AQU 2 Appendix 1

Habitat Suitability Criteria for Swift Bypass Reach and Meeting Participants

AQU 2 Appendix 1

Suitability Curves used in the Swift Bypass Reach IFIM study

Participants in Lewis River workshops to develop habitat suitability criteria

Name	Organization
Hal Beecher	WDFW
Brad Caldwell	WDOE
Tim Hardin	Hardin-Davis Inc.
Curt Leigh	WDFW
Dave Leonhardt	PacifiCorp
Erik. Lesko	PacifiCorp
Diana. MacDonald	Cowlitz PUD
Jennifer Sampson	American Rivers
Gene Stagner	USFWS
Bob Tuck	Yakama Nation

Lewis River Habitat Suitability Curve References

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Notes on meeting in Lacey, Dec 15 2000

Present: Curt Leigh, Bob Tuck, Hal Beecher, Brad Caldwell, Gene Stagner, Jennifer Sampson, Dave Leonhardt, Erik Lesko, Tim Hardin

The IHA was discussed briefly. J. Sampson thought IHA could provide a better recommended flow regime than PHABSIM. Hydrologic diversity should provide habitat diversity. The conservation groups want to protect the whole ecosystem, not build in trade-offs among species. T. Hardin said the two methods were compatible. PHABSIM could be used to develop seasonal flows for various species. Then some proposals for flow fluctuation could be made. Fluctuating flows could be run through IHA to calculate scores; these same flows could be run through PHABSIM to calculate average WUA values over any time period. To date, no one has advanced any specific flow-fluctuation proposal.

The proposed curves provided by T. Hardin were discussed, and compared to the literature curves for selected species and life stages. Discussions were lengthy, so by 1PM only rainbow trout and bull trout had been addressed. Consensus curves were developed for rainbow trout adults and juveniles, and for bull trout rearing (combined juvenile-adult) and spawning.

The group agreed to meet again in Lacey on January 5. H Beecher thought we could make faster progress if we first went through the proposed curves to pick out those that are not controversial, and focus our time on the more difficult curves.

<u>Findings</u>

Rainbow trout adults.
Depth: Use the proposed curve, but bring the index down to 0.82 between 4 and 6 ft; leave at 0.82 thereafter
Velocity Adopt the proposed curve

Rainbow trout juveniles
Depth: Move the proposed curve slightly to the left, and use the McKenzie (Hardin-Davis et al. 1990) coordinates on the right side.
Velocity: Adopt the proposed curve

Bull trout
H Beecher displayed his most recent data on bull tout. We discussed nose velocities vs. mean velocities, and decided that our models would work better with mean velocity data. We also decided that bull trout should show a strong preference for large substrate. After considerable discussion, the group decided to adopt one combined curve ("rearing") for juveniles and adults.

Rearing
Depth: The curve has 0.0 suitability to 0.5 ft, then rises to 1.0 at 1.0 ft and remains up.

Velocity: The consensus curve follows H. Beecher's new data, but is smoothed on the left side. It drops to 0.0 at 3 ft/sec.

Spawning
Depth: The curve follows WDFW on the left side, then drops to 0.5 at all depths of 4 ft. or more.

Velocity: The consensus curve follows WDFW, but is shifted slightly to the left at higher velocities.

Hydraulic modeling. WDFW and WDOE have not reviewed the hydraulic (IFG4) models yet. T. Hardin agreed to re-send the uncalibrated data in two different formats. He will also send calibrated files. WDOE and WDFW will examine them and determine whether a meeting is needed to agree on the hydraulic results.

Notes on meeting in Lacey, Jan 05 2001

Present: Bob Tuck, Brad Caldwell, Diana MacDonald, Dave Leonhardt, Tim Hardin

This was a continuation of the December 15 meeting to develop HSI curves for the Lewis River. The proposed curves provided by T. Hardin were discussed, and compared to the literature curves for selected species and life stages. Consensus curves were developed for rainbow trout spawning, cutthroat trout juvenile/adult/spawning, whitefish adult/juvenile, chinook juvenile/spawning, coho juvenile/spawning, and steelhead juvenile/spawning.

Curves for the following life stages were tabled for the time being: Rainbow juvenile and adult winter rearing; Chinook fry and adult holding; coho fry; steelhead fry and adult holding. B. Caldwell stated that WDFW and WDOE did not normally consider any of these life stages when making flow recommendations. Fry curves and winter curves tend to peak at very low flows; holding habitat for anadromous adults can be protected by providing spawning habitat. The Applicants are free to use the proposed curves for any of these life stages, but the results will probably not affect the State's interpretation.

FINDINGS

Rainbow trout spawning

Depth and Velocity: Proposed curves kept as-is.

Cutthroat trout adult

Depth : Proposed curve from WDFW adjusted slightly on right side
Velocity: Proposed curves kept as-is.

Cutthroat trout juvenile: Use the cutthroat adult curves

Cutthroat trout spawning: Use the rainbow trout spawning curves

Whitefish adult

Depth: Peak shifted slightly to 2.8 based on most curves
Velocity: Right side of peak shifted to 2.75 based on most curves

Whitefish juvenile

Depth: Peak shifted slightly to left based on several of the literature curves plus professional opinion (Caldwell and Tuck)
Velocity: Proposed curves kept as-is.

Chinook juvenile

Depth: Use NESCO Lewis River curve
Velocity Use NESCO Lewis River curve

Chinook spawning

Depth and Velocity: Proposed curves kept as-is.

Coho juvenile: B. Caldwell stated that the agencies might not consider these curves, since these fish key into low-velocity areas with cover.

Depth: Proposed curves kept as-is.
Velocity: Change to WDFW curve.

Coho spawning

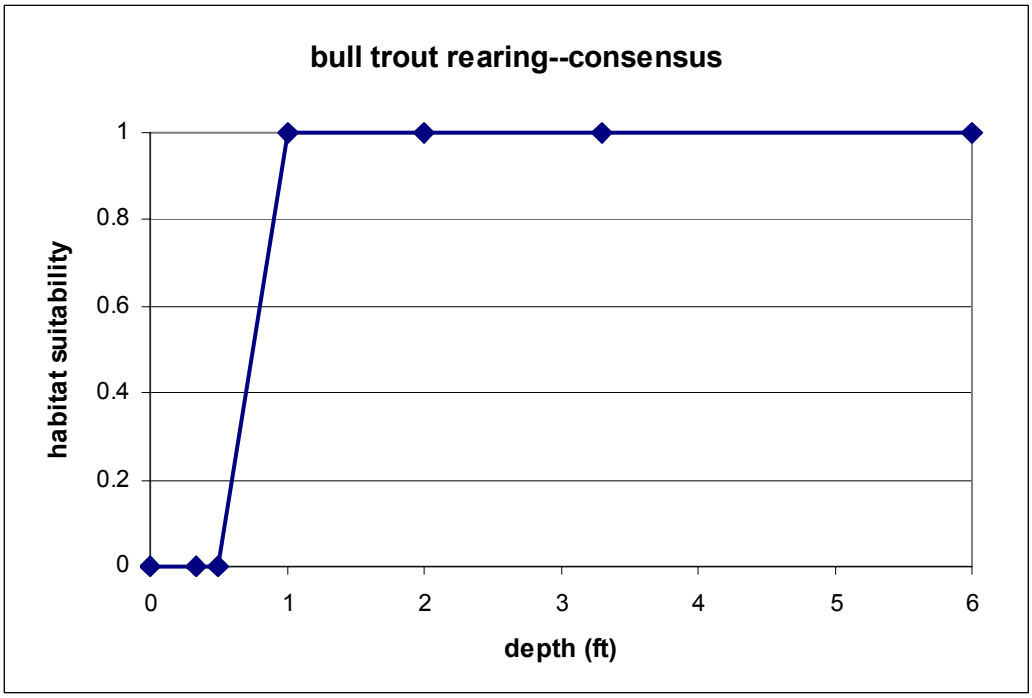
Depth: Proposed curve shifted slightly on right side, based on most literature curves
Velocity : Proposed curve shifted slightly on right side, based on most literature curves

Steelhead juvenile

Depth: Peak at 1.6 to 2.8 ft, based on Hardin (McKenzie R.) and WDFW curves
Velocity : Proposed curve kept as-is.

Steelhead spawning

Depth: End proposed curve at 4 ft due to lack of observations beyond this depth
Velocity: Proposed curve kept as-is.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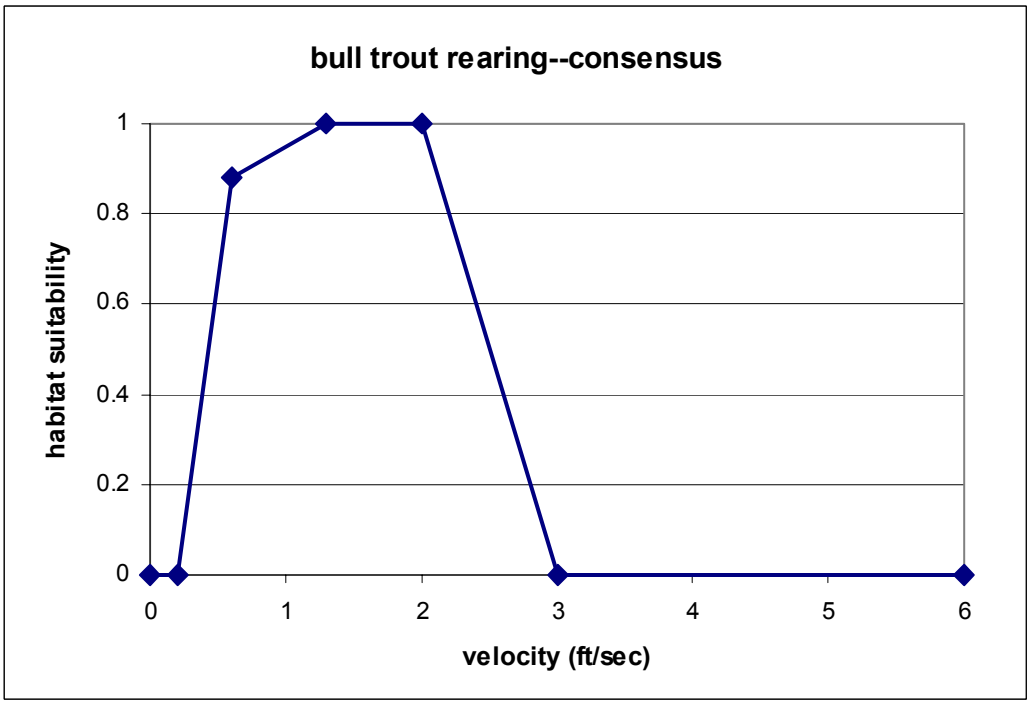
depth (ft)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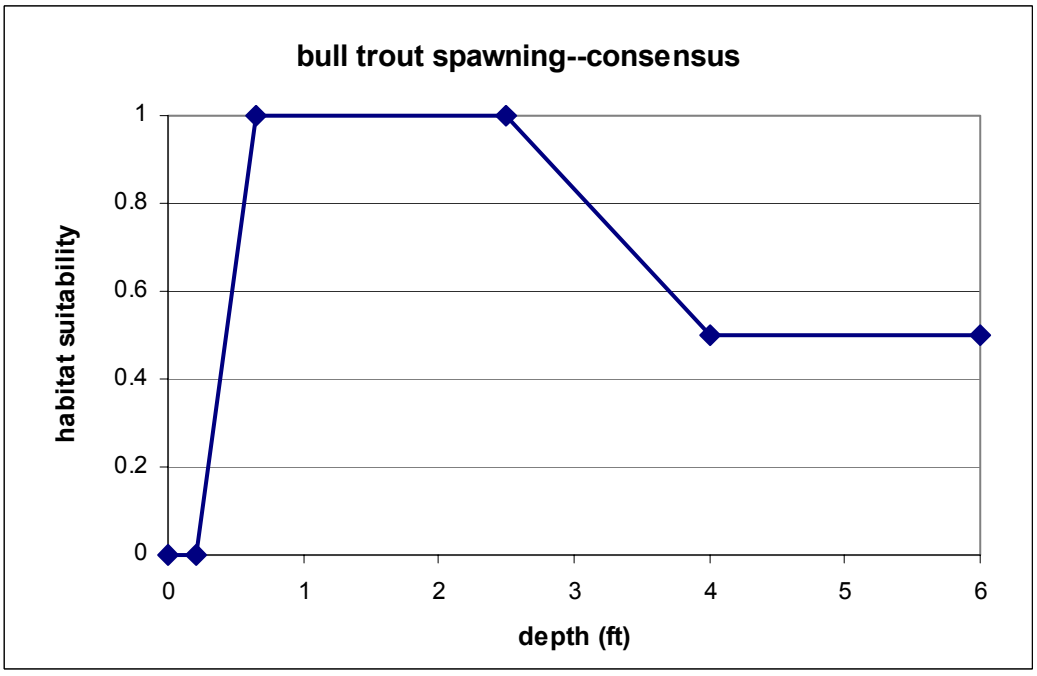
velocity (ft/sec)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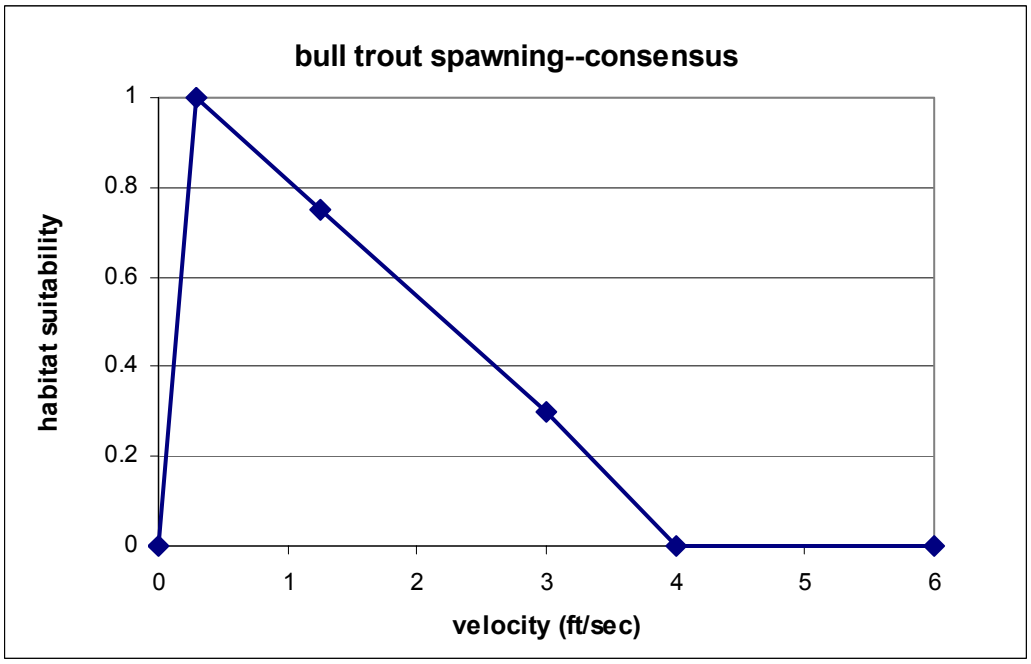
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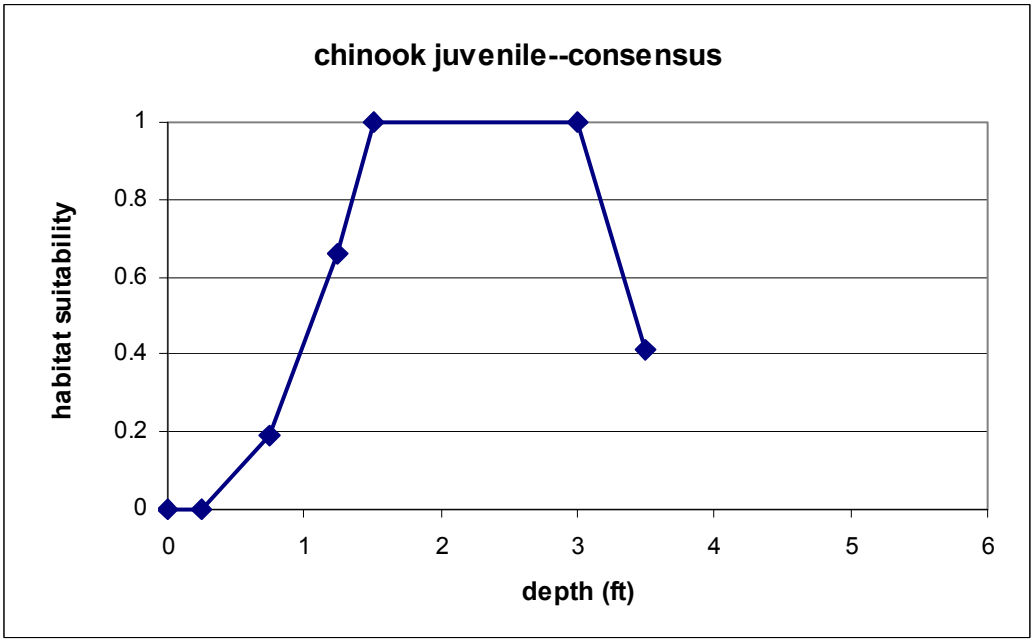
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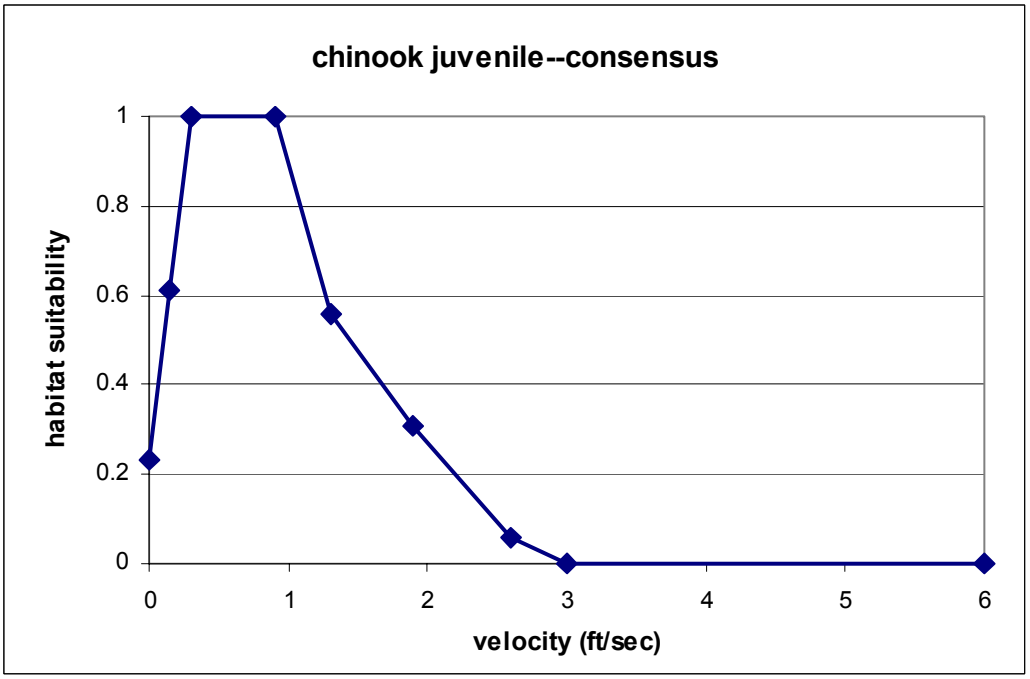
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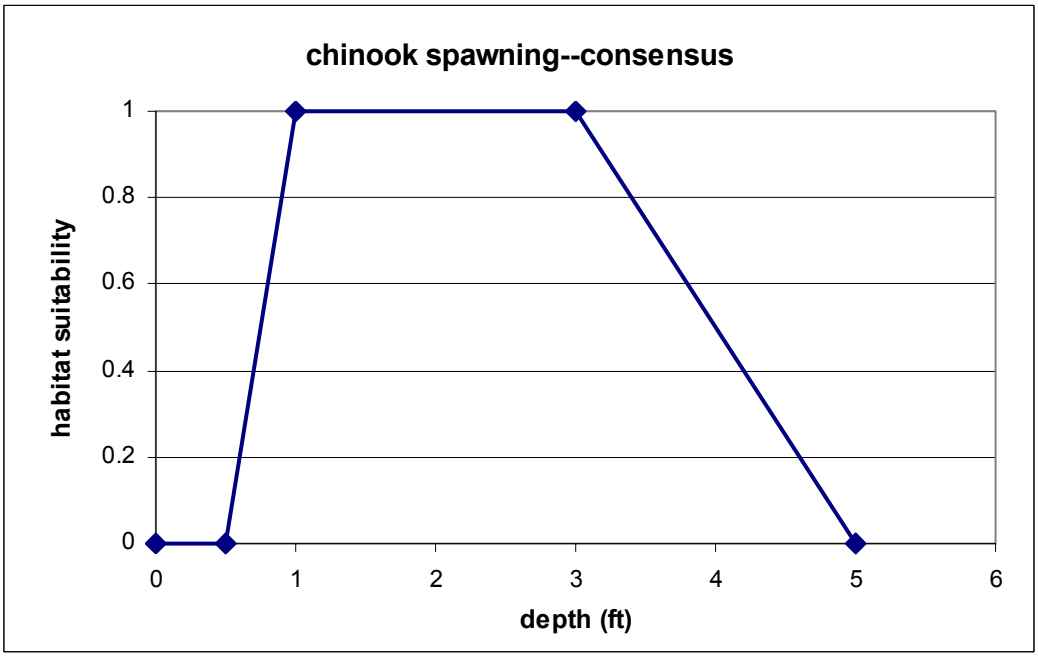
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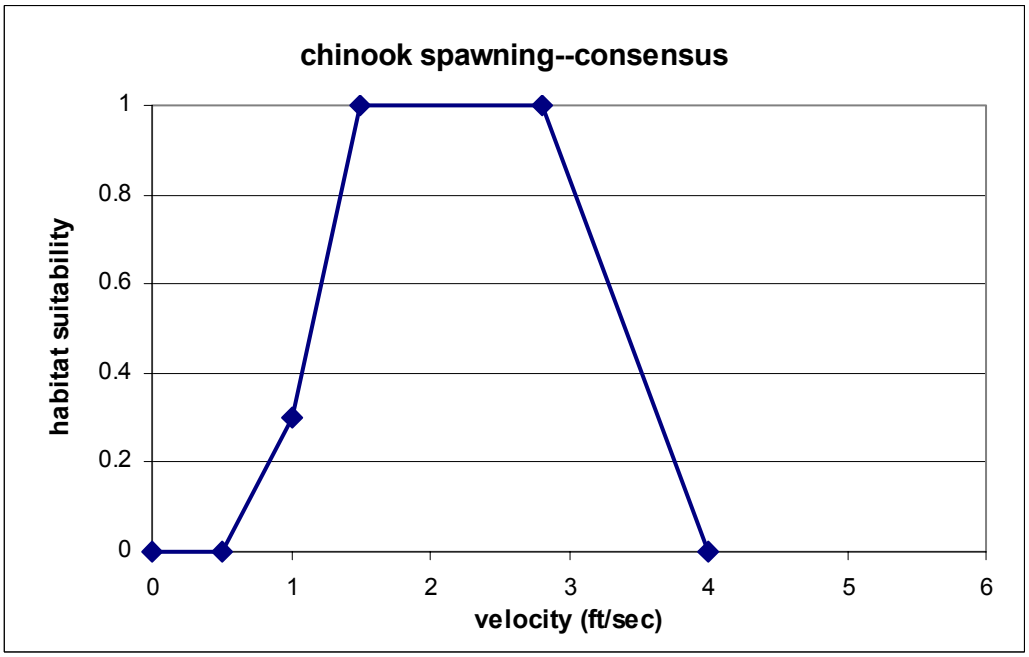
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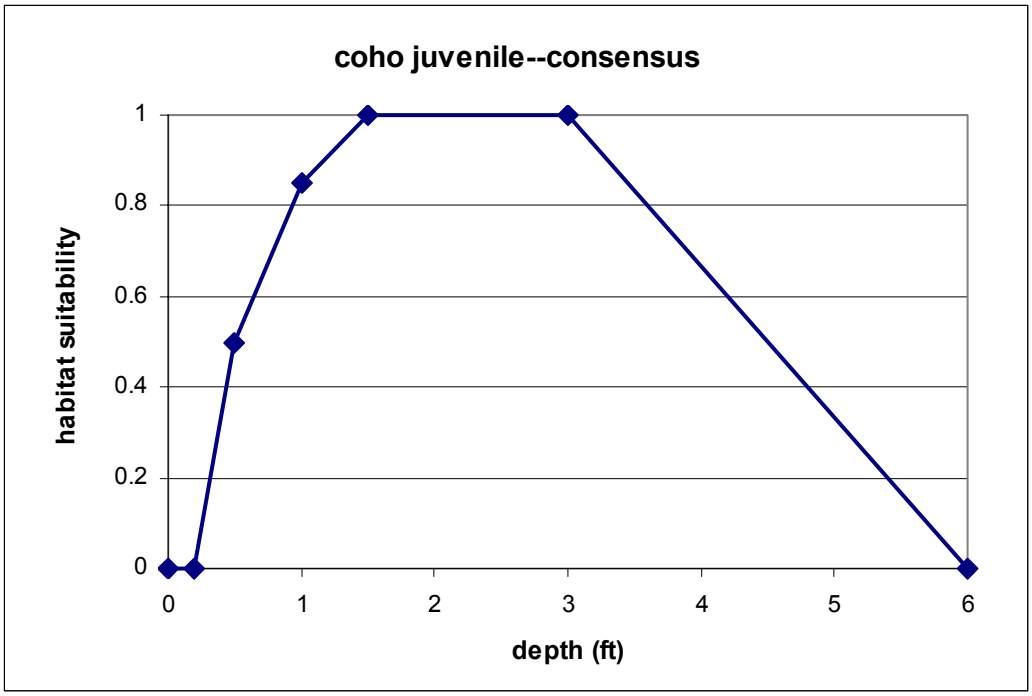
velocity (ft/sec)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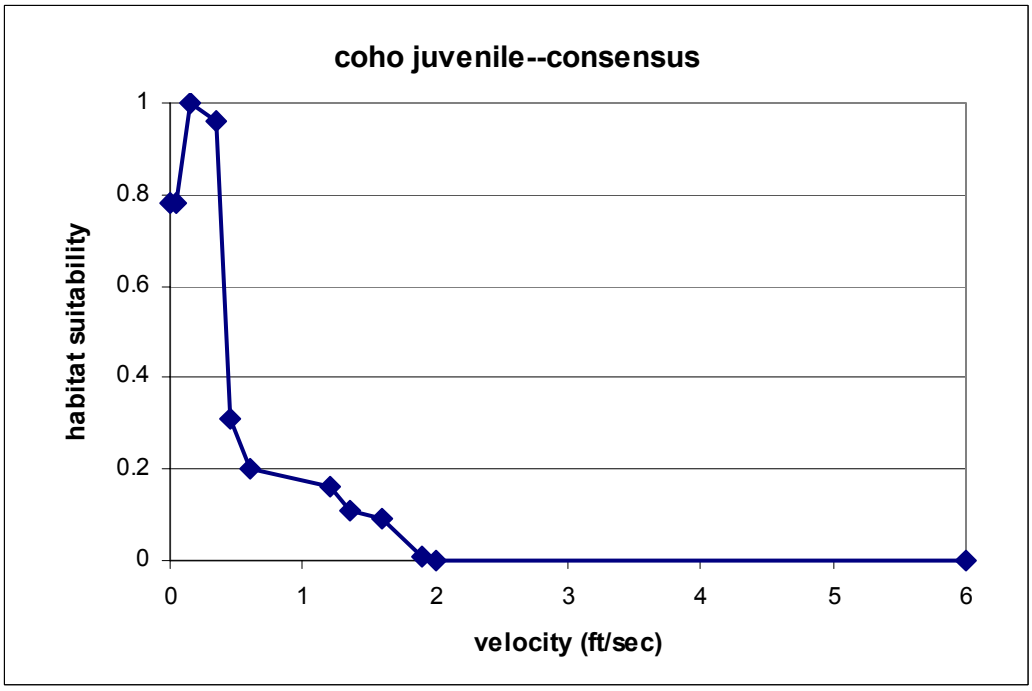
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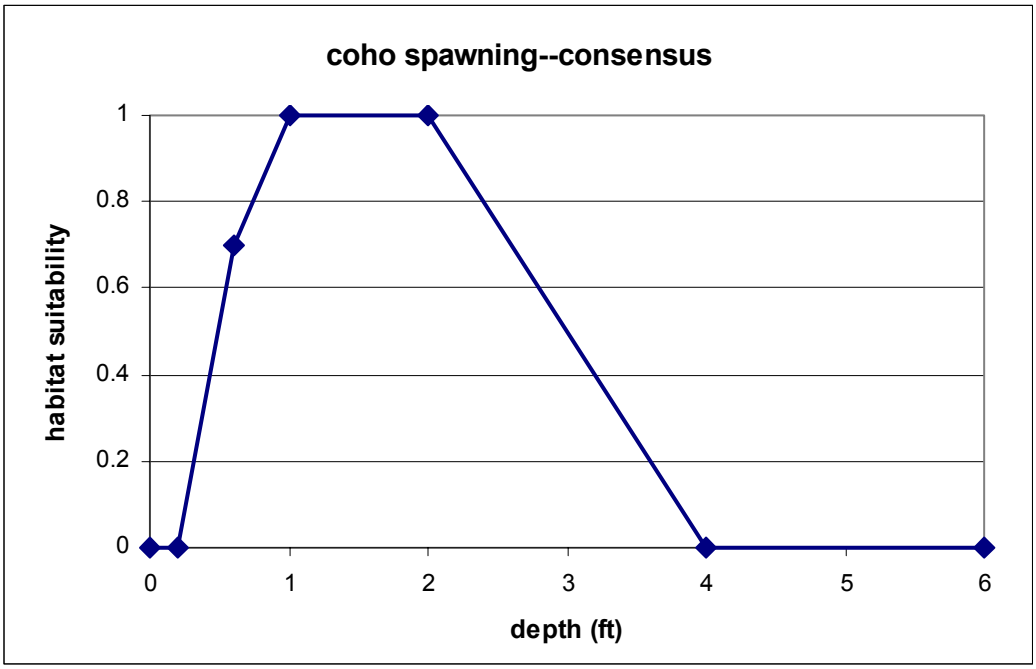
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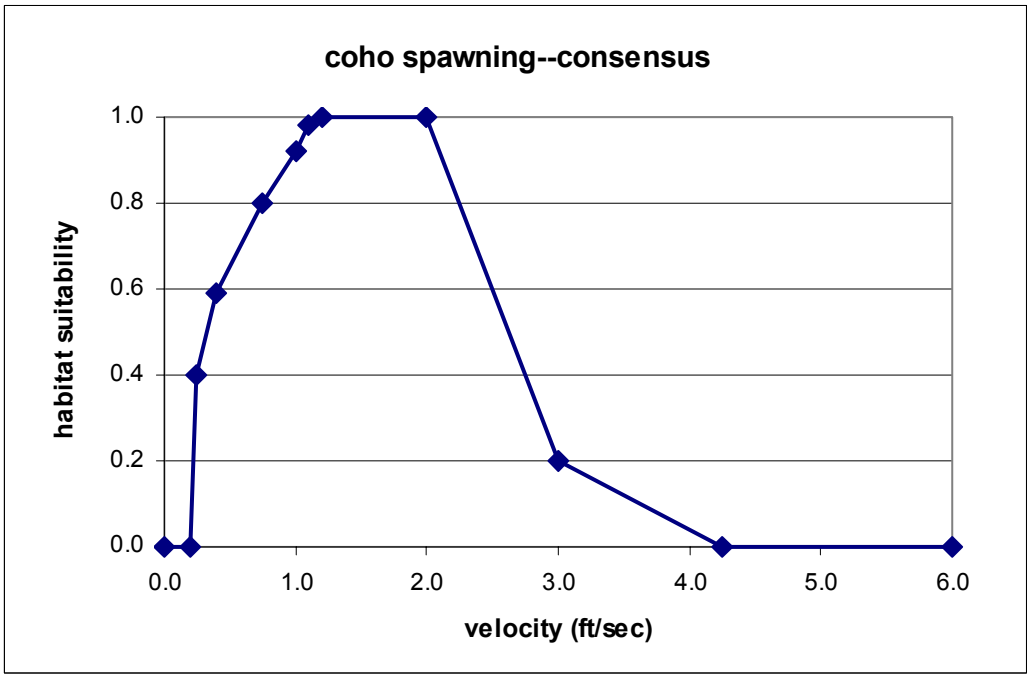
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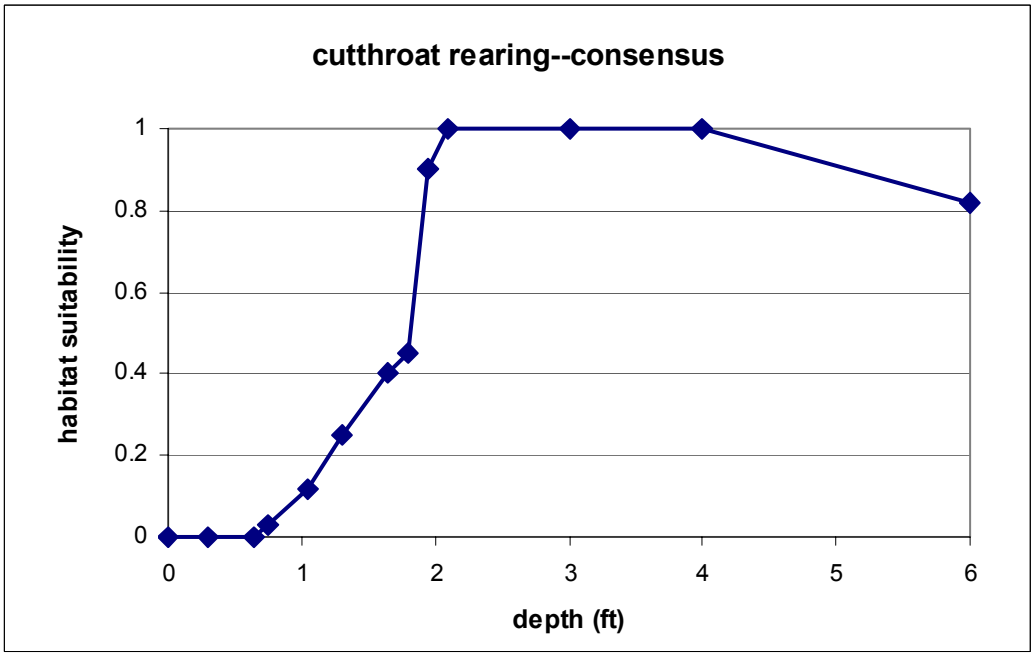
velocity (ft/sec)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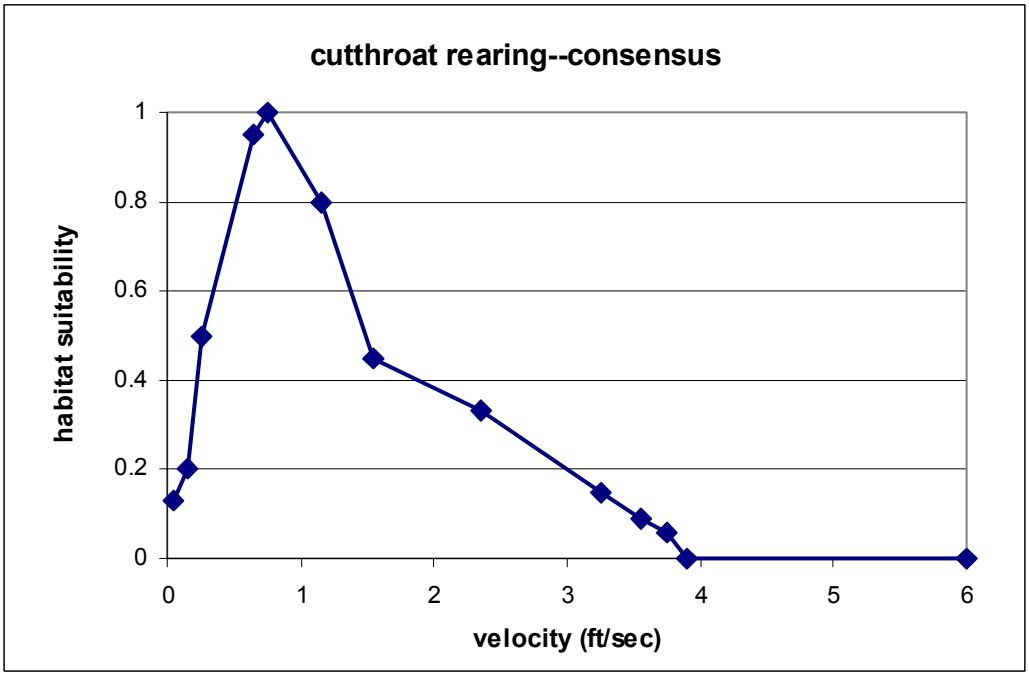
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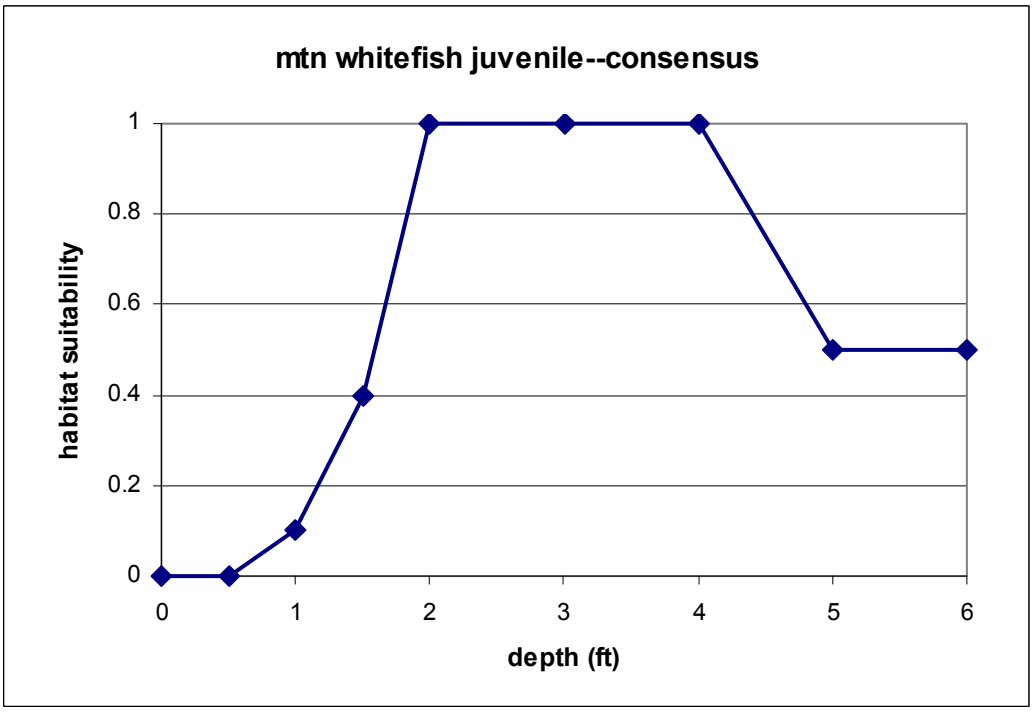
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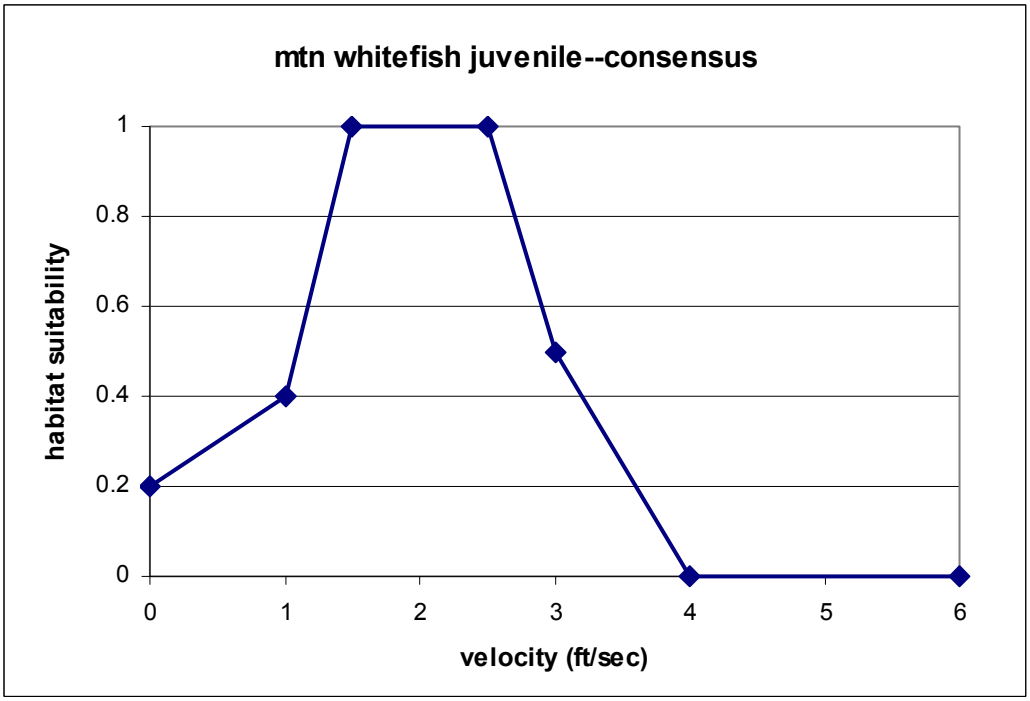
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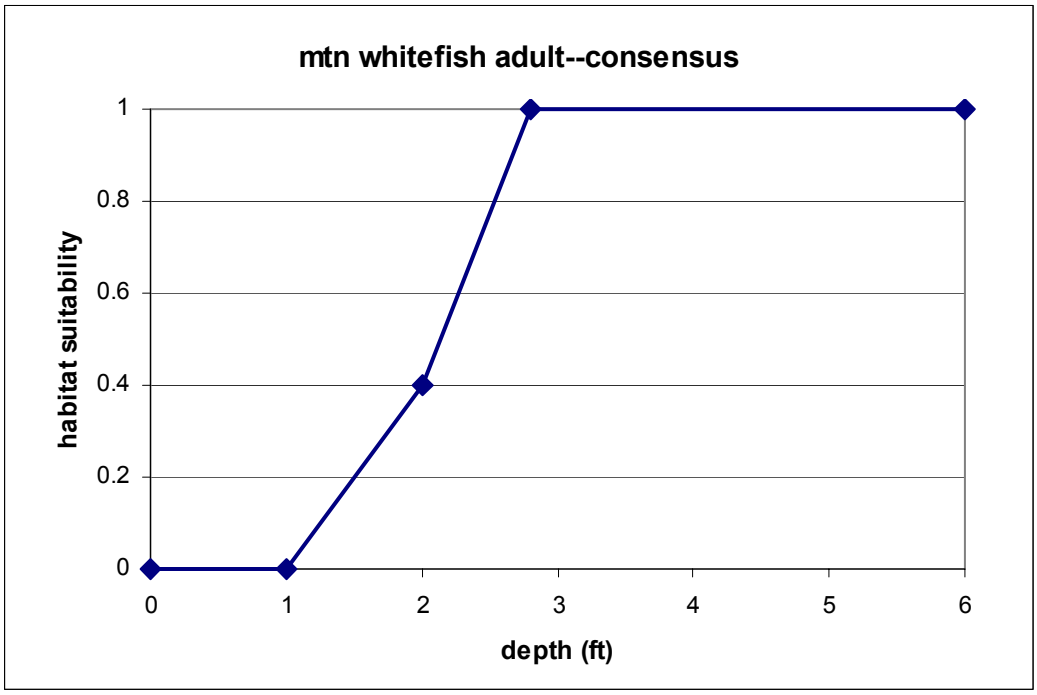
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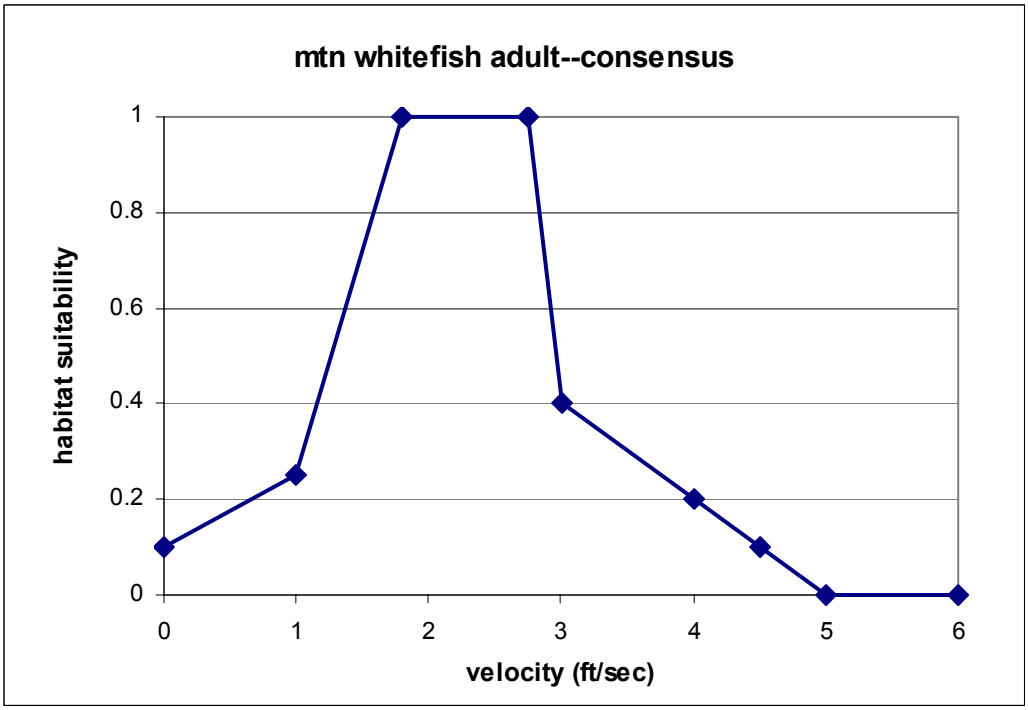
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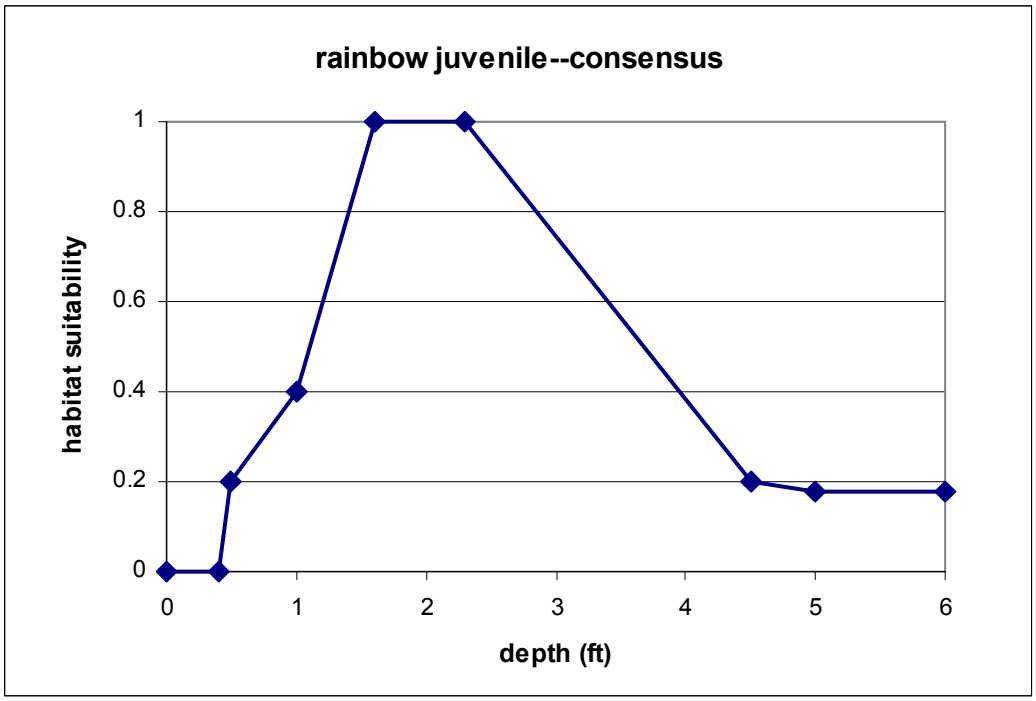
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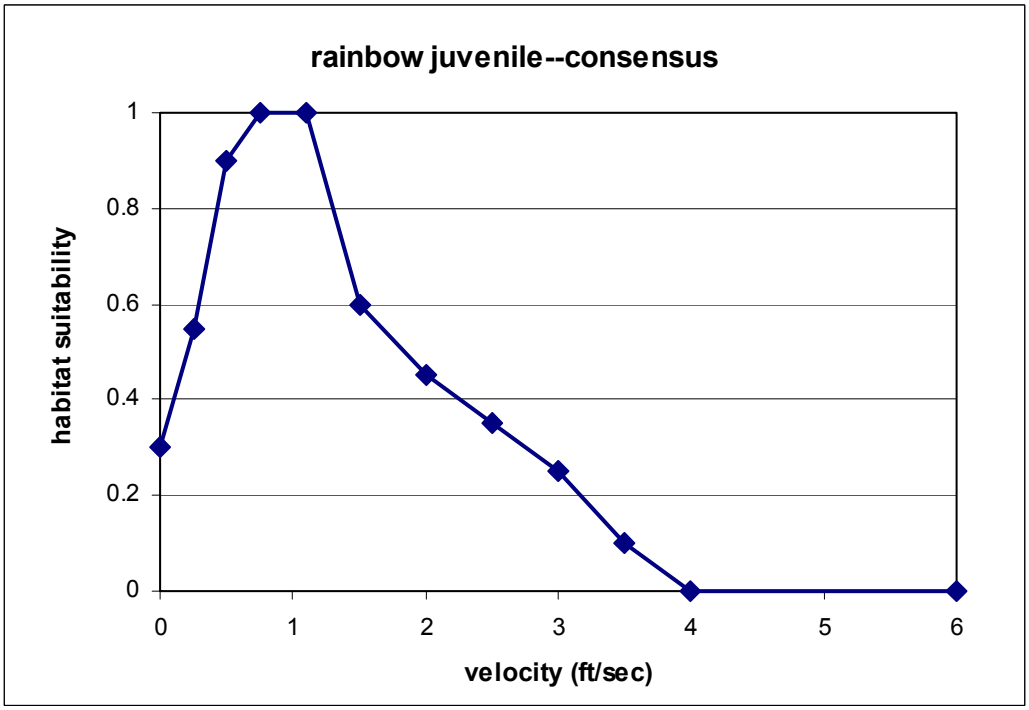
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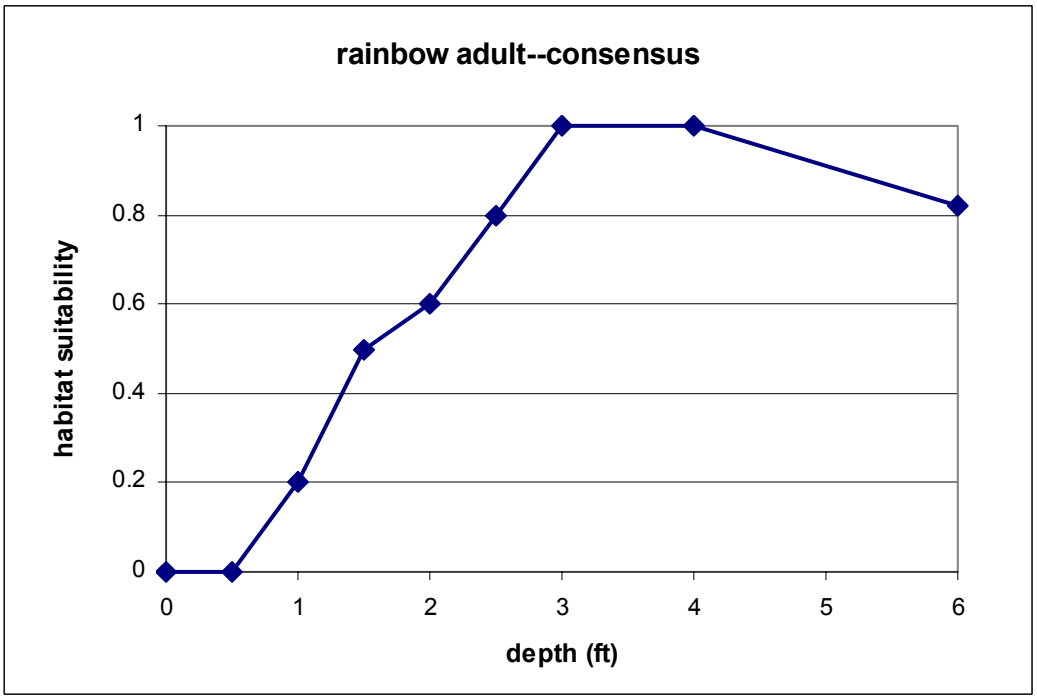
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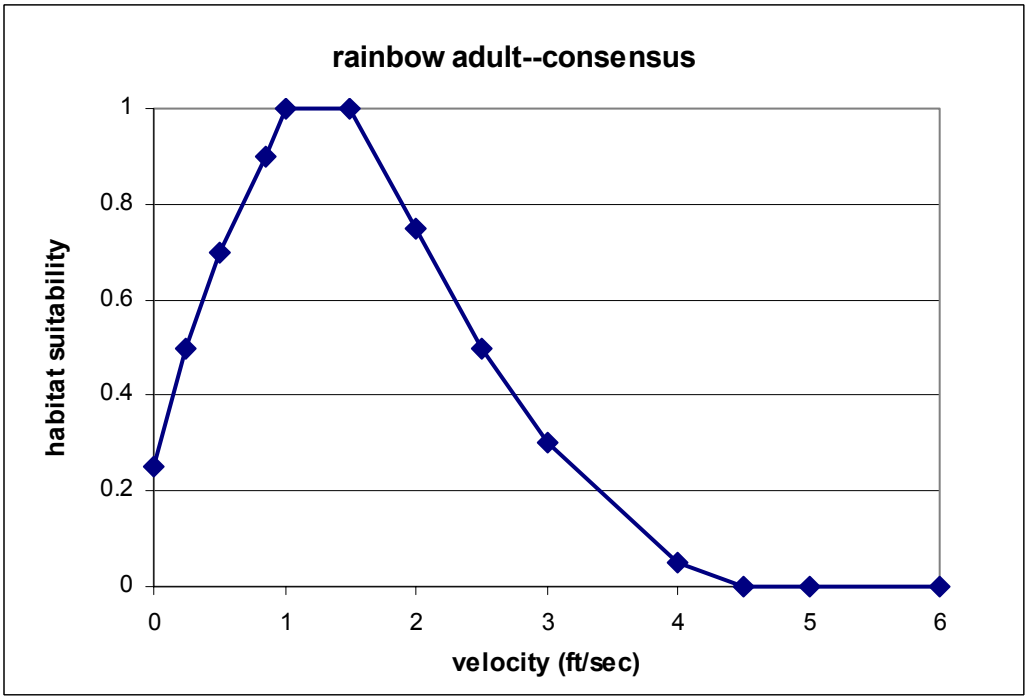
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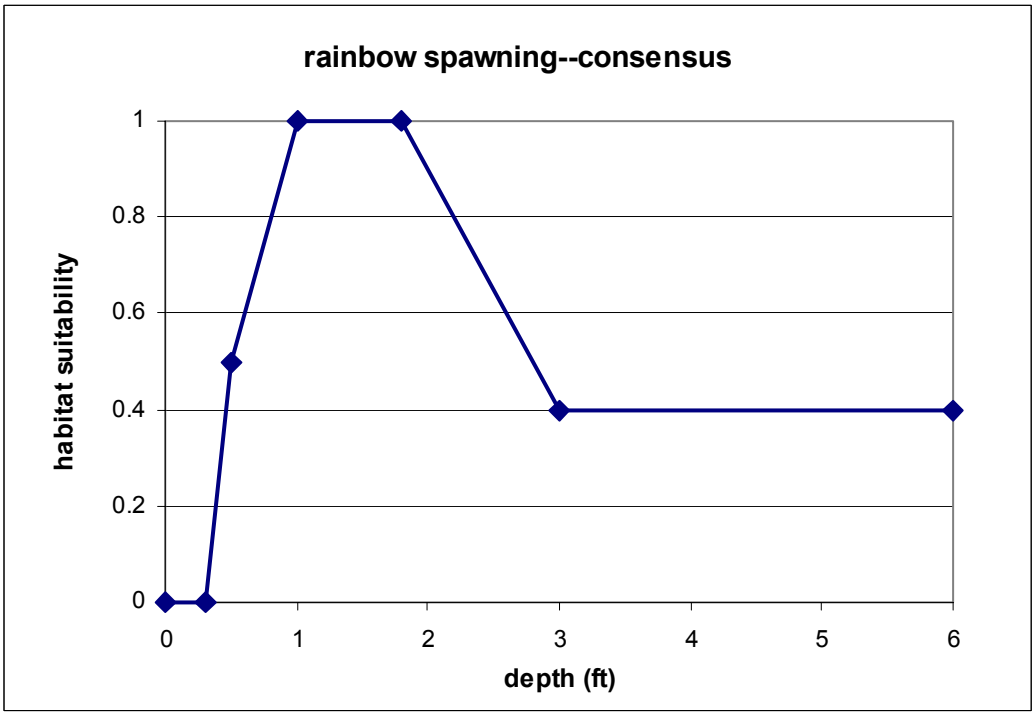
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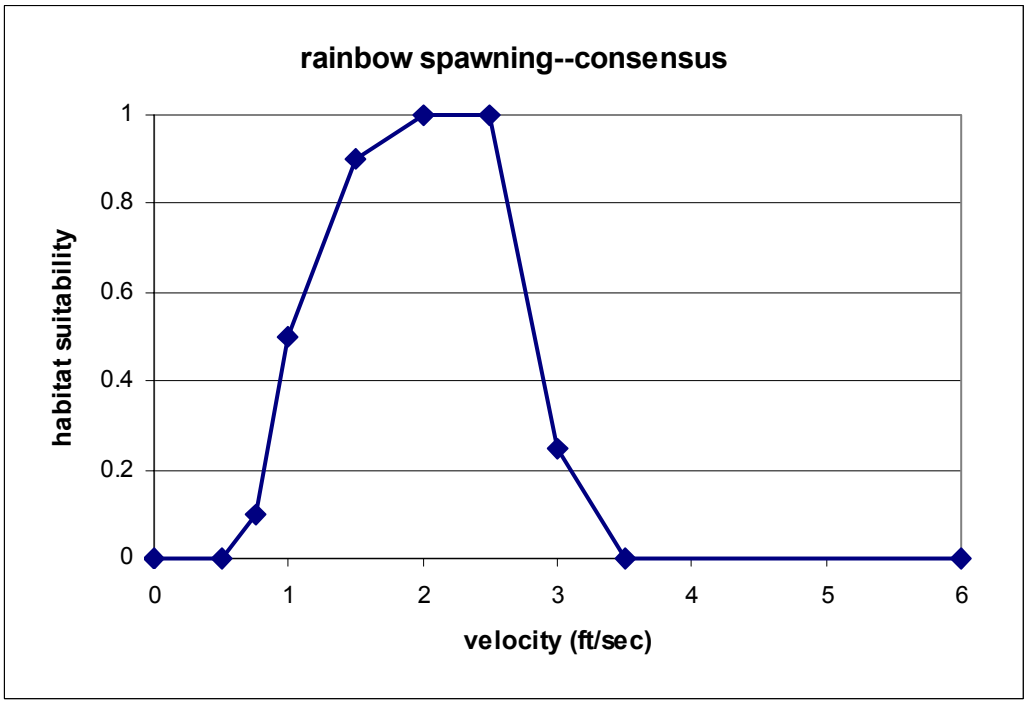
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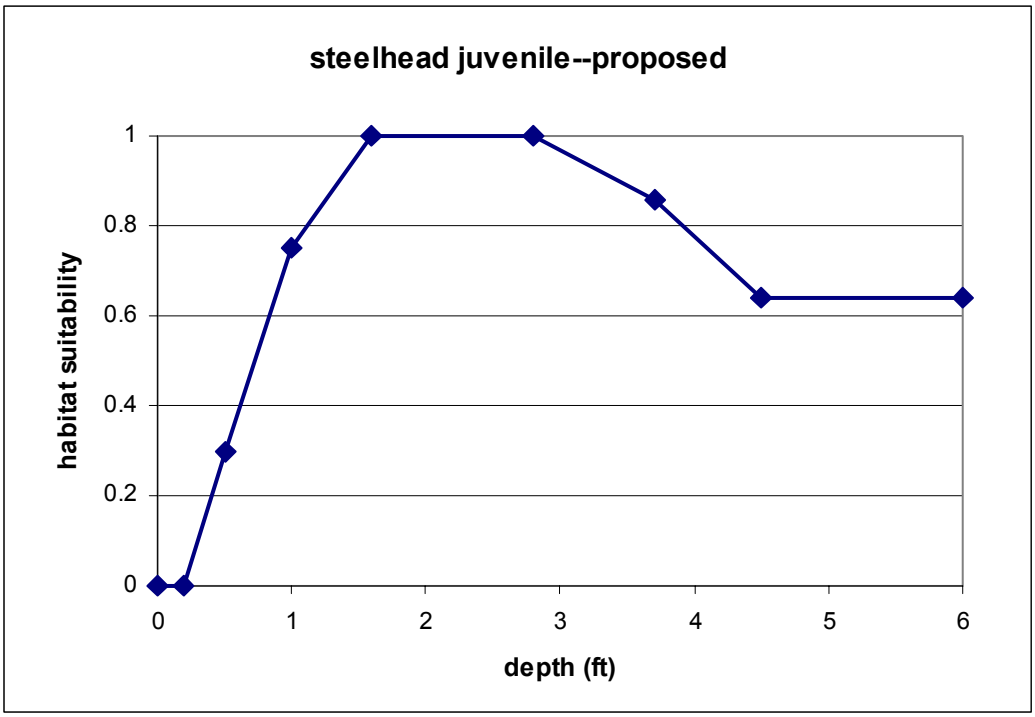
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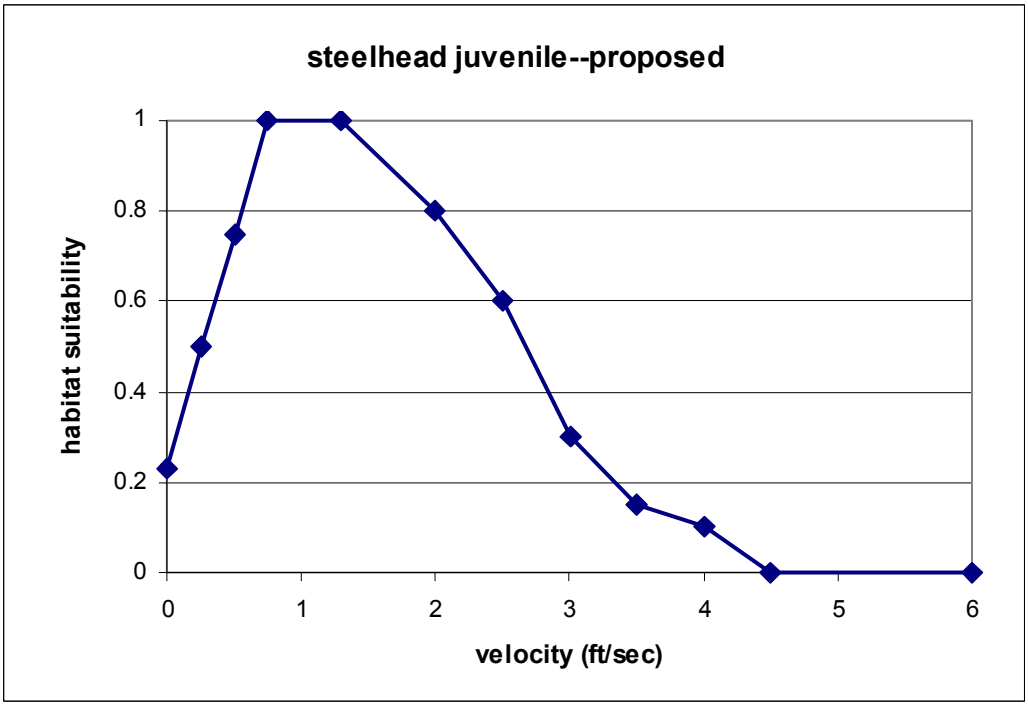
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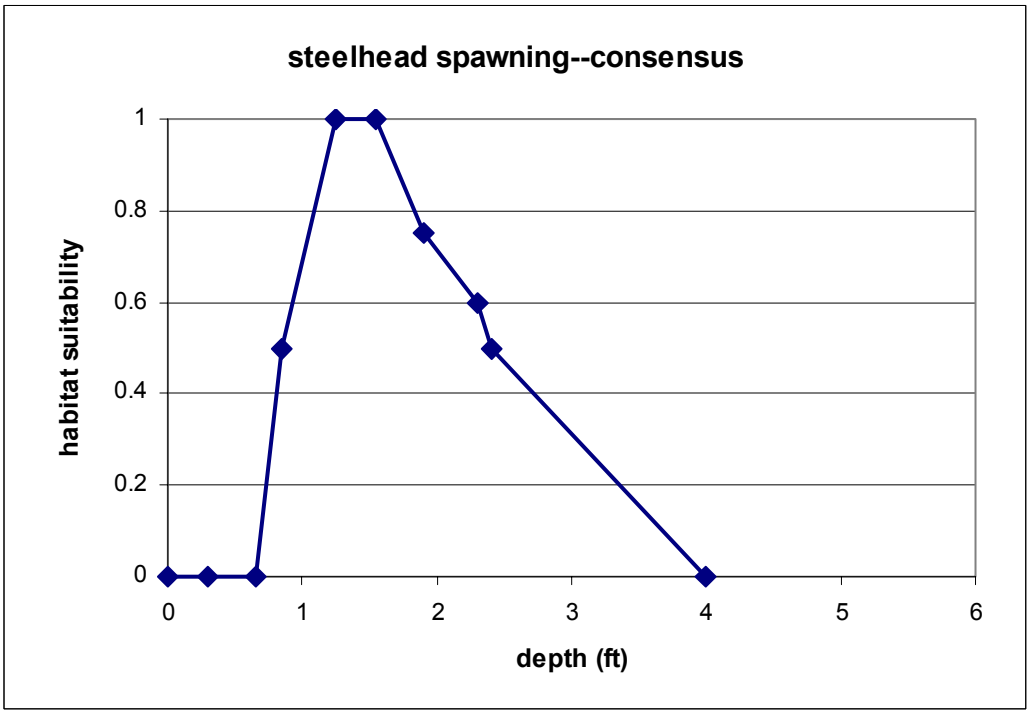
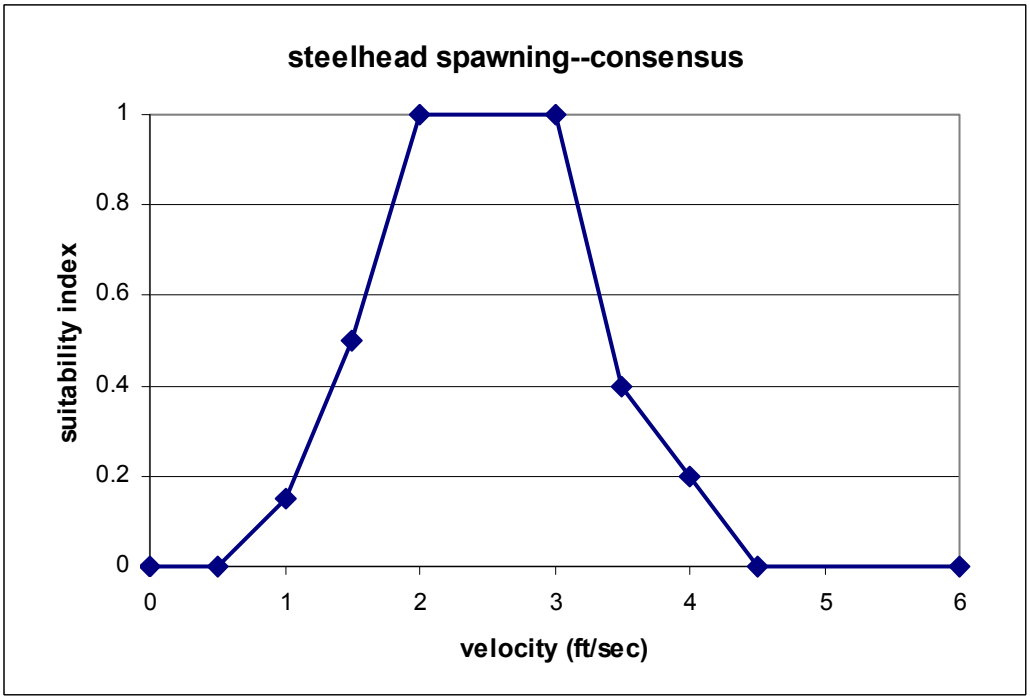
6
velocity (ft/sec)


steelhead spawning--consensus
habitat suitability
1
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
depth (ft)


steelhead spawning--consensus
suitability index
1
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
velocity (ft/sec)