

# Equilibrium

“Channel stability” as used here is synonymous with “equilibrium”, or the ability of a stream, over time, to transport the sediment and streamflows produced by its watershed in such a manner that the stream maintains its dimension, pattern and profile with out aggrading nor degrading (Rosgen, 1996).

# Beaver Creek

Channel Restoration

Inventory

# OBJECTIVES

- Aerial photo evaluation.
- Field data collection for stream classification and reference reaches.
- Provide management interpretation of stream types.
- Evaluate the suitability of structures for stream types.

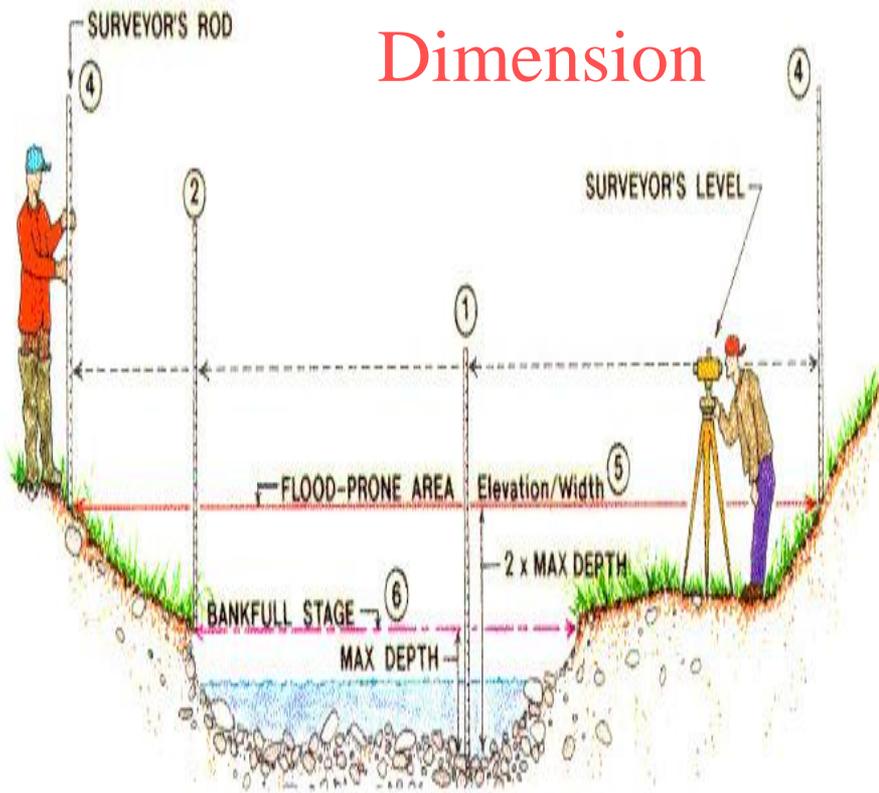
An aerial photograph of a river valley. A large dam is visible in the middle ground, with a reservoir behind it. The river flows through the valley, showing various channel types and breaks. The surrounding landscape is hilly and forested. The text 'AERIAL PHOTO EVALUATION' is overlaid in large, bold, black letters at the top of the image.

# AERIAL PHOTO EVALUATION

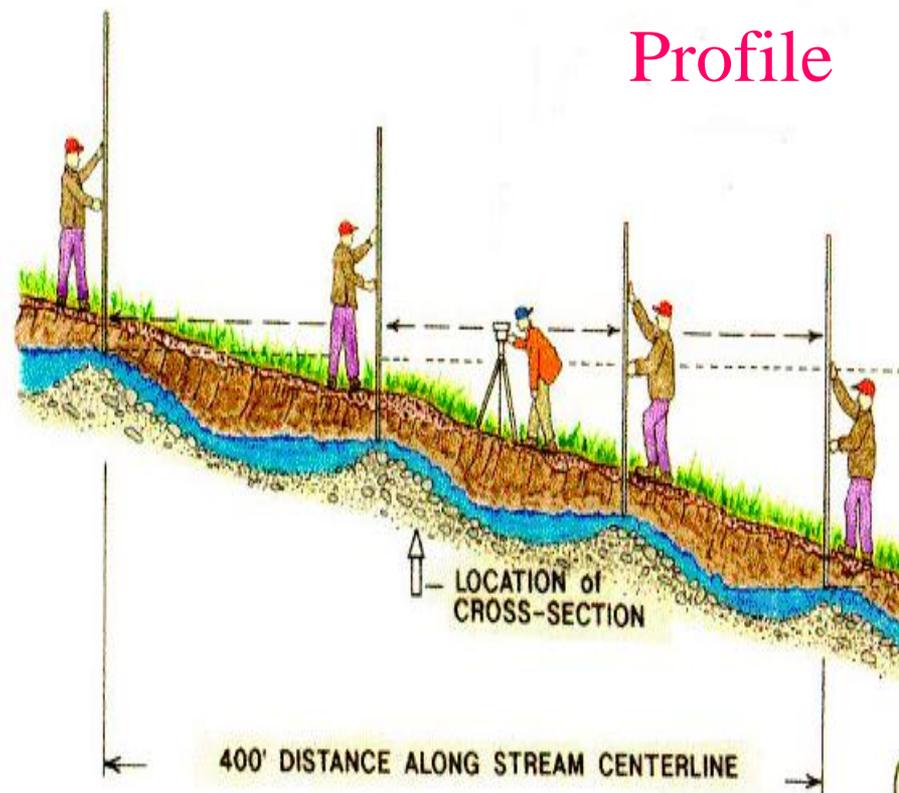
- **Historical channel condition**
- **Existing reach breaks and channel types**
- **Reference reach Identification**

# Stream Typing

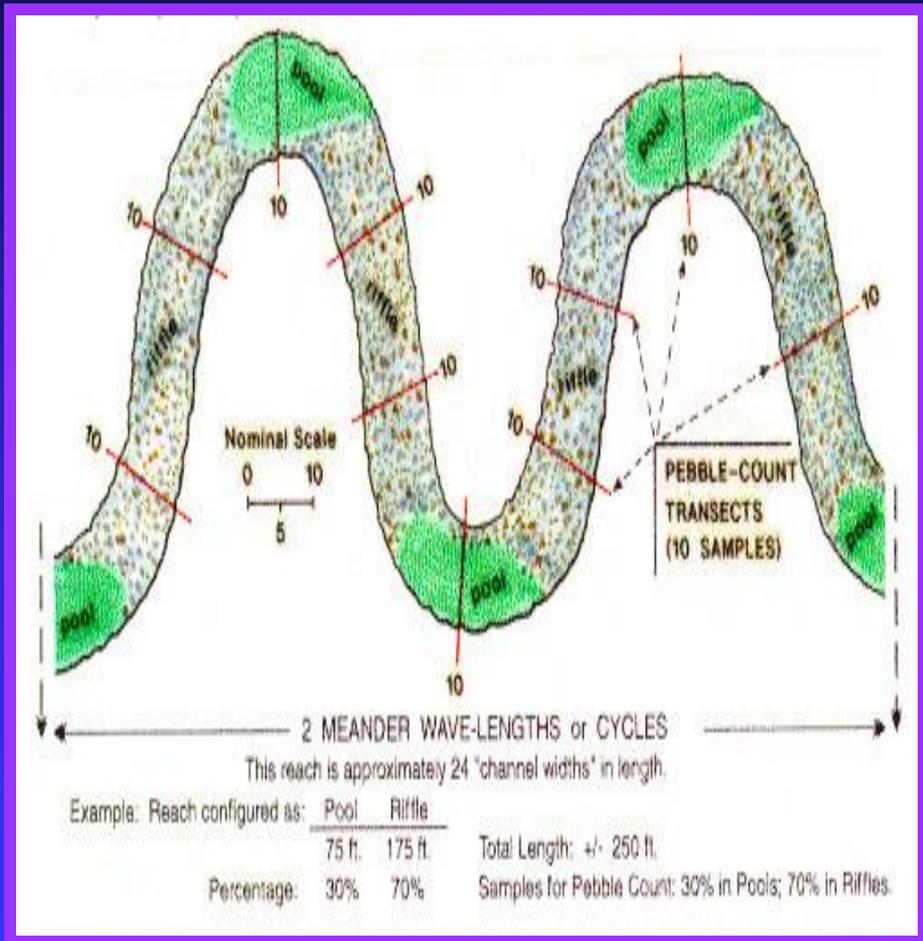
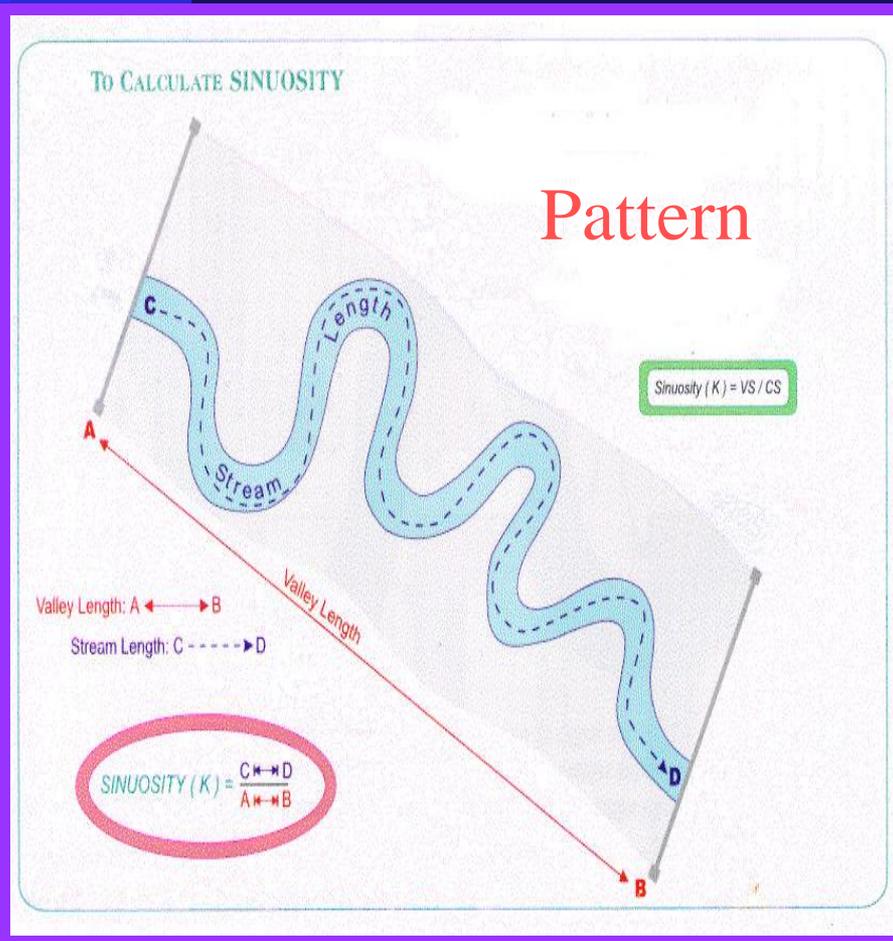
Dimension



Profile

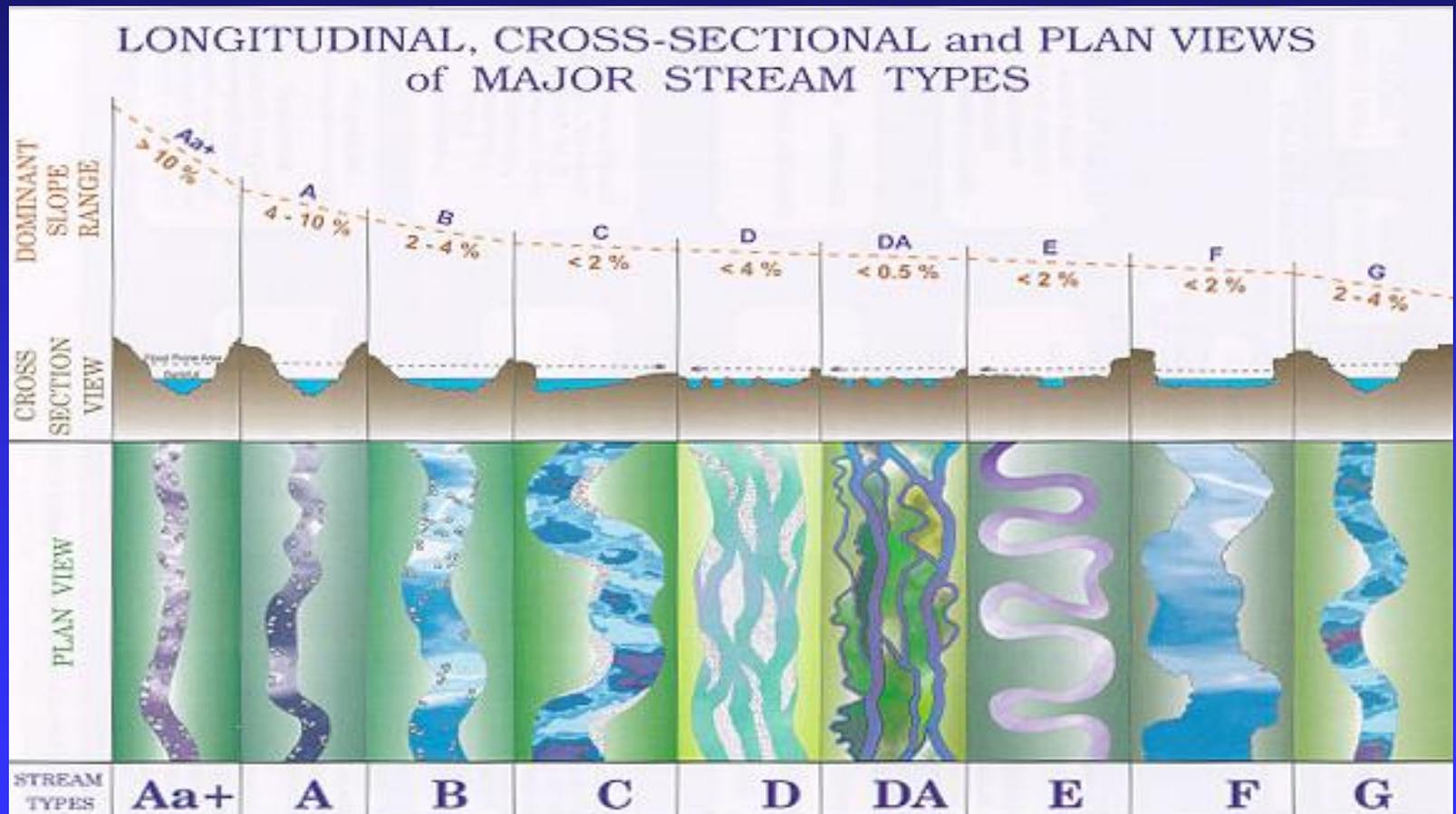


# Stream Typing



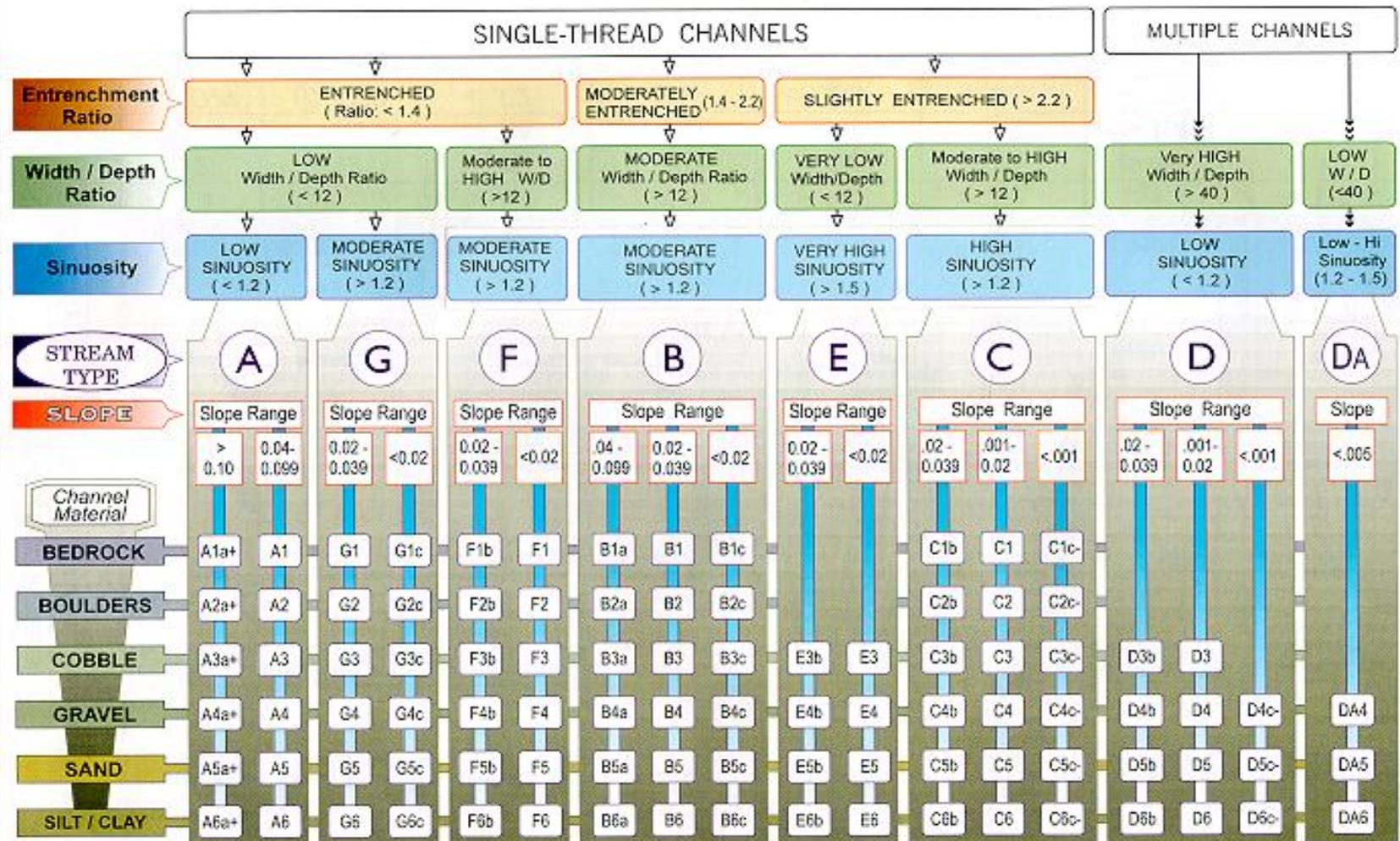
(Rosgen, 1996)

# Stream typing



(Rosgen, 1996)

# Stream Classification



KEY to the **ROSGEN** CLASSIFICATION of NATURAL RIVERS. As a function of the "continuum of physical variables" within stream reaches, values of **Entrenchment** and **Sinuosity** ratios can vary by +/- 0.2 units; while values for **Width / Depth** ratios can vary by +/- 2.0 units.

# Reference Reach

- All based on “BANK FULL”
- Segment that represents a stable channel
- Used to develop a natural design
- Stream channel dimension
- Dimensionless

# Log Barbs / J-Hook Veins



# Suitability of Structures

## APPLICATIONS

Previous Types 1985	Channel Type 1994	Low St. Ch. Dams	Med. St. Ch. Dams	Random Boulder Placement	Bank Placed Boulder	Single Wing Deflector	Double Wing Deflector	Channel Constrictor	Bank Cover	Half Log Cover	Floating Log Cover
A1	A1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
A2	A2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
A3	A3	FAIR	POOR	POOR	GOOD	POOR	FAIR	N/A	POOR	POOR	FAIR
A3	A4	FAIR	POOR	POOR	GOOD	POOR	FAIR	N/A	POOR	POOR	FAIR
A4	A5	FAIR	POOR	POOR	GOOD	POOR	FAIR	N/A	POOR	POOR	FAIR
A5	A6	FAIR	FAIR	POOR	GOOD	POOR	FAIR	N/A	POOR	FAIR	FAIR
B1-1	B1	POOR	POOR	POOR	EXC	POOR	POOR	POOR	EXC	GOOD	GOOD
B1	B2	EXC	EXC	N/A	N/A	EXC	EXC	EXC	EXC	N/A	N/A
B2	B3	EXC	GOOD	EXC	EXC	EXC	EXC	EXC	EXC	EXC	EXC
	B4	EXC	GOOD	EXC	EXC	EXC	EXC	EXC	EXC	EXC	EXC
	B5	GOOD	FAIR	FAIR	EXC	GOOD	GOOD	GOOD	EXC	GOOD	EXC
	B6	GOOD	FAIR	FAIR	EXC	GOOD	GOOD	GOOD	EC	EXC	EXC
C1-1	C1	POOR	POOR	POOR	N/A	POOR	POOR	POOR	EXC	EXC	EXC
C2	C2	GOOD	FAIR	N/A	N/A	GOOD	GOOD	GOOD	GOOD	N/A	GOOD
C2	C3	GOOD	FAIR	GOOD	EXC	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD
C3	C4	FAIR	POOR	POOR	GOOD	FAIR	FAIR	FAIR	GOOD	FAIR	GOOD
C4	C5	FAIR	POOR	POOR	GOOD	POOR	POOR	POOR	FAIR	POOR	GOOD
C5	C6	FAIR	POOR	POOR	GOOD	POOR	POOR	FAIR	GOOD	FAIR	GOOD
D1	D3	POOR	POOR	POOR	FAIR	FAIR	FAIR	FAIR	POOR	POOR	POOR
D1	D4	POOR	POOR	POOR	FAIR	FAIR	FAIR	FAIR	POOR	POOR	POOR
D2	D5	POOR	POOR	POOR	FAIR	FAIR	FAIR	FAIR	POOR	POOR	POOR
B6	E3	N/A	POOR	POOR	GOOD	POOR	FAIR	N/A	N/A	N/A	N/A
C6	E4	N/A	POOR	POOR	GOOD	POOR	FAIR	N/A	N/A	N/A	N/A
C6	E5	N/A	POOR	POOR	GOOD	POOR	FAIR	N/A	N/A	N/A	N/A
C6	E6	N/A	POOR	POOR	GOOD	POOR	FAIR	N/A	N/A	N/A	N/A
F1	F1	POOR	POOR	POOR	GOOD	FAIR	POOR	POOR	FAIR	FAIR	FAIR
F2	F2	FAIR	POOR	N/A	N/A	FAIR	FAIR	FAIR	FAIR	FAIR	FAIR
F3	F3	FAIR	POOR	FAIR	GOOD	GOOD	GOOD	FAIR	FAIR	FAIR	FAIR
F3	F4	FAIR	POOR	POOR	POOR	GOOD	FAIR	FAIR	FAIR	FAIR	FAIR
F4	F5	FAIR	POOR	POOR	GOOD	FAIR	FAIR	FAIR	FAIR	FAIR	FAIR
F5	F6	FAIR	POOR	FAIR	GOOD	FAIR	FAIR	FAIR	FAIR	FAIR	FAIR
	G1	N/A	N/A	POOR	N/A	N/A	N/A	N/A	POOR	FAIR	FAIR
	G2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	POOR	FAIR	N/A
	G3	FAIR	POOR	POOR	GOOD	POOR	FAIR	N/A	POOR	POOR	FAIR
B3	G4	FAIR	POOR	POOR	GOOD	POOR	FAIR	N/A	POOR	POOR	FAIR
B4	G5	FAIR	POOR	POOR	GOOD	POOR	FAIR	N/A	POOR	POOR	FAIR
B5	G6	FAIR	POOR	POOR	GOOD	POOR	FAIR	N/A	POOR	POOR	FAIR

TABLE 8-2a. Fish habitat improvement structures - suitability to stream types.

## APPLICATIONS

V-SHAPED GRAVEL TRAP*			LOG SILL GRAVEL TRAPS		
Rating	Channel Types	Limitation/Discussion	Rating	Channel Types	Limitation/Discussion
Exc.	B2	No limitations.	Exc.	B2	No limitations.
Good	B1, B3, C1-C3		Good	B1, B3, C2, C3	
Fair	E3, F2, F3	Higher sediment yields make invasion of fines possible. Use with pervious trap so intra-gravel flow rate is maintained.	Fair	C1, F2, F3, E3	Frequent bed scour or bank erosion may inundate gravel with fines.
Poor	G3-G6, B5, B6, C5, C6, D3, D5, D6, E5, E6, F1, F5, F6, A3-A6	Entrench. and low w/d struct. unstable Unstable bank and bed with high sediment supply limits effectiveness and/or no source for suitable spawning-gravel.  Stream too steep and/or unstable	Poor	B5, B6, C5, C6, D3, D5, D6, F1, F5, F6, E5, E6, A3-A6, G3-G6	High transport of fine sediments. gravel size bedload unavailable. Unstable bed and banks, hi. bedload.
N/A	B4, C4, E4, F4, A1, A2, G1, G2	Stream types that have gravel sizes for spawning potential. Not associated with spawning habitat	N/A	B4, C4, E4, F4, D4, A1, A2, G1, G2	Channel too steep and/or unstable for structures.  Gravel bed stream types that have spawning potential. Not associated with spawning habitat
*Note: Downcutting often occurs at the apex which can undermine the structure.					
GRAVEL PLACEMENT			MIGRATION BARRIER		
Rating	Channel Types	Limitation/Discussion	Rating	Channel Types	Limitation/Discussion
Exc.		No limitations.	Exc.	A1, A2	No limitations.
Good	B3, C2, C3	Must select lower velocity areas within the reach - transition zones between pool and riffle.	Good	B1-B4, G1, G2	Proper site selection must be made within the reach where banks are high and stable.
Fair	B1, B2, C1, E3, F2, F3	May not be effective considering the limited area where critical shear velocities would not be exceeded. Can cause capacity reduction and increase bank erosion. Treat smaller percentage of the channel area and/or stabilize banks. Potential for fine sediment invasion with minimal disturbance due to frequent bed shifts.	Fair	A3-A6, B5, B6	Erodible banks and moderate confinement limit barrier placement.
Poor	B5, B6, C5, C6, D3, D5, D6, F5, F6, E5, E6, F1, A1-A6, G1-G6	Will fill in with finer bed load transported material.  Channel too steep, deeply incised and/or unstable for spawning channel.	Poor	C1-C6, D3-D6, E3-E6, F1-F6, G3-G6	Bank and bed instability can result in structure failure. Low banks - cannot create adequate height for falls.
N/A	B4, C4, D4, E4, F4	Gravel bed stream type.	N/A		

TABLE 8-3d. Limitations and discussions of various fish habitat improvement structures by stream types. (Cont.)

# PROPOSAL

- NFCDA WAG write grant(s) (319, RAC or ? ) to meet objectives stated above.
- Cost share with ISWCC, SWCD and private land owners when conducting field surveys.
- Administered through Panhandle Lakes RCD.