

APPENDIX A—Selecting the DMA and Monitoring Indicators

Step 1. Define the Riparian Complex(s) within the Management Unit

In the office, obtain information on the stream within the management unit using USGS topographic maps, aerial photos, GIS maps, remote sensing imagery, and soils or landtype inventories.

1. Graph the stream profile; note average grades and breaks; classify the stream gradient type using Rosgen's criteria (Table A1).
2. Evaluate valley width, noting any abrupt changes within the pasture. Classify the valley type using Rosgen's Valley Morphology classification (Table A2).
3. Determine the dominant soil family type from the soils inventory or Landtype maps, noting key substrate characteristics—texture, potential vegetation, flooding, etc.
4. Evaluate vegetation patterns along the stream, noting key groupings of woody types and herbaceous types where possible from the imagery or photos.
5. Map the riparian complexes within the pasture based upon changes in channel type, valley type, and/or dominant soil families.

Step 2. Define the Appropriate Monitoring Indicators for the Riparian Complex

1. Use the outline in Appendix B to select the monitoring indicators appropriate to the channel type type and vegetation cover type in the riparian complex. When in doubt, apply all 10 indicators

Step 3. Locate the Designated Monitoring Area and Transect in the Field

1. Define the type of DMA to be selected (representative, critical, or reference). Consider established resource objectives and document rationale for DMA selection.
2. Walk through the Riparian Complex in the management unit to be monitored.
3. Validate the mapped Riparian Complex and adjust descriptions as necessary.
4. Evaluate grazing use or other management impacts along and adjacent to the stream. Note where the impacts occur and the types of disturbance. Use a "LIVESTOCK USE PATTERN MAP" if available and applicable.
5. Select a monitoring reach typical of the grazing use or other activities that overlaps any critical aquatic habitat—spawning and/or early rearing reaches, etc.
 - a. Make sure it does not include a cattle crossing or local point of disturbance concentration.
 - b. The starting point for the transect may be randomly selected by going to the downstream end of the reach, selecting a random number between 1 and 10, and then pacing off that number of steps upstream.

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- c. At the starting point, place a stake adjacent to the stream and well back from the edges of any cutbanks. The stake should be located above the bankfull elevation of the stream.
- d. Place a stake to mark the ending point of the transect across the stream from the starting point (the transect will proceed upstream from the starting point a distance of at least 363 feet, cross the stream, and proceed from that point downstream to a stake located across the stream from the starting point).
- e. Place stakes on each bank at the upstream end of the reach to define the transect extent.
- f. If multiple channels are encountered, the current, most active channel should be followed. Do not sample streambanks on islands in the stream.

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Table A1. Channel Type Descriptions (Rosgen 1996, p. 4–5)

Channel Type	Description	Entrenchment Ratio	W/D Ratio	Sinuosity	Slope	Landform
C	Low gradient, meandering, point-bar, riffle/pool, alluvial channels	>2.2	>12	>1.4	<.02	Broad valleys with terraces. Well-defined meandering channels.
E	Low gradient, meandering riffle/pool stream with low width/depth ratio and little deposition	>2.2	<12	>1.5	<.02	Broad valley/meadows. Alluvial materials with floodplains. Highly sinuous. Very low width/depth ratio.
F	Entrenched meandering riffle/pool channel on low gradients with high width/depth ratio	<1.4	>12	>1.4	<.02	Entrenched in highly weathered material. Gentle gradients with high bank erosion rates.
G	Entrenched “gully” step/pool and low width/depth ratio on moderate gradients	<1.4	<12	>1.2	.02 to .039	Gullies, step/pool morphology. Narrow valleys or deeply incised in alluvial or colluvial materials. Unstable with high bank erosion rate.
B	Moderately entrenched, moderate gradient, riffle dominated channel, with infrequently spaced pools	1.4 to 2.2	>12	>1.2	.02 to .039	Moderate relief, colluvial deposition, and/or structural. Narrow, gently sloping valleys.
A	Steep, entrenched, cascading, step-pool streams. Very stable if bedrock or boulder dominated.	<1.4	<12	1.0 to 1.2	.04 to .10	High relief. Erosional or depositional and bedrock forms. Entrenched and confined streams with cascading reaches.

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Table A2. Valley Morphology Types (Rosgen 1996, pages 4-12 to 4-20)

Valley Type	Shape	Channel Types Represented	Valley Slope %	Typical Substrate	Landforms
II	Broad V-shape or narrow U-shape in colluvial valleys	"B"	<4%	Cobble and boulder from alluvium and colluvium	Cryoplanated uplands with colluvial slopes – in narrow valley
III	Broad V-shape filled with alluvial fans and debris cones	"A", "B", "G", and "D"	>2%	Cobble and boulder	Colluvial and alluvial side-slope fans in the V-shaped valley
IV	V-shaped confined in entrenched canyon	"F" and "C"	<2%	Sand to cobble	Entrenched meanders (gorges) in confined alluvial valleys
V	Wide, U-shaped valley	"C", "D", and "G"	<4%	Sand to cobble	Moraines, terraces, and floodplains in wide, U-shaped valley
VI	Broad V-shape or narrow U-shape	"B"	<4%	Sand to cobble	Fault-line valley with steeper slopes on one side of the valley
VIII	Wide, flat valley shape	"C" and "E"	<2%	Sand to cobble	Alluvial terraces and floodplains in broad valley
IX	Wide, flat	"C" and "D"	<2%	Sand to gravel	Glacial outwash plain
X	Very wide, flat plain	"C", "E", and "DA" with "G" and "F"	<2%	Sand to gravel	Broad lacustrine and alluvial flats
XI	Broad, flat to lobate shapes	"DA", "D", "C", and "E"	<2%	Sand to gravel	River deltas, tidal flats

APPENDIX B—Guide to the Selection of Monitoring Indicators

The following guide can be used to prescribe streamside monitoring indicators appropriate for various channel types (Rosgen, 1996) and for existing and potential vegetative conditions along the greenline.

I. “C” channel type, herbaceous vegetation dominant, potential vegetation: herbaceous or mixed herbaceous and shrubs.



- **TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:**
 - Stubble height on key riparian species, or species groups on the greenline
 - Use compliance (livestock numbers and time in pasture)
 - Bank disturbance or alteration
- **ENDPOINT: End-of-season indicator of proper use to maintain or ensure increased composition key hydric stabilizers:**
 - Stubble height on key riparian species, or species groups on the greenline
 - Bank disturbance or alteration
- **RIPARIAN OBJECTIVE: Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives:**
 - Streambank stability
 - Greenline composition maintained or trend toward hydric stabilizers
- **STREAM CHANNEL: Long-term indicators of stream channel condition to assess attainment of the Riparian Management Objectives:**
 - Greenline-greenline width
 - Thalweg water depth with water width
 - Pebble count (substrate composition)

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II. “C” channel type, mixed shrub-herbaceous vegetation dominant, potential vegetation: mixed herbaceous and shrubs, or shrubs.



- **TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:**
 - Stubble height on key riparian species or species groups on the greenline
 - Use compliance (livestock numbers and time in pasture)
 - Bank disturbance or alteration
 - Change in preference to woody species seedlings and young
- **ENDPOINT: End-of-season indicator of proper use to maintain or ensure increased composition key hydric stabilizers:**
 - Stubble height on key riparian species or species groups on the greenline
 - Bank disturbance or alteration
 - Woody species use on seedlings and young (less than 5 feet above ground)
- **RIPARIAN OBJECTIVE: Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives:**
 - Streambank stability
 - Greenline composition maintained or trend toward hydric stabilizers
 - Woody species regeneration—15–20% seedlings and young, 60–70% mature, and 15–20% dead
- **STREAM CHANNEL: Long-term indicators of stream channel condition to assess attainment of the Riparian Management Objectives:**
 - Greenline-greenline width
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III. “C” channel type, woody dominant, potential vegetation: shrubs and trees.



- **TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:**
 - Use compliance (livestock numbers and time in pasture)
 - Bank disturbance or alteration
 - Change in preference to woody species seedlings and young
- **ENDPOINT: End-of-season indicator of proper use to maintain or ensure increased composition key hydric stabilizers:**
 - Bank disturbance or alteration
 - Woody species use on seedlings and young (less than 5 feet above ground)
- **RIPARIAN OBJECTIVE: Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives:**
 - Streambank stability
 - Woody species regeneration—15–20% seedlings and young, 60–70% mature, and 15–20% dead
- **STREAM CHANNEL: Long-term indicators of stream channel condition to assess attainment of the Riparian Management Objectives:**
 - Thalweg water depth with water width
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IV. “E” channel type, herbaceous vegetation dominant, potential vegetation: herbaceous or mixed herbaceous and shrubs.



- **TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:**
 - Stubble height on key riparian species, or species groups on the greenline
 - Use compliance (livestock numbers and time in pasture)
 - Bank disturbance or alteration
- **ENDPOINT: End-of-season indicator of proper use to maintain or ensure increased composition key hydric stabilizers:**
 - Stubble height on key riparian species, or species groups on the greenline
 - Bank disturbance or alteration
- **RIPARIAN OBJECTIVE: Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives**
 - Streambank stability
 - Greenline composition maintained or trend toward hydric stabilizers
- **STREAM CHANNEL: Long-term indicators of stream channel condition to assess attainment of the Riparian Management Objectives:**
 - Greenline-greenline width
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V. “F” channel type (entrenched floodplain), herbaceous vegetation dominant, potential vegetation: herbaceous or mixed herbaceous and shrubs.



- **TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:**
 - Stubble height on key riparian species, or species groups on the greenline
 - Use compliance (livestock numbers and time in pasture)
 - Bank disturbance or alteration
- **ENDPOINT: End-of-season indicator of proper use to maintain or ensure increased composition key hydric stabilizers:**
 - Stubble height on key riparian species, or species groups on the greenline
 - Bank disturbance or alteration
- **RIPARIAN OBJECTIVE: Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives:**
 - Streambank stability
 - Greenline composition maintained or trend toward hydric stabilizers
- **STREAM CHANNEL: Long-term indicators of stream channel condition to assess attainment of the Riparian Management Objectives:**
 - Greenline-greenline width
 - Thalweg water depth with water width
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VI. “G” channel type (entrenched—no floodplain), herbaceous vegetation or bare banks dominant. Potential vegetation: herbaceous.



- **TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:**
 - Use compliance (livestock numbers and time in pasture)
 - Bank disturbance or alteration
- **ENDPOINT: End-of-season indicator of proper use to maintain or ensure increased composition key hydric stabilizers:**
 - Bank disturbance or alteration
- **RIPARIAN OBJECTIVE: Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives:**
 - Streambank stability
 - Greenline composition maintained or trend toward hydric stabilizers
- **STREAM CHANNEL: Long-term indicators of stream channel condition to assess attainment of the Riparian Management Objectives:**
 - Greenline-greenline width
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VII. “B” channel type, mixed shrub-herbaceous vegetation dominant, potential vegetation: mixed herbaceous and shrubs, or shrubs.



- **TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:**
 - Stubble height on key riparian species, or species groups on the greenline
 - Use compliance (livestock numbers and time in pasture)
 - Bank disturbance or alteration
 - Change in preference to woody species seedlings and young
- **ENDPOINT: End-of-season indicator of proper use to maintain or ensure increased composition key hydric stabilizers:**
 - Stubble height on key riparian species, or species groups on the greenline
 - Bank disturbance or alteration
 - Woody species use on seedlings and young (less than 5 feet above ground)
- **RIPARIAN OBJECTIVE: Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives:**
 - Streambank stability
 - Greenline composition maintained or trend toward hydric stabilizers
 - Woody species regeneration—15–20% seedlings and young, 60–70% mature, and 15–20% dead
- **STREAM CHANNEL: Long-term indicators of stream channel condition to assess attainment of the Riparian Management Objectives:**
 - Greenline-greenline width
 - Thalweg water depth with water width
 - Pebble count (substrate composition)

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VIII. “B” channel type, woody dominant, potential vegetation: Shrubs and trees.



- **TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:**
 - Use compliance (livestock numbers and time in pasture)
 - Bank disturbance or alteration
- **ENDPOINT: End-of-season indicator of proper use to maintain or ensure increased composition key hydric stabilizers:**
 - Bank disturbance or alteration
 - Woody species use on seedlings and young (less than 5 feet above ground)
- **RIPARIAN OBJECTIVE: Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives**
 - Streambank stability
 - Woody species regeneration—15–20% seedlings and young, 60–70% mature, and 15–20% dead
- **STREAM CHANNEL: Long-term indicators of stream channel condition to assess attainment of the Riparian Management Objectives:**
 - Greenline-greenline width
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IX. “A” channel. Mixed shrubs and herbaceous, or shrubs dominant. Potential vegetation: mixed shrubs and herbaceous, or shrubs. Substrate large.



TRIGGER: Within-season trigger to move livestock, to maintain or increase vigor on key hydric stabilizers:

- Use compliance (livestock numbers and time in pasture)
- Bank disturbance or alteration
- Change in preference to woody species seedlings and young
- **ENDPOINT:** End-of-season indicator of proper use to maintain or ensure increased composition key hydric stabilizers:
 - Bank disturbance or alteration
 - Woody vegetation use on seedlings and young (less than 5 feet above ground)
- **RIPARIAN OBJECTIVE:** Long-term indicator of riparian condition to assess attainment of the Riparian Management Objectives
 - Streambank stability
 - Woody species regeneration—15–20% seedlings and young, 60–70% mature, and 15–20% dead
- **STREAM CHANNEL:** Long-term indicators of stream channel condition to assess attainment of the Riparian Management Objectives:
 - Greenline-greenline width
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Herbaceous vegetation does not normally contribute significantly to the stability of A channels. The rare exception would likely be associated with A5 and A6 channel types. A5's are steep channels incised in sandy materials and occur on highly weathered granites or sedimentary rocks. Such channels often experience natural bank erosion through fluvial and earth flow processes. A6's are steep, entrenched channels in weathered shales and lacustrine soils that are very cohesive.