

MEMORANDUM

TO: Turners Falls Project team
FROM: Brandon Kulik
DATE: May 1, 2013
RE: **INSTREAM FLOW STUDY: HABITAT SUITABILITY CRITERIA**

On April 16, 2013, the participants at the First Light study scoping meeting identified additional species and lifestages for which Habitat Suitability Criteria (HSC)) criteria would be required. This included darter and dace species; walleye (spawning, fry, juvenile, and adult lifestages and aquatic macroinvertebrates. During the discussion it was also suggested that a habitat guild approach might be an alternative for at least some species. The purpose of this memo is to summarize recommended HSC for these species.

LITERATURE CITED

- Central Vermont Public Service System. Lamoille River IFIM study. Gomez- Sullivan Engineers, Weare, NH
- Mc Mahon, T.E., J.W. Terrell, and P.C. Nelson. 1984. Habitat suitability information: Walleye. U.S. Fish and Wildl. Serv. FWS/OBS-82/10.56. 43 pp.
- South Carolina Electric and Gas Company. 2008. Saluda River Instream Flow Study. Kleinschmidt Associates, Pittsfield, Maine.

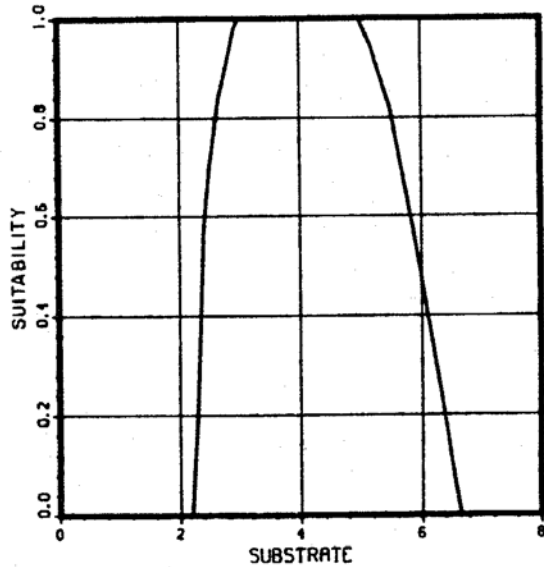
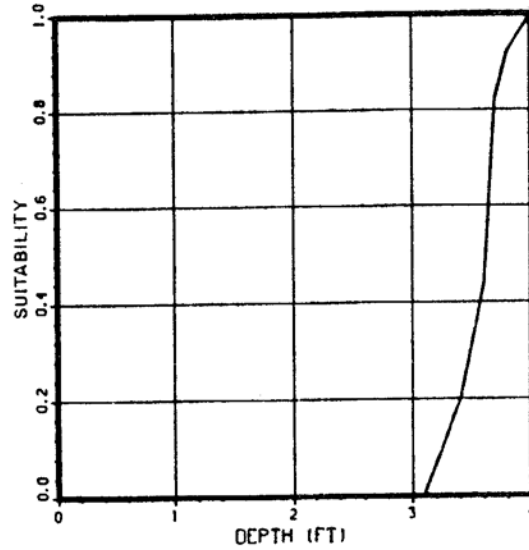
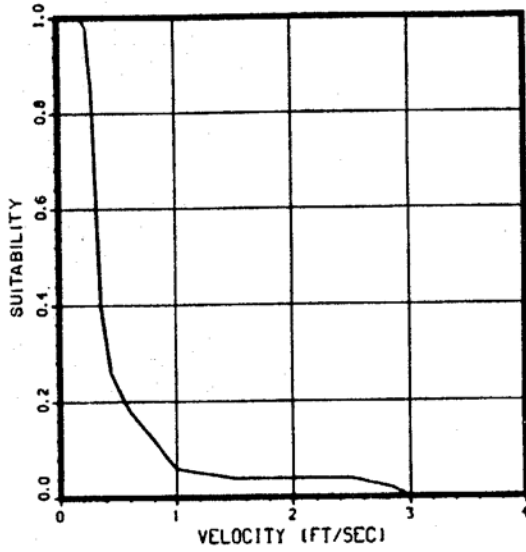
Walleye.

The following Category 2 curves were developed by McMahon, et al., 1984:

50002

ADULTS

78/07/26.

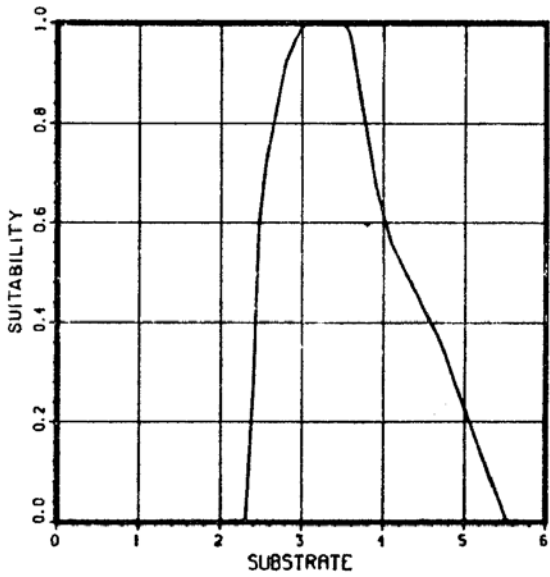
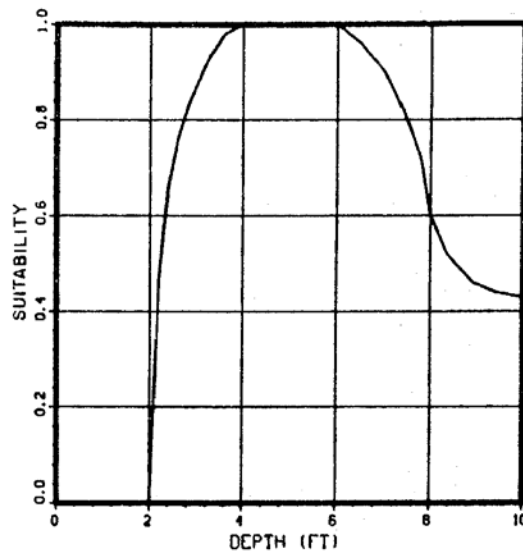
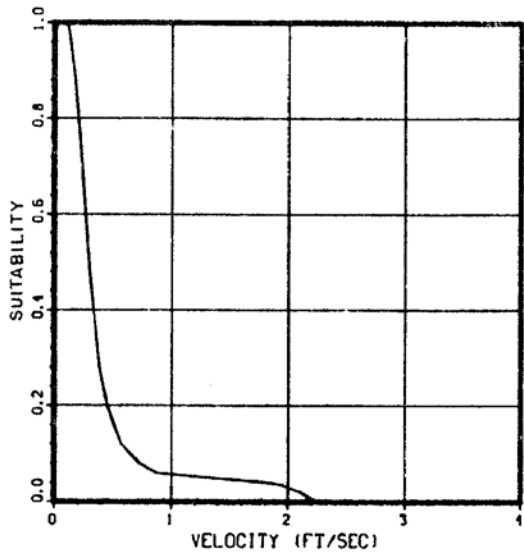


- The following categories can be used for IFIM analyses (see Bovee 1982):
- 1 = plant detritus/organic material
 - 2 = mud/soft clay
 - 3 = silt (particle size < 0.062 mm)
 - 4 = sand (particle size 0.062-2.000 mm)
 - 5 = gravel (particle size 2.0-64.0 mm)
 - 6 = cobble/rubble (particle size 64.0-250.0 mm)
 - 7 = boulder (particle size 250.0-4000.0 mm)
 - 8 = bedrock (solid rock)

50001

JUVENILES

78/07/19.

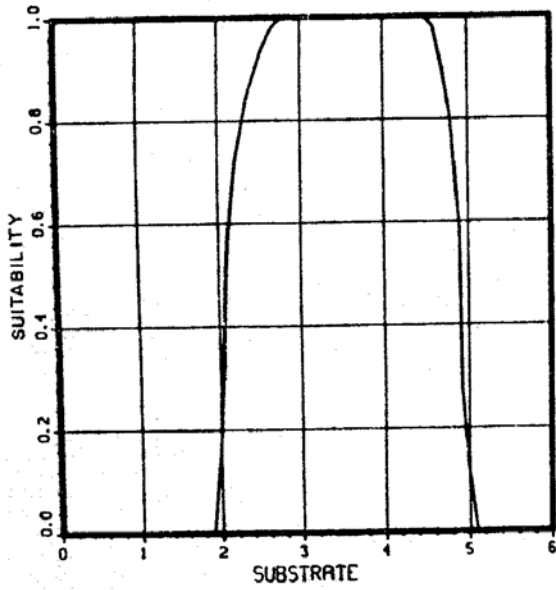
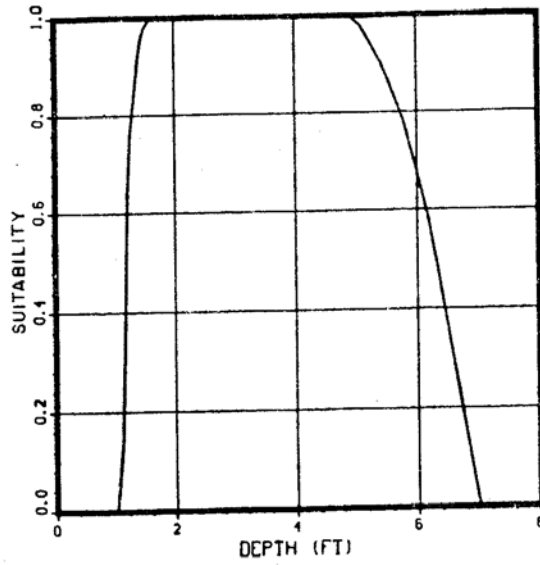
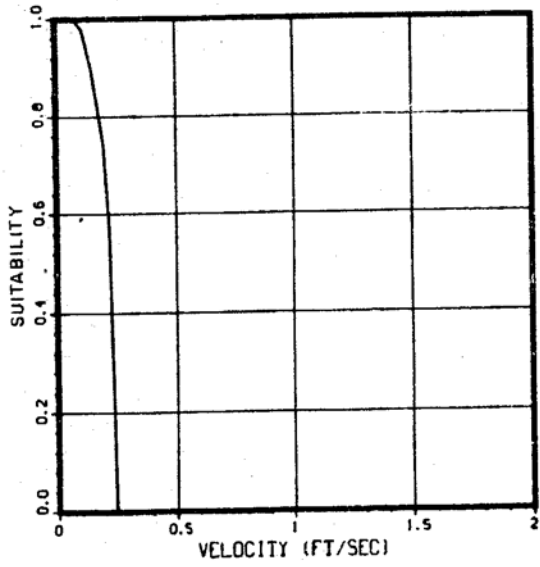


SUITABILITY

50000

FRY

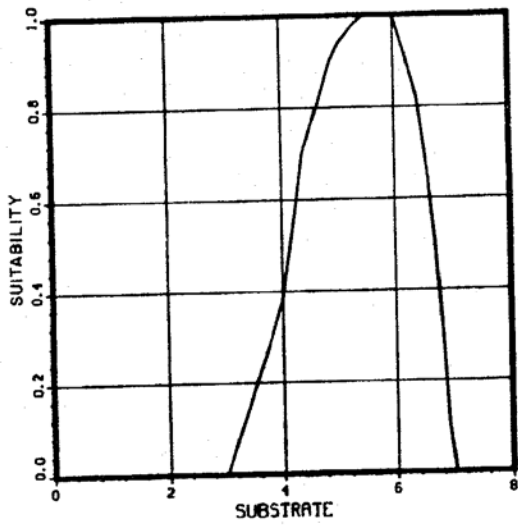
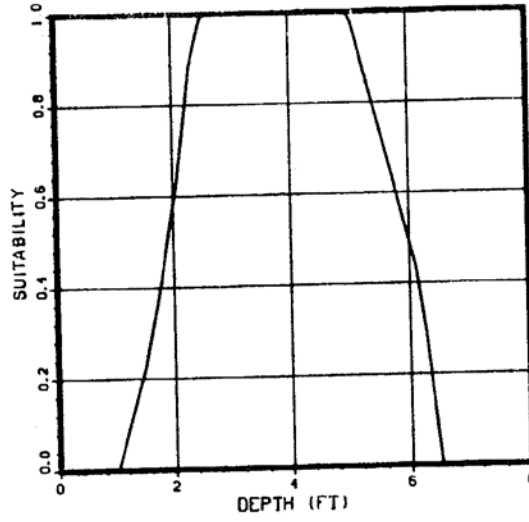
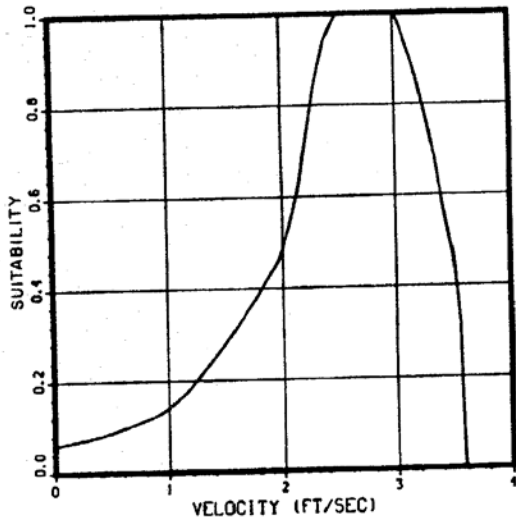
78/07/19.



50003

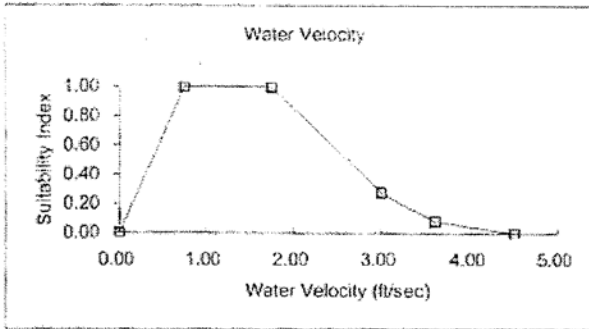
SPAWNING

78/07/13.

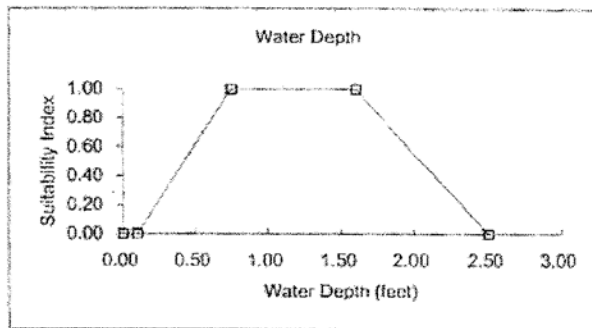


Species: Longnose Dace
Lifestage: Adult

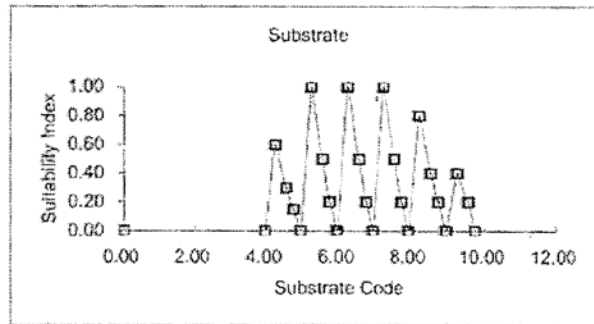
Velocity	
Velocity	SI Value
0.00	0.00
0.75	1.00
1.75	1.00
3.00	0.28
3.50	0.08
4.50	0.00
100.00	0.00



Depth	
Depth	SI Value
0.00	0.00
0.10	0.00
0.75	1.00
1.60	1.00
2.50	0.00
100.00	0.00



Substrate			
Substrate	SI Value	Substrate	SI Value
0.00	0.00	6.93	0.00
3.96	0.00	6.96	0.00
4.23	0.60	7.23	1.00
4.26	0.60	7.26	1.00
4.53	0.30	7.53	0.50
4.56	0.30	7.56	0.50
4.73	0.15	7.73	0.20
4.76	0.15	7.76	0.20
4.93	0.00	7.93	0.00
4.96	0.00	7.96	0.00
5.23	1.00	8.23	0.80
5.26	1.00	8.26	0.80
5.53	0.50	8.53	0.40
5.56	0.50	8.56	0.40
5.73	0.20	8.73	0.20
5.76	0.20	8.76	0.20
5.93	0.00	8.93	0.00
5.96	0.00	8.96	0.00
6.23	1.00	9.23	0.40
6.26	1.00	9.26	0.40
6.53	0.50	9.53	0.20
6.56	0.50	9.56	0.20
6.73	0.20	9.73	0.00
6.76	0.20	100.00	0.00



Note: This SI curve shows embeddedness because it is related to habitat quality.

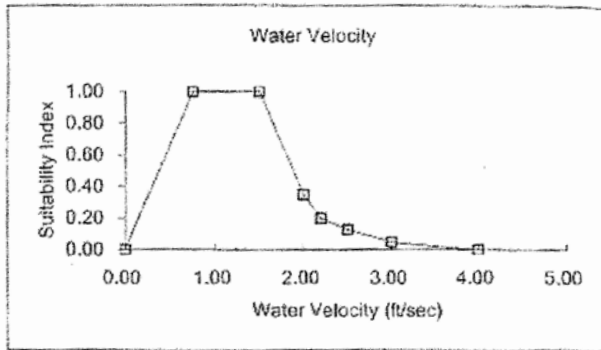
Reference: Library of Midcontinent Ecological Science Center, U.S. Geological Service, and modified by VDFW.

Lamotte River IFM
Gomez and Sullivan Engineers
2-10-00

Species: Longnose Dace
Lifestage: Juvenile

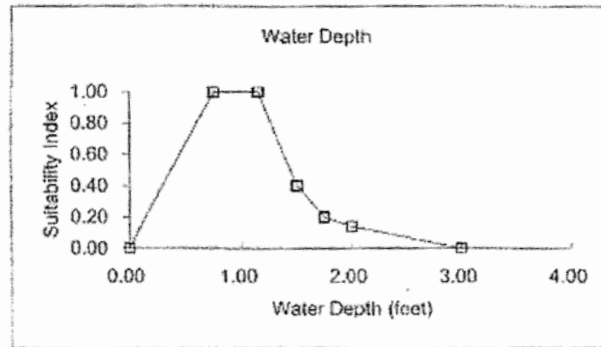
Velocity

Velocity	SI Value
0.00	0.00
0.75	1.00
1.50	1.00
2.00	0.35
2.20	0.20
2.50	0.13
3.00	0.05
4.00	0.00
100.00	0.00



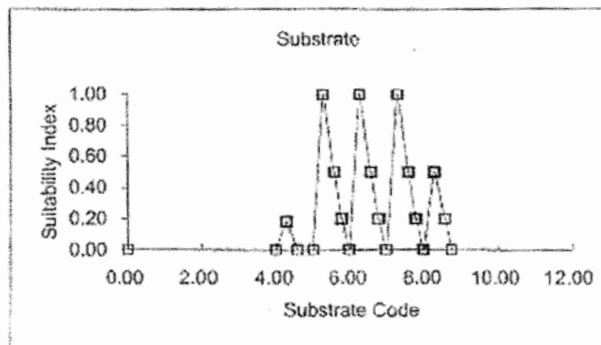
Depth

Depth	SI Value
0.00	0.00
0.75	1.00
1.15	1.00
1.50	0.40
1.75	0.20
2.00	0.14
3.00	0.00
100.00	0.00



Substrate

Substrate	SI Value	Substrate	SI Value
0.00	0.00	6.73	0.20
3.96	0.00	6.76	0.20
4.23	0.18	6.93	0.00
4.26	0.18	6.96	0.00
4.53	0.00	7.23	1.00
4.96	0.00	7.26	1.00
5.23	1.00	7.53	0.50
5.26	1.00	7.56	0.50
5.53	0.50	7.73	0.20
5.56	0.50	7.76	0.20
5.73	0.20	7.93	0.00
5.76	0.20	7.96	0.00
5.93	0.00	8.23	0.50
5.96	0.00	8.26	0.50
6.23	1.00	8.53	0.20
6.26	1.00	8.56	0.20
6.53	0.50	8.73	0.00
6.56	0.50	100.00	0.00



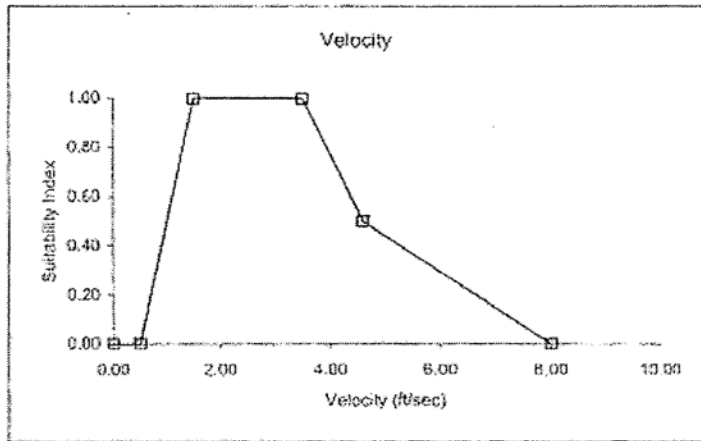
Note: This SI curve shows embeddedness because it is related to habitat quality.

Reference: Library of Midcontinent Ecological Science Center, U.S. Geological Service, and modified by VDFW.

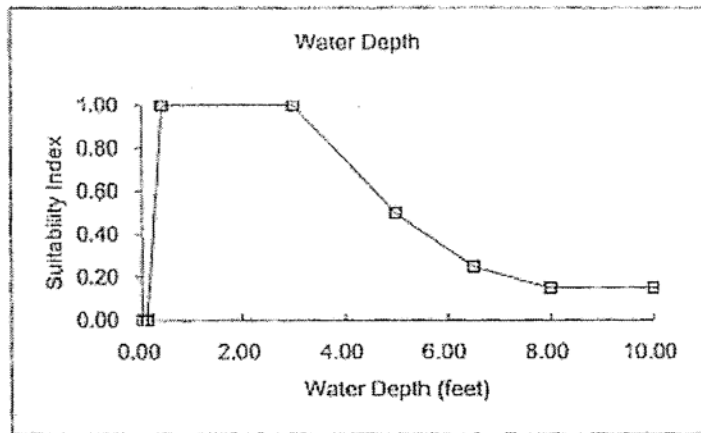
Lampille River IFIM
 Gomez and Sullivan Engineers
 2/10/00
 Page R-18

Species: Modified VANR Macroinvertebrates
(VANR modified Velocity and NMPC Macros Depth & Substrate)

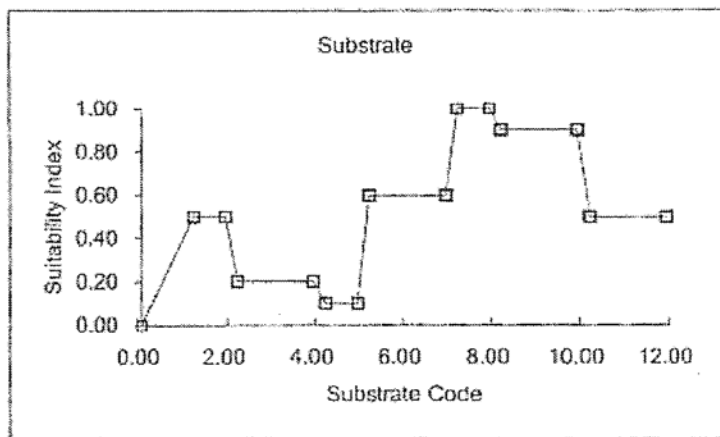
Velocity	SI Value
0.00	0.00
0.50	0.00
1.50	1.00
3.50	1.00
4.60	0.50
8.00	0.00
100.00	0.00



Depth	SI Value
0.00	0.00
0.10	0.00
0.40	1.00
3.00	1.00
5.00	0.50
6.50	0.25
8.00	0.15
10.00	0.15
100.00	0.00



Substrate	SI Value
0.00	0.00
1.23	0.50
1.96	0.50
2.23	0.20
3.96	0.20
4.23	0.10
4.96	0.10
5.23	0.60
6.96	0.60
7.23	1.00
7.96	1.00
8.23	0.90
9.96	0.90
10.23	0.50
11.96	0.50
100.00	0.00



CENTRAL VERMONT PUBLIC SERVICE CORPORATION
LAMOILLE RIVER INSTREAM FLOW STUDY
SUBSTRATE CODING SYSTEM

Substrate Codes:

- 1- Roots, Snags, Undercut Banks, Overhead Cover
- 2- Clay
- 3- Silt
- 4- Sand
- 5- Small Gravel (< 2")
- 6- Gravel (2"-4")
- 7- Cobble (4"-10")
- 8- Boulder (10"-2')
- 9- Boulder (>2')
- 10- Ledge
- 11- Detritus, Vegetation

Percent Embeddedness Codes:

- .2 - 0-25% Embeddedness
- .5 - 26-50% Embeddedness
- .7 - 51-75% Embeddedness
- .9 - 76-100% Embeddedness

Embeddedness = Amount of fine material in interstitial spaces

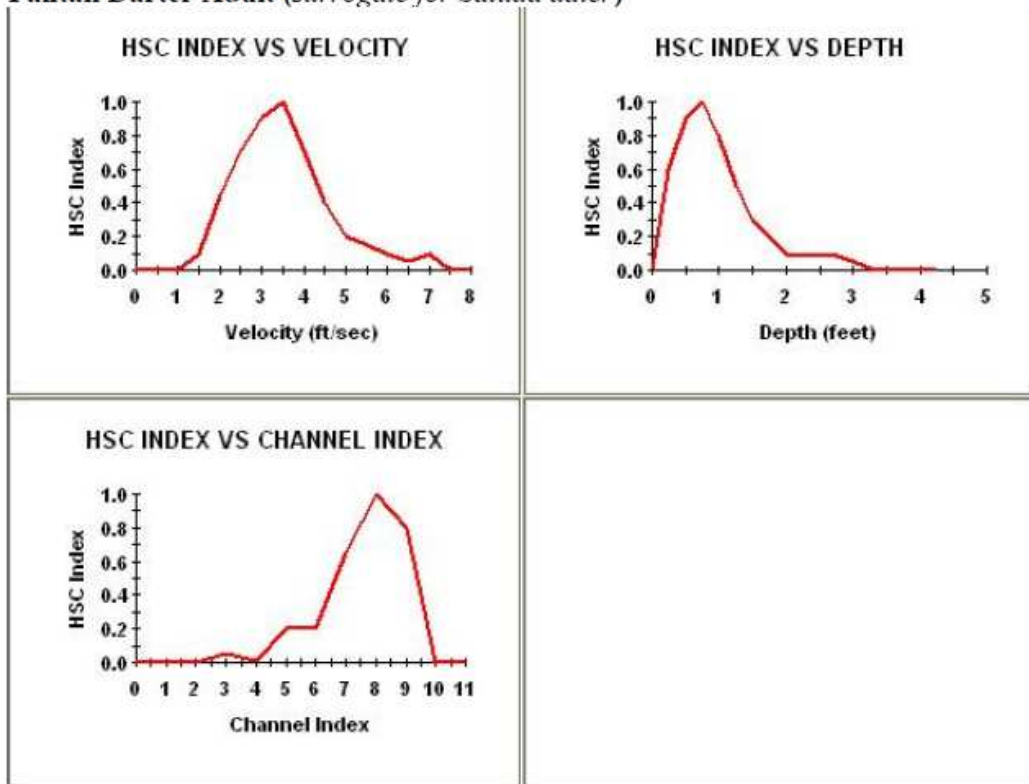
Cover Codes:

- 0.03 Cover- Few Velocity Refuges
- 0.06 Cover- Abundant Velocity Refuges

where Abundant Velocity Refuges are defined as: Large Boulder >25% or,
Small Boulder >75% or,
Instream Structural Cover >50%

Suggested surrogate criteria for Connecticut River darter species

Fantail Darter Adult (*surrogate for Saluda dater*)



Shallow-Fast Guild Spawning

