Characteristics – Form A.7.1</b>                                                                                                                                                               |                                                  |                 |   |  |                                                                                                    |   |   |   |   |
| Decrease in Riparian Area Extent                                                                                                                                                                                     | 0 = none, 2 = low, 3 = moderate, 4 = high        |                 |   |  |                                                                                                    |   |   |   |   |
| Vegetation Vigor                                                                                                                                                                                                     | 1 = high, 2 = moderate, 3 = low                  |                 |   |  |                                                                                                    |   |   |   |   |
| Vegetation Mortality                                                                                                                                                                                                 | 1 = high, 2 = moderate, 3 = low                  |                 |   |  |                                                                                                    |   |   |   |   |
| Wetland Indicator Status                                                                                                                                                                                             | 1 = high, 2 = moderate, 3 = low                  |                 |   |  |                                                                                                    |   |   |   |   |
| Successional Class                                                                                                                                                                                                   | 1 = high, 2 = moderate, 3 = low                  |                 |   |  |                                                                                                    |   |   |   |   |
| Bank Stability Class                                                                                                                                                                                                 | 1 = high, 2 = moderate, 3 = low                  |                 |   |  |                                                                                                    |   |   |   |   |
| Nonnative Invasive Species                                                                                                                                                                                           | 1 = none to few, 2 = common, 3= widespread       |                 |   |  |                                                                                                    |   |   |   |   |
| <b>Sum of Vegetation Characteristics =</b>                                                                                                                                                                           |                                                  |                 |   |  |                                                                                                    |   |   |   |   |
| <b>Response to Anthropogenic and Other Disturbances – Form A.8.1</b>                                                                                                                                                 |                                                  |                 |   |  |                                                                                                    |   |   |   |   |
| Roads and Road Crossings                                                                                                                                                                                             | 0 = none, 2= low, 3 = moderate, 4 = high         |                 |   |  |                                                                                                    |   |   |   |   |
| Recreational Activities                                                                                                                                                                                              | 0 = none, 2= low, 3 = moderate, 4 = high         |                 |   |  |                                                                                                    |   |   |   |   |
| Development (housing)                                                                                                                                                                                                | 0 = none, 2= low, 3 = moderate, 4 = high         |                 |   |  |                                                                                                    |   |   |   |   |
| Development (mining)                                                                                                                                                                                                 | 0 = none, 2= low, 3 = moderate, 4 = high         |                 |   |  |                                                                                                    |   |   |   |   |
| Surface Water Manipulation                                                                                                                                                                                           | 0 = none, 2= low, 3 = moderate, 4 = high         |                 |   |  |                                                                                                    |   |   |   |   |
| Groundwater Extraction                                                                                                                                                                                               | 0 = none, 2= low, 3 = moderate, 4 = high         |                 |   |  |                                                                                                    |   |   |   |   |
| Water Diversion (dams/canals)                                                                                                                                                                                        | 0 = none, 2= low, 3 = moderate, 4 = high         |                 |   |  |                                                                                                    |   |   |   |   |
| Beaver Dams (incision, etc.)                                                                                                                                                                                         | 0 = none, 2= low, 3 = moderate, 4 = high         |                 |   |  |                                                                                                    |   |   |   |   |
| Fire Effects                                                                                                                                                                                                         | 0 = none, 2= low, 3 = moderate, 4 = high         |                 |   |  |                                                                                                    |   |   |   |   |
| Livestock Grazing                                                                                                                                                                                                    | 0 = none, 2= low, 3 = moderate, 4 = high         |                 |   |  |                                                                                                    |   |   |   |   |
| Wildhorse Effects                                                                                                                                                                                                    | 0 = none, 2= low, 3 = moderate, 4 = high         |                 |   |  |                                                                                                    |   |   |   |   |
| Other:                                                                                                                                                                                                               | 0 = none, 2= low, 3 = moderate, 4 = high         |                 |   |  |                                                                                                    |   |   |   |   |
| Other:                                                                                                                                                                                                               | 0 = none, 2= low, 3 = moderate, 4 = high         |                 |   |  |                                                                                                    |   |   |   |   |
| <b>Sum of Disturbance Response =</b>                                                                                                                                                                                 |                                                  |                 |   |  |                                                                                                    |   |   |   |   |

**Table A.11.2-** Descriptions of the data needed to complete the data form for the watershed ecological integrity assessment (A.11.1).

### **General Geomorphic Characteristics**

- **Debris Flow Activity:** The watershed score for past debris flow activity (# of flows) in form A.4.1 is used to assign the scores for debris flow activity. The watershed score is entered for each reach as: 0 = none (0-10), 2 = slight (10-20), 3 = moderate (20-40), 4 = large (>40).
- **Active or Recent Channel Incision:** The subtotals for incision evidence for the sampled reaches and incision sensitivity index in form A.10.1 are used to assign the scores for active or recent channel incision. The scores are: 0 (none) = no evidence of recent channel incision affecting channel processes and riparian ecosystems, 2 (local) = channel incision is localized and is affecting only a few areas within the watershed, 3 (moderate) = channel incision is fairly widespread within the watershed, 4 (widespread) = channel incision is progressive and affects the ecological integrity of most of the watershed.
- **Recent Avulsions Preventing Stabilization:** The subtotals for the avulsion evidence for the sampled reaches and avulsion sensitivity index in form A.10.1 are used to assign the scores for active or recent channel incision. The scores are: 0 (none) = no evidence of recent channel avulsion affecting channel processes and riparian ecosystems, 2 (local) = avulsion is localized and is affecting the ecological integrity of only a few areas within the watershed, 3 (moderate) = avulsion is fairly widespread within the watershed and is affecting ecological integrity, 4 (widespread) = channel avulsion occurs throughout the watershed and is significantly affecting ecological integrity.

### **General Vegetation Characteristics**

- **Riparian Area Extent, Vegetation Vigor and Mortality, Wetland Indicator Status, Successional Status, and Bank Stability Status:** These data are collected during the riparian vegetation assessment and are described in table A.7.2. Data on riparian area extent

are from the first section of form A.7.1; data on wetland indicator status, successional status, bank stability status, vegetation vigor and vegetation mortality are from the reach summaries in form A.7.1.

- **Nonnative Invasive Species:** Nonnative invasive species are typically an indicator of anthropogenic disturbance at some point in time. The information entered into this form are derived from the reach summaries for the riparian vegetation data in form A.7.1. Assignment of scores is as follows: 1 = none to few nonnative invasive species occur and cover of these species is very low; 2 = several nonnative invasive species occur and cover of these species is low to moderate; 3 = a large number of nonnative invasive species are present and cover of these species is moderate to high.

### **Response to Anthropogenic and Other Disturbances**

The primary natural and anthropogenic disturbances affecting stream systems and riparian and meadow vegetation are described in the text. The scores are based on the watershed-scale (A.4.1) and reach-scale disturbance data collected within the watershed (A.8.1). Assignment of scores for all disturbances is as follows: 0 = no negative effect; 2 = low if the disturbance is having a minor negative effect on the stream channel, stream banks, or vegetation; 3 = moderate if it is having a clear negative effect on geomorphic processes or riparian vegetation; and 4 = high if the disturbance has significantly altered geomorphic processes or the riparian vegetation in a negative way.