EPA
United States
Environmental Protection
Agency

SVAP2, Serbia Edition

Stream Visual Assessment Protocol Version 2

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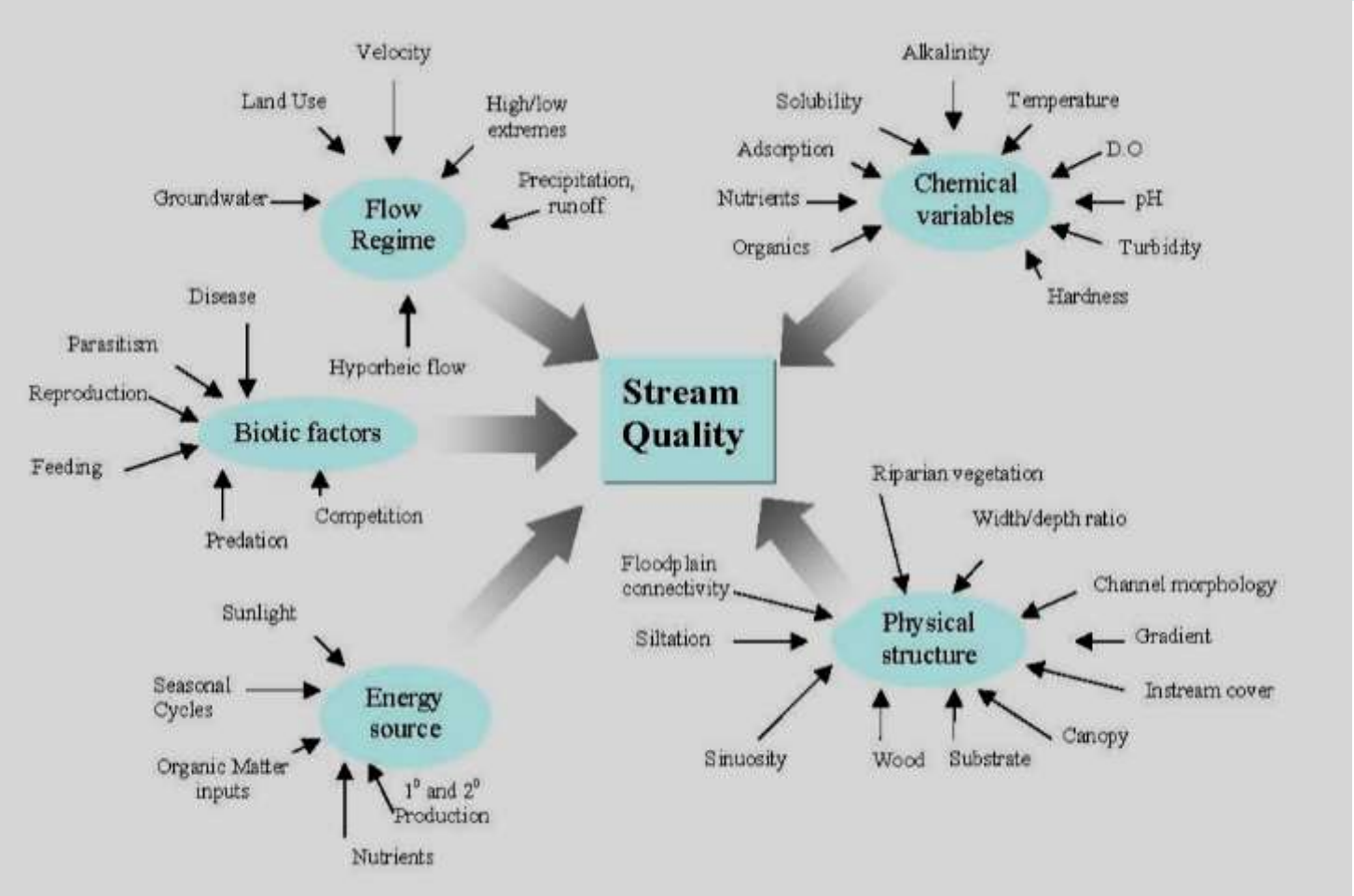
SVAP History

- A qualitative visual assessment tool
- Evaluates physical, chemical, and biological features affecting wadeable stream conditions
- Developed in 1999; Revised in 2009 (SVAP2)
  - ✓ US Department of Agriculture's Natural Resources Conservation Service (NRCS)
  - ✓ University of Georgia (1999).

What is a healthy stream?

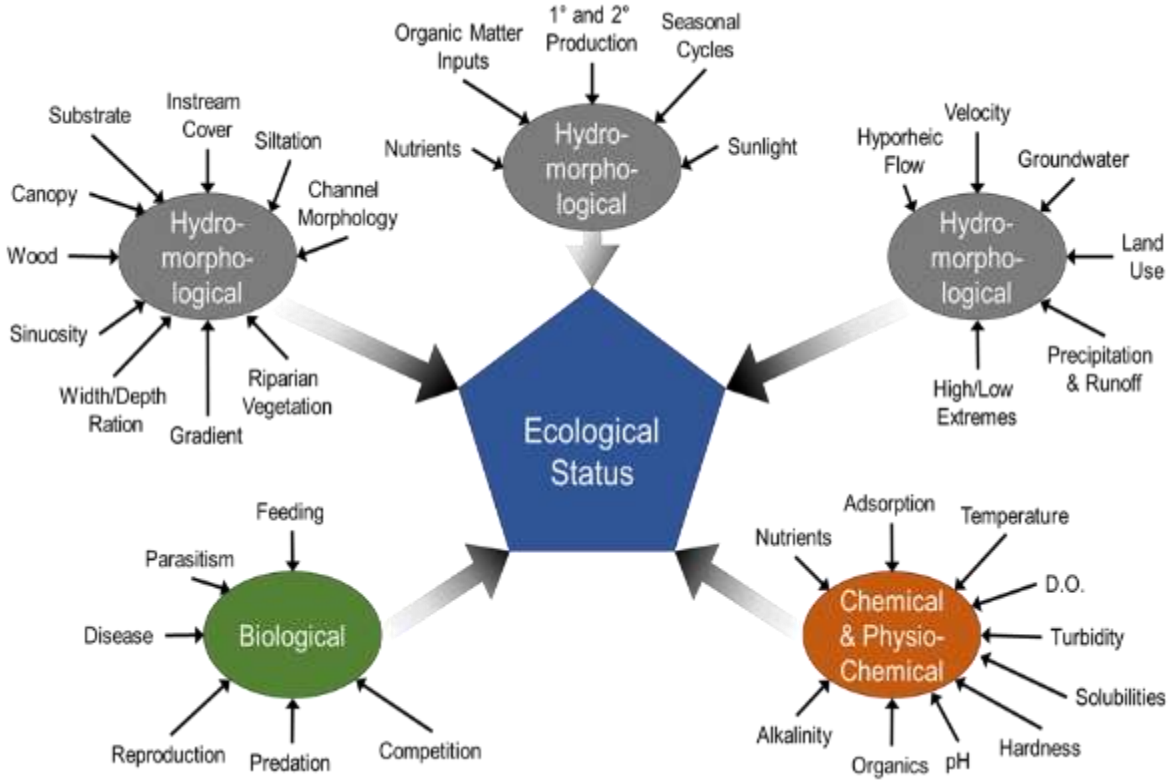


Factors that influence stream quality or condition

Modified from Karr 1986

SVAP2 for Serbia

Incorporating Metrics of the Water Framework Directive



SVAP2 Basics

- Describes overall condition for a specified section of stream

- Compare scores at that stream to a “typical” reach of streams in the area
  - ✓Reference reaches of streams in Serbia

SVAP2 use in Serbia!

- Scores ecological and physical variables that are *least sensitive to regional differences*
  - Note: Regional variation in stream conditions exist and should be acknowledged

- Scoring elements should be modified as needed to reflect regional differences in physical landscape features and weather patterns

SVAP 2 Training Module April 2009

SVAP2 Scoring

- 16 possible stream elements to score
  - Score only those elements that are relevant to the site
- Score range
  - 10 = best conditions, 0 = worst conditions
- Modify protocol's elements to reflect local conditions, where applicable

Preliminary Data Collection

- **Collect basic information:**
  - ✓ ownerships, land uses
  - ✓ ecoregion
  - ✓ watershed features such as water diversions
  - ✓ “natural” flow regime
  - ✓ aquatic species of concern
  - ✓ identification of suitable reference stream, for comparison and scoring accuracy

Stream Visual Assessment Protocol
Summary Sheet

Owner's name _____ Evaluator's name _____

Stream name _____ Tributary to: _____ HUC: ____

1. Preliminary Assessment

A. Watershed Description:

Ecoregion or MLRA _____ Watershed Drainage area (acres or sq miles) _____

Watershed management structures: (no.): dams___ water controls _____ irrigation diversions___

No. of miles of contiguous riparian cover/mile of entire stream in watershed (estimated)_____

Land use within watershed (%): cropland _____ hayland _____ grazing/pasture _____ forest ____

urban _____ industrial _____ other (specify) _____

Agronomic practices in uplands include: _____

Confined animal feeding operations (no.) _____ Conservation (acres) _____ industrial(acres) _____

Number of stream miles on property_____ Number of total stream miles_____

Stream hydrology: _____intermittent; months of year wetted : _____

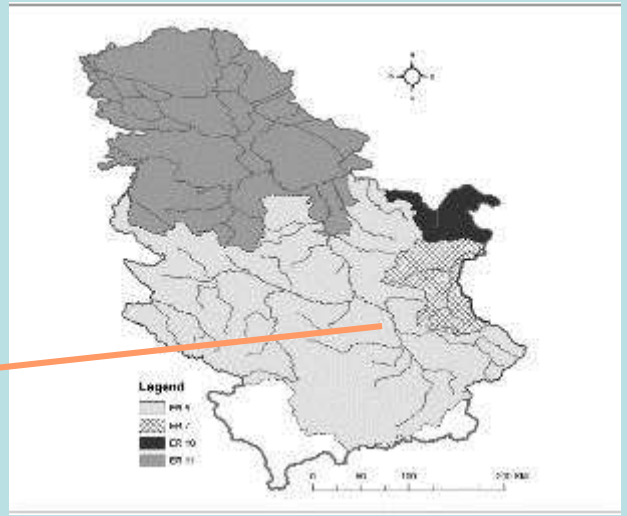
____ perennial; months of year at base flow _____

B. Stream/Reach Description:

Stream Gage Location/Discharge: _____/_____cfs

Applicable Reference Stream: _____ Reference Stream Location: ____/____

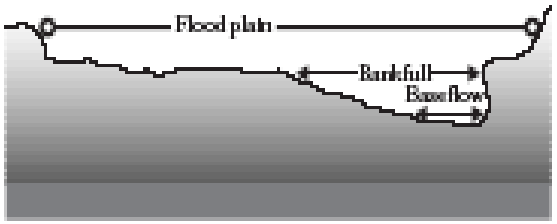
Information Sources:

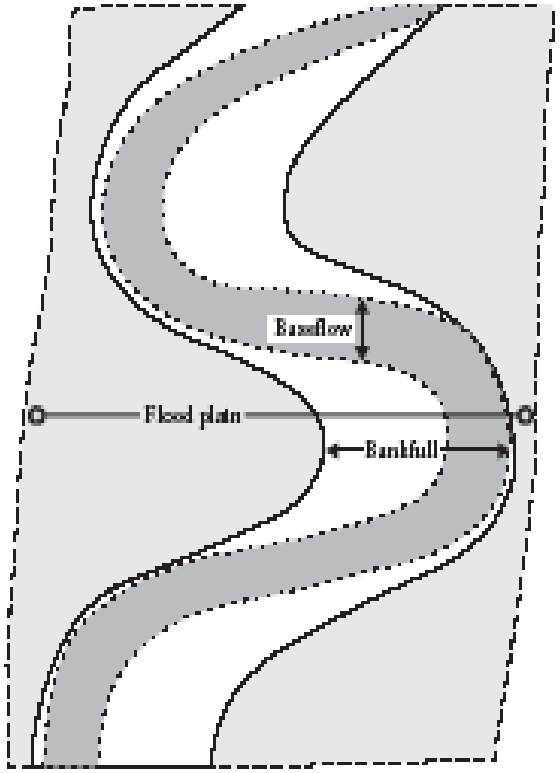


What is the best condition we can expect for a given stream?

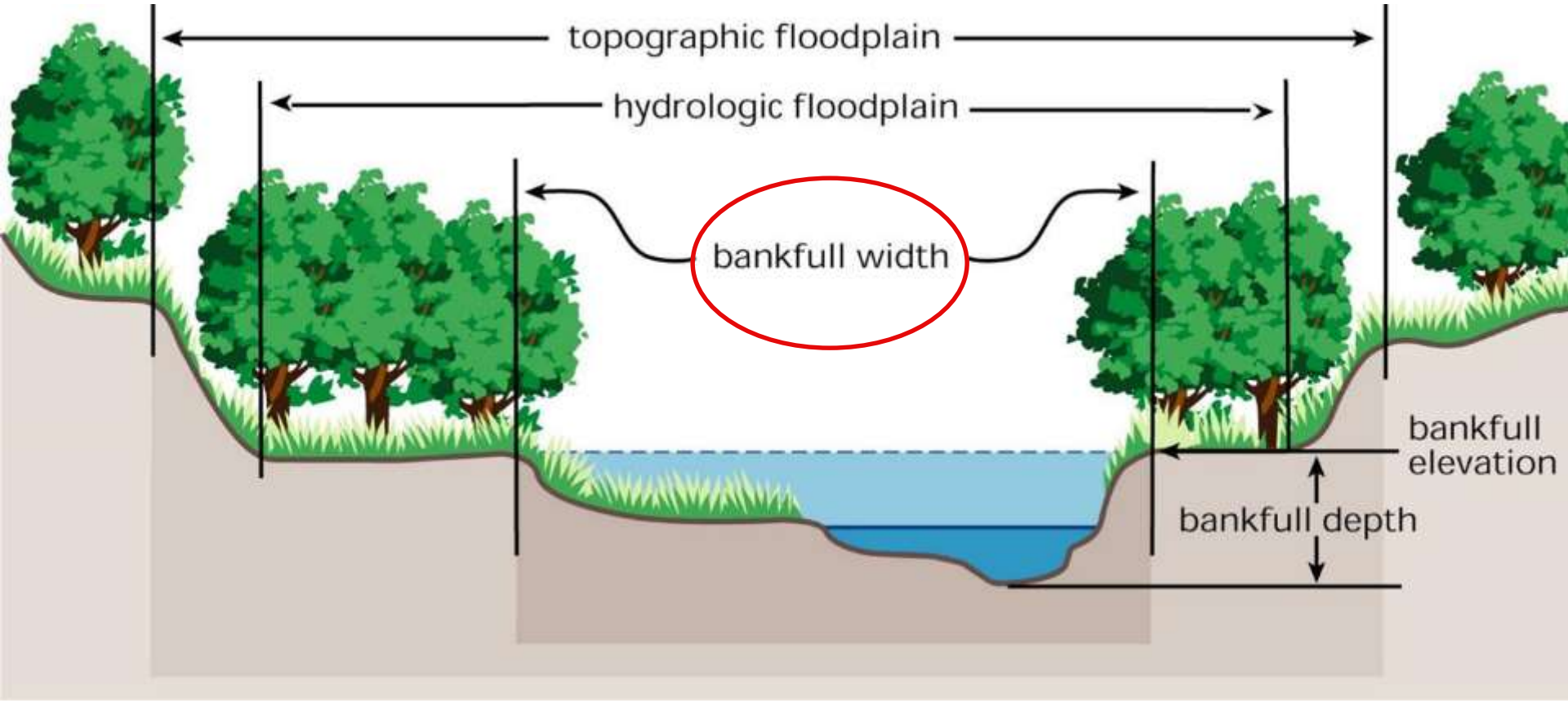
Assessment Reach

- Score one stream reach per assessment, unless additional reaches are warranted due to multiple land uses or ownerships.
- Choose a reach based on channel type.
- Stream reach = at least *12X* the width of the stream channel at bankfull stage.





Identifying bankfull width:



Overall assessment calculations and interpretations

- Descriptions for each element, or *metric,* identify the key features that are used to assign a score to that element
  - scores range from 10 (excellent) to 0 (poor)
- Individual element scores can help identify *potential stressors* to the stream system.
- The final SVAP2 score indicates the condition of the stream reach assessed, and the quality of the habitat for local species and communities.

B. SVAP2 Scores

Element	Score
1. Channel Condition	
2. Hydrologic Alteration	
3. Bank Condition	
4. Riparian Area Quantity	
5. Riparian Area Quality	
6. Canopy Cover	
7. Water Appearance	
8. Nutrient Enrichment	
9. Manure or Human Waste	
10. Pools	
11. Barriers to Movement	
12. Fish Habitat Complexity	
13. Aquatic Invertebrate Habitat	

Element	Score
14. Aquatic Invertebrate Community	
15. Riffle Embeddedness	
~~16. Salinity~~	

A. Sum of all elements scored

B. Number of elements scored

Overall score: A/B _____

1 to 2.9	Severely Degraded
3 to 4.9	Poor
5 to 6.9	Fair
7 to 8.9	Good
9 to 10	Excellent

Suspected causes of SVAP scores less than 5 (5.0 and greater meets Quality Criteria)

_____

_____

_____

Recommendations for further assessment or actions:

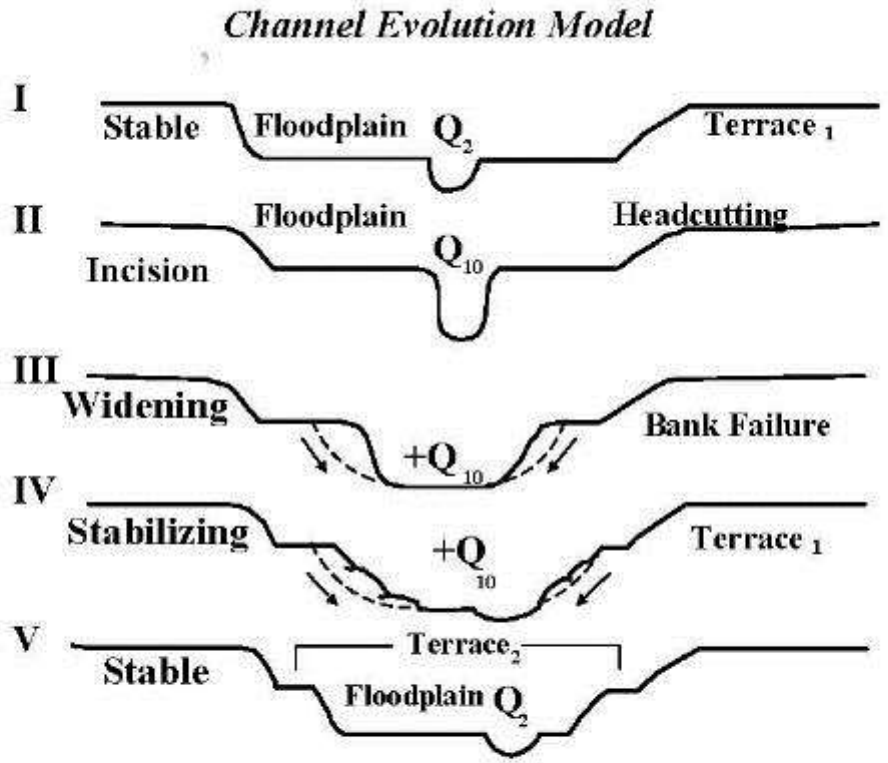
_____

_____

_____

Scoring each element in the field

Element 1: Channel Condition



. Channel Evolution Model, after Schumm, Harvey and Watson, 1984. Q_2 indicates a flood interval of 2 years; Q_{10} indicates an interval of 10 years.

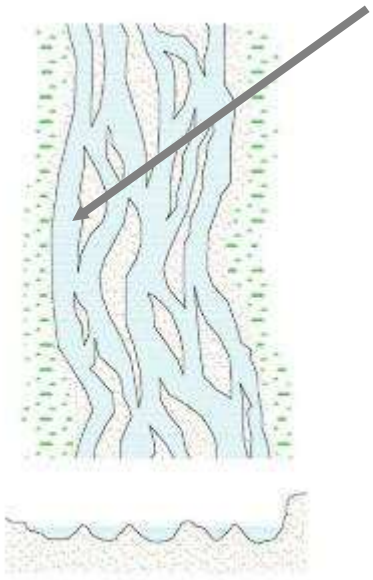
Natural, stable channel with established bank vegetation.	**If channel is incising (appears to be downcutting or degrading), score this element based on the descriptions in the upper section of the matrix:**		
No discernible signs of incision (such as vertical banks) or aggradation (such as very shallow multiple channels); Active channel and floodplain are connected throughout reach, and flooded at natural intervals; Streambanks low with few or no bank failures; Stage I: Score 10 Stage V: Score 9 (if terrace is visible)	Evidence of past incision and some recovery; some bank erosion possible; Active channel and floodplain are connected in ***most*** areas, inundated seasonally; Streambanks may be low or appear to be steepening; Top of point bars are below active floodplain. Stage I: Score 8 Stage V: Score 7-8 Stage IV: Score 6	Active incision evident; plants are stressed, dying or falling in channel; Active channel appears to be disconnected from the floodplain, with infrequent or no inundation; Steep banks, bank failures evident or imminent; Point bars located adjacent to steep banks. Stage IV: Score 5 Stage III: Score 4 Stage II: Score 3	Headcuts or surface cracks on banks; active incision; vegetation very sparse; Little or no connection between floodplain and stream channel, and no inundation; Steep streambanks and failures prominent; Point bars, if present, located adjacent to steep banks. Stage II or III, scores ranging from 2 to 0, depending on severity.
	8 7 6	**5 4 3**	**2 1 0**
	If channel is aggrading (appears to be filling in and is relatively wide and shallow), score this element based on the descriptions in the lower section of the matrix:		
No more than 1 bar forming in channel	Minimal lateral migration and bank erosion; A few shallow places in reach, due to sediment deposits; Minimal bar formation (less than 3).	Moderate lateral migration and bank erosion; Deposition of sediments causing channel to be very shallow in places; 3-4 bars in channel	Severe lateral channel migration, and bank erosion; Deposition of sediments causing channel to be very shallow in reach; Braided channels (5 or more bars in channel.
10 9	**8 7 6**	**5 4 3**	**2 1 0**

Element 1: Channel Condition

Score of 10

- Natural, stable channel
- Established bank vegetation
- No signs of incision
- No signs of aggradation
- Flooded at intervals suitable for the site.

Element 1: Channel Condition



Aggraded channel, Score 1-2

Score of 1 - Channel is *actively aggrading*, forming a braided channel with 5 or more bars**.**

Score of 1 - Channel is *degrading*, little or no connection between floodplain and stream channel.

Stage II CEM – Score 1

Incision & Aggradation

Element 1: Channel Condition

Natural, stable channel with established bank vegetation.	If channel is incising (appears to be downcutting or degrading), score this element based on the descriptions in the upper section of the matrix:
	If channel is aggrading (appears to be filling in and is relatively wide and shallow), score this element based on the descriptions in the lower section of the matrix:

Natural, stable channel with established bank vegetation.	**If channel is incising (appears to be downcutting or degrading), score this element based on the descriptions in the upper section of the matrix:**		
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10 9	**8 7 6**	**5 4 3**	**2 1 0**

Element 2: Hydrologic Alteration

Score of 10

Bankfull or higher flows occur according to the flow regime that is known for the site, typically every 1 to 2 years, and no dams or water structures are present.

Score of 0-2

Bankfull or higher flows rarely occur, water withdrawals de-water the channel.

Element 3: Bank Condition

Score of 10
Banks are stable; protected by roots of natural vegetation, wood or rock; no man-made structures present on bank; no bank failures, and no recreational or livestock access.

Score of 0-2
Banks are unstable; numerous bank failures, unrestricted use by recreational traffic or animals is contributing to long-term bank instability.

Element 4:
Riparian Area Quantity

Score of 10
Natural plant community extends at least 2 bankfull widths, or over the entire active floodplain and is generally contiguous throughout the stream reach being assessed.

Score of 1
Natural plant community extends less than 1/3 of the bankfull width or less than 25% of active floodplain. Vegetation gaps exceed 30% of the estimated length of the stream on the property.

Element 5:
Riparian Area Quality

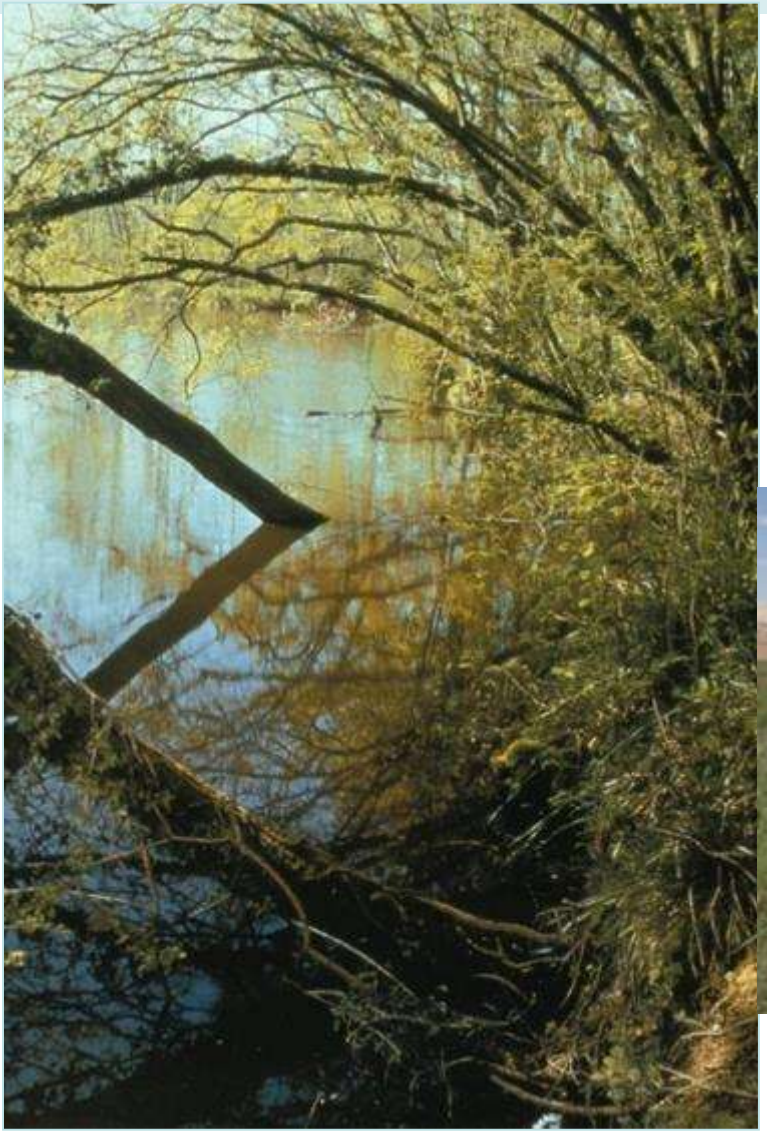
Score of 10
Natural and diverse vegetation with composition, density and age structure appropriate for the site. No invasive species and no concentrated flows.

Score of 1-2
Little or no natural vegetation, and evidence of concentrated flows in the riparian area.

Element 6:
Canopy Cover – Coldwater Streams

Score of 10

50 to 75% of water surface shaded within the length of the stream on landowner's property



Score of 1

< 20% water surface shaded within the length of the stream on landowner's property.

Element 7:
Water Appearance

Score of 10
Water in stream is very clear, with no evidence of contamination by oil, wastes, or metal precipitates.

Score of 5
Water in stream is occasionally cloudy, especially after storm event, but clears rapidly; objects visible at depth of .5 to 1 meter; may have slightly green color; no oil sheen on water surface.

Element 8: Nutrient Enrichment

Score 9-10

Clear water along entire reach; little or no algal growth present.

Score 0-2

Thick algal mats dominating stream.

Element 9: Animal or Human Waste

Score 10
Livestock do not have access to stream.

Score 1 -2
Livestock have unlimited access to stream.

Element 10: Pools

Is the reach of stream low gradient, <2%?

Or is the stream high gradient, >2%?

Element 10 Pools: Low-Gradient

Score 10
More than 2 deep pools separated by riffles, each with greater than 30% of the pool bottom obscured by depth, wood, or other cover.

Score 2-0
Pools absent, but some slow water habitat is available; or reach is dominated by shallow continuous pools or slow water.

Element 10: Pools, High-Gradient

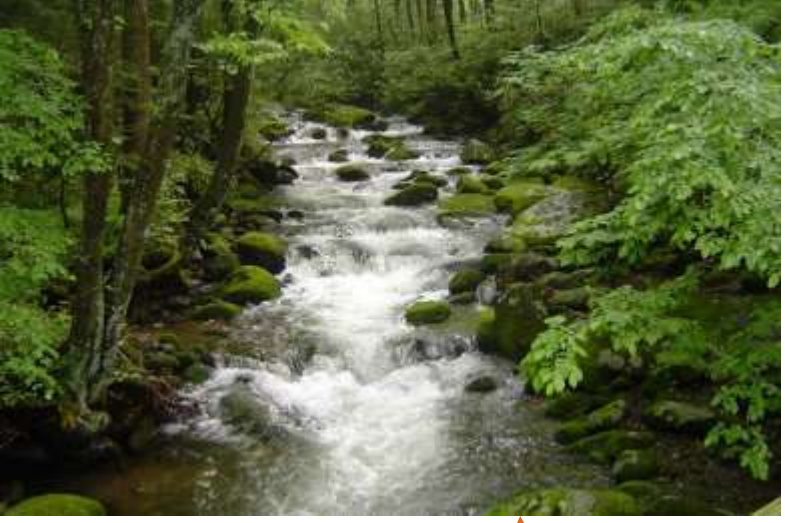
Score 10 More than 3 deep pools separated by boulders or wood, each with > than 30% of bottom obscured to view

Score 1-2 Pools absent

Element 11:
Barriers to Fish Movement

Background information needed:

- Which fish species are present in the stream
- What is their life history?
- How high can they jump?
- Can they tolerate high water temperatures?



Element 11:
Barriers to Fish Movement

Element 11 Barriers to aquatic species movement scoring matrix

No artificial barriers that prohibit movement of aquatic organisms during any time of the year	Physical structures, water withdrawals and/ or water quality season-ally restrict movement of aquatic species			Physical structures, water withdrawals and/ or water quality restrict movement of aquatic species throughout the year				Physical structures, water withdrawals and/ or water quality prohibit movement of aquatic species		
10	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**

Element 12:
Fish Habitat Complexity

10 or more habitat features available, at least one of which is considered optimal in reference sites (e.g., large wood in forested streams.)	8 to 9 habitat features available.	6 to 7 habitat features available.	4 to 5 habitat features available.	<4 habitat features available.
10 9	**8 7**	**6 5**	**4 3**	**2 1 0**

Fish Habitat features include

- ✓ Logs, large wood
- ✓ Small wood accumulations
- ✓ Deep pools, shallow pools, glides, pockets
- ✓ Large boulders, Small border clusters
- ✓ Overhanging vegetation
- ✓ Undercut banks
- ✓ Riffles
- ✓ Root mats, emergent vegetation
- ✓ Off-channel habitats, including backwaters, oxbows, side-channels, wetlands

Root mats,
emergent vegetation

Overhanging
vegetation

Element 13:
Aquatic Invertebrate Habitat

At least 9 types of habitat present; a combination of wood with riffles should be present and suitable in addition to other types of habitat. (If non-forested stream, consider reference site's optimal habitat type needed for this high score.)	8 to 6 types of habitat; site may be in need of more wood or reference habitat features, and stable wood-riffle sections.	5 to 4 types of habitat present	3 to 2 types habitat present	None to 1 type of habitat present
10 9	8 7 6	5 4	3 2	1 0

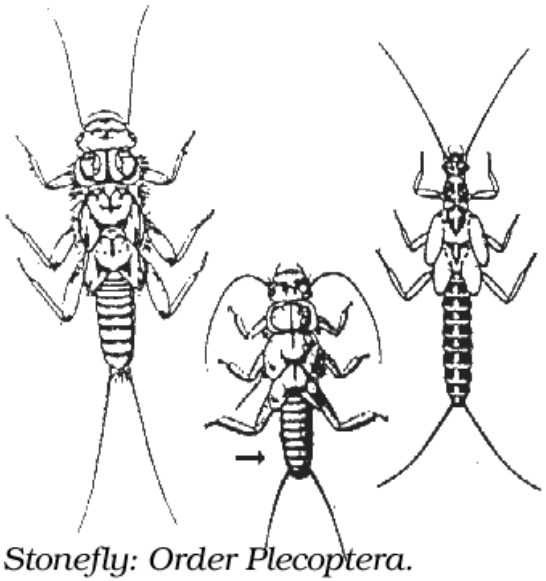
What lies beneath the water's surface?

Indicators of water quality conditions

Element 14:
Aquatic Invertebrate Community

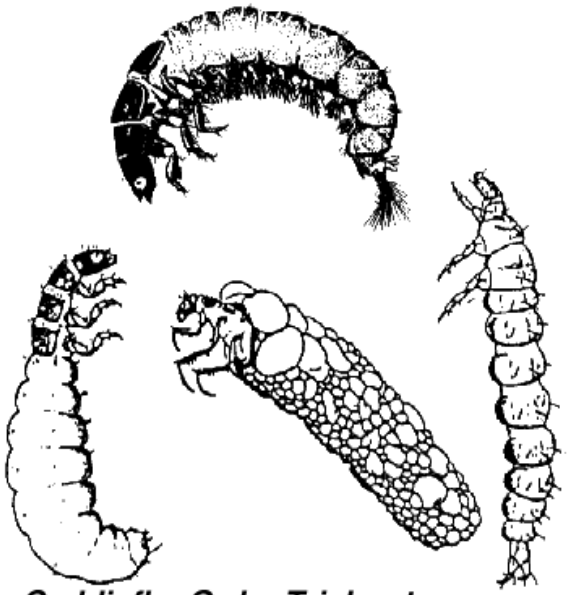
Invertebrate community is diverse and well represented by Group I or intolerant species; one or two species do not dominate.	Invertebrate community is well represented by Group II or facultative species, and Group I species are also present; one or two species do not dominate.	Invertebrate community is composed mainly of Groups II and III, and/or 1 or 2 species of any group may dominate.	Invertebrate community composition is predominantly Group III species and/or only 1 or 2 species of any group is present and abundance is low.
10 9 8	7 6 5	4 3 2	1 0

Group One Taxa: Pollution-sensitive species found in good quality water.



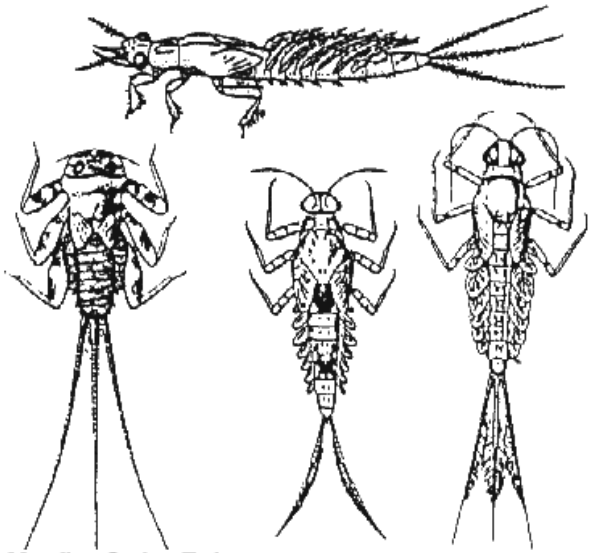
Stonefly: Order Plecoptera.

1/2" -1 1/2", 6 legs with hooked tips, antennae, 2 hair-like tails. Smooth (no gills) on lower half of body. (See arrow)



Caddisfly: Order Trichoptera.

Up to 1", 6 hooked legs on upper third of body, 2 hooks at back end. May be in a stick, rock or leaf case with its head sticking out. May have fluffy gill tufts on lower half.

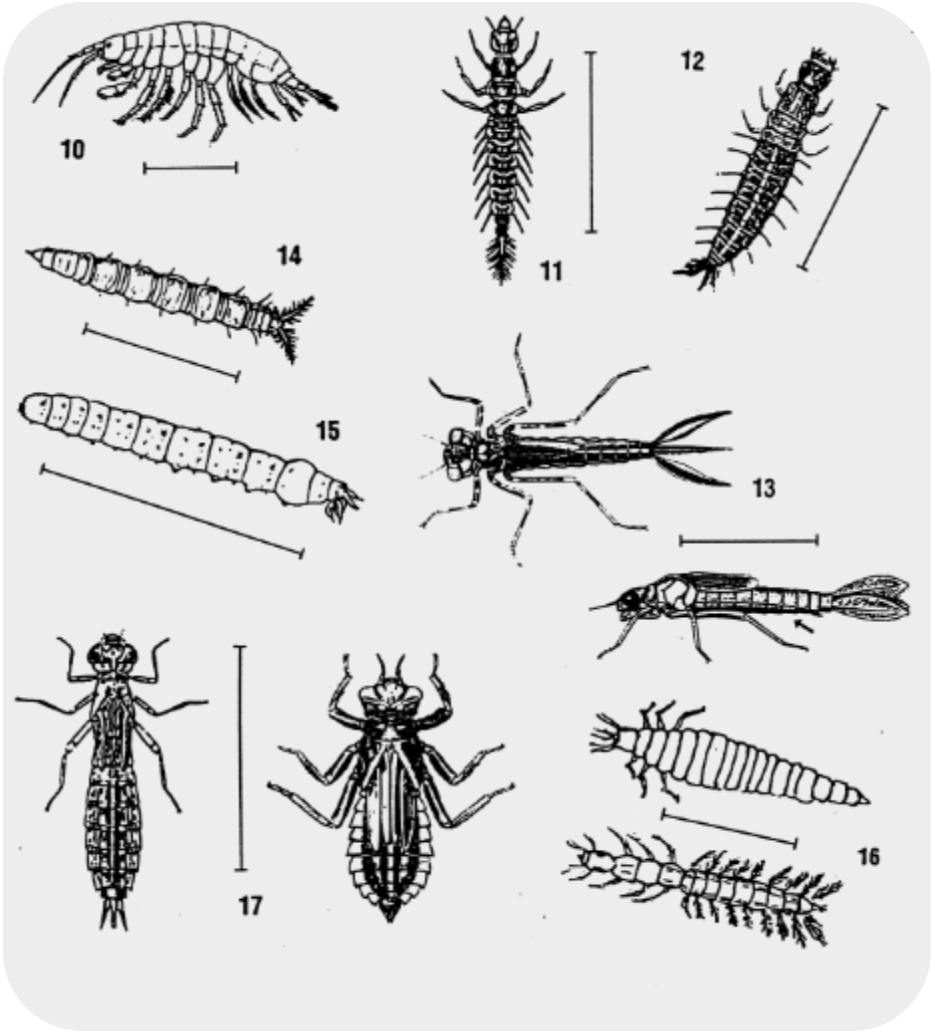


Mayfly: Order Ephemeroptera.

1/4" -1", brown, moving, plate-like or feathery gills on sides of lower body (see arrow), 6 large hooked legs, antennae, 2 or 3 long, hair-like tails. Tails may be webbed together.

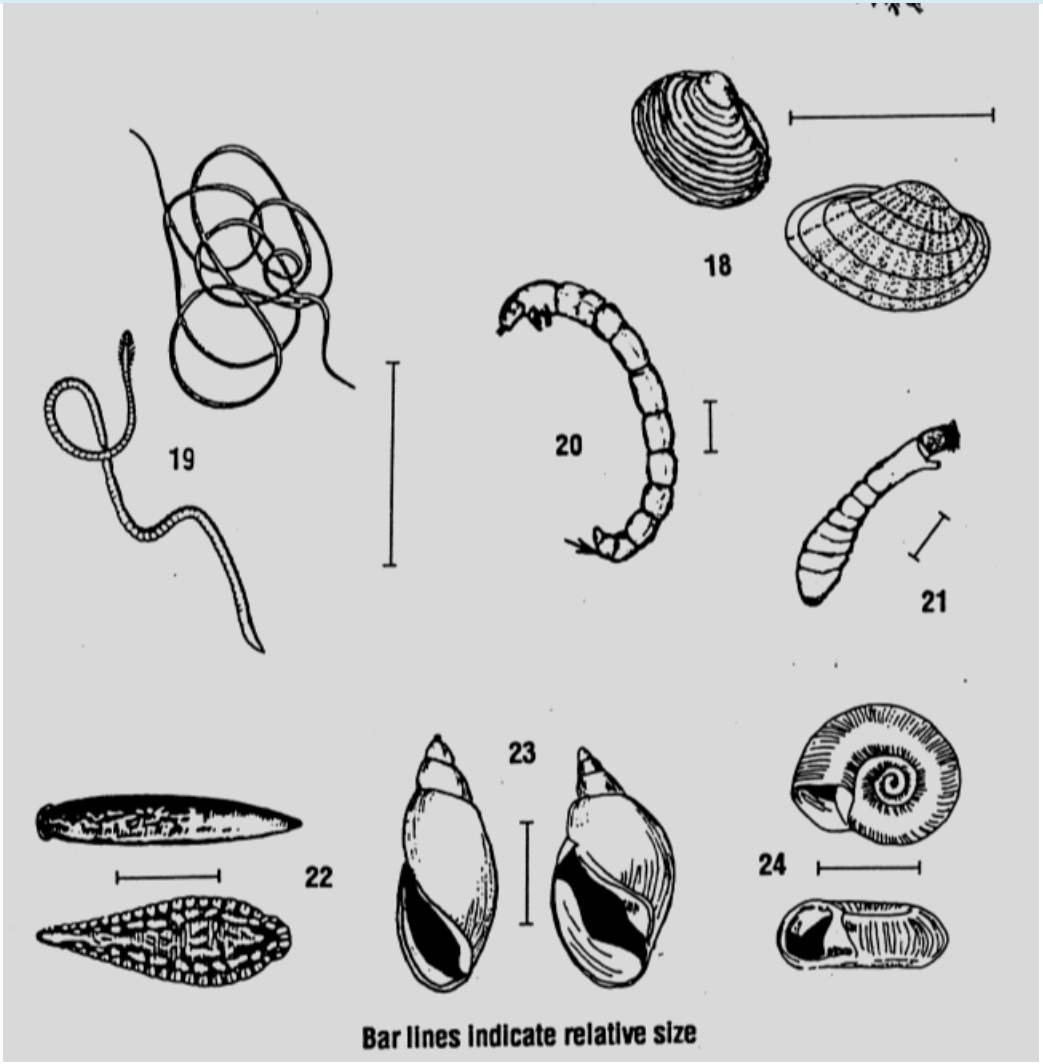
Group Two Taxa: Somewhat pollution tolerant; found in good or fair water quality

10 Scud – amphipod
11 Alderfly larva
12 Fish fly larva
13 Damsel fly larva
14 Water snipe larva
15 Cranefly larva
16 Beetle larva
17 Dragon fly larva

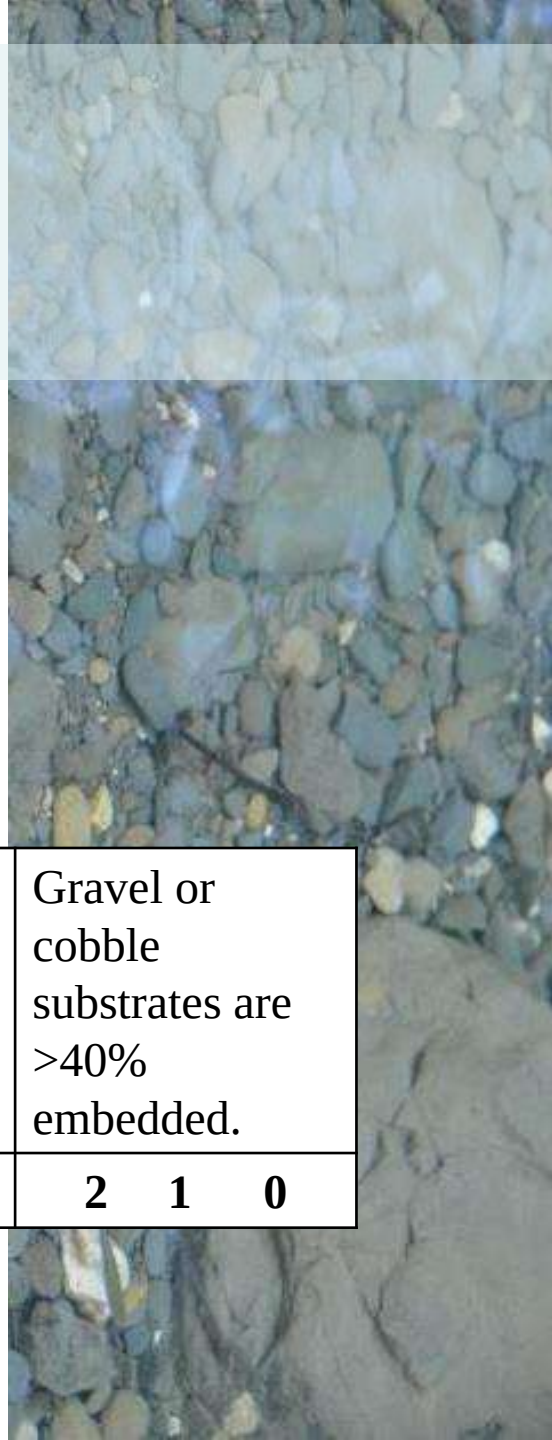


Group Three Taxa: Pollution-tolerant organisms can be found in any quality of water

18 clam
19 Aquatic worm
20 Midge fly larva
21 black fly larva
22 leech
23 pond snails
24 other snails



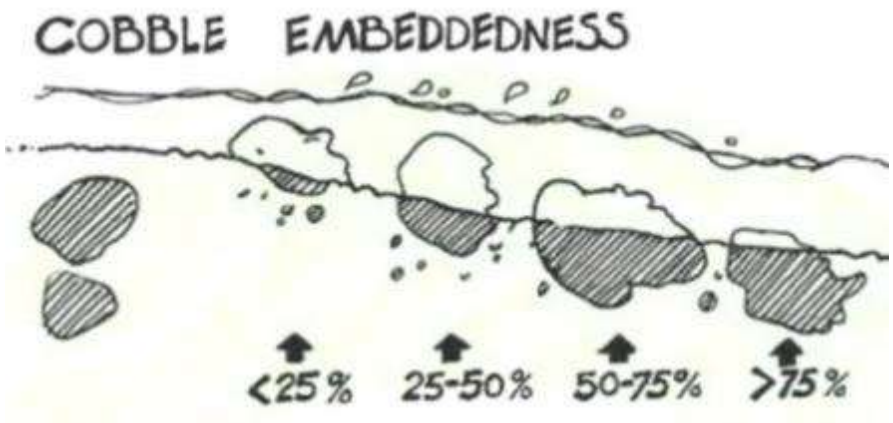
Element 15:
Riffle Embeddedness



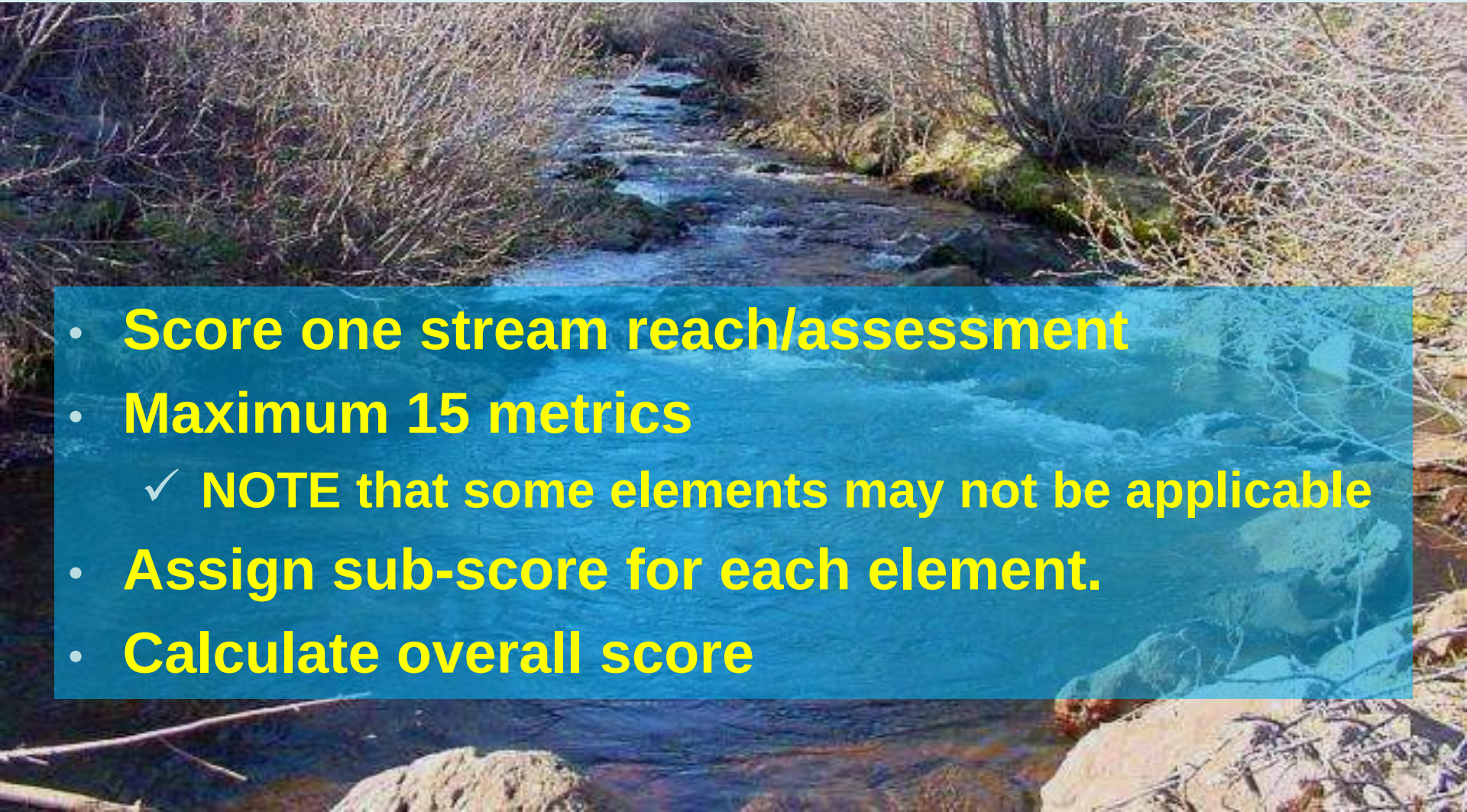
Do not assess this element unless riffles or swift-flowing water and coarse substrates are present or these are natural features that should be present.

Gravel or cobble substrates are <10% embedded.	Gravel or cobble substrates are 10-20% embedded.	Gravel or cobble substrates are 21-30% embedded.	Gravel or cobble substrates are 31-40% embedded.	Gravel or cobble substrates are >40% embedded.
10 9	**8 7**	**6 5**	**4 3**	**2 1 0**

Element 15: Riffle Embeddedness



Assessing Stream Condition: Summary



- **Score one stream reach/assessment**
- **Maximum 15 metrics**
  - ✓ **NOTE that some elements may not be applicable**
- **Assign sub-score for each element.**
- **Calculate overall score**

1. Channel Condition	**8**	14. Aquatic Invertebrate Community	**9**
2. Hydrologic Alteration	**10**	15. Riffle Embeddedness*	**10**
3. Bank Condition	**8**	16. Salinity	**NA**
4. Riparian Area Quantity	**10**	**A. Sum of all elements scored**	**130**
5. Riparian Area Quality	**9**	**B. Number of elements scored**	**14**
6. Canopy Cover*	**10**	**Overall score: A/B** 8.7 1 to 2.9 Severely Degraded 3 to 4.9 Poor 5 to 6.9 Fair 7 to 8.9 Good 9 to 10 Excellent	
7. Water Appearance	**9**		
8. Nutrient Enrichment	**9**		
9. Manure or Human Waste	**10**		
10. Pools*	**10**		
11. Barriers to Movement	**10**		
12. Fish Habitat Complexity	**NA**		
13. Aquatic Invertebrate Habitat	**8**		

1. Channel Condition	**5**	14. Aquatic Invertebrate Community	**3**
2. Hydrologic Alteration	**6**	15. Riffle Embeddedness*	**4**
3. Bank Condition	**6**	16. Salinity	**NA**
4. Riparian Area Quantity	**10**	**A. Sum of all elements scored**	**82**
5. Riparian Area Quality	**7**	**B. Number of elements scored**	**15**
6. Canopy Cover*	**7**	**Overall score: A/B** 5.8 1 to 2.9 Severely Degraded 3 to 4.9 Poor 5 to 6.9 Fair 7 to 8.9 Good 9 to 10 Excellent	
7. Water Appearance	**7**		
8. Nutrient Enrichment	**6**		
9. Manure or Human Waste	**5**		
10. Pools*	**6**		
11. Barriers to Movement	**10**		
12. Fish Habitat Complexity	**6**		
13. Aquatic Invertebrate Habitat	**8**		

What is next under this scenario?

Overall assessment calculations and interpretations

Elements critical to overall stream health

- ✓Channel Condition
- ✓Bank Condition
- ✓Hydrological Alteration

Difficult to assess accurately

Scores of less than 5

- ✓May indicate substantial channel adjustments are occurring
- ✓May warrant a quantitative assessment by well-trained specialists

“No Regrets” Management Actions

- Riparian buffers/stabilizing vegetation
  - Improved agricultural practices
    - Don’t develop floodplains

Slow down the water