

Using Habitat Guilds to Develop Habitat Suitability Criteria for a Warmwater Stream Fish Assemblage

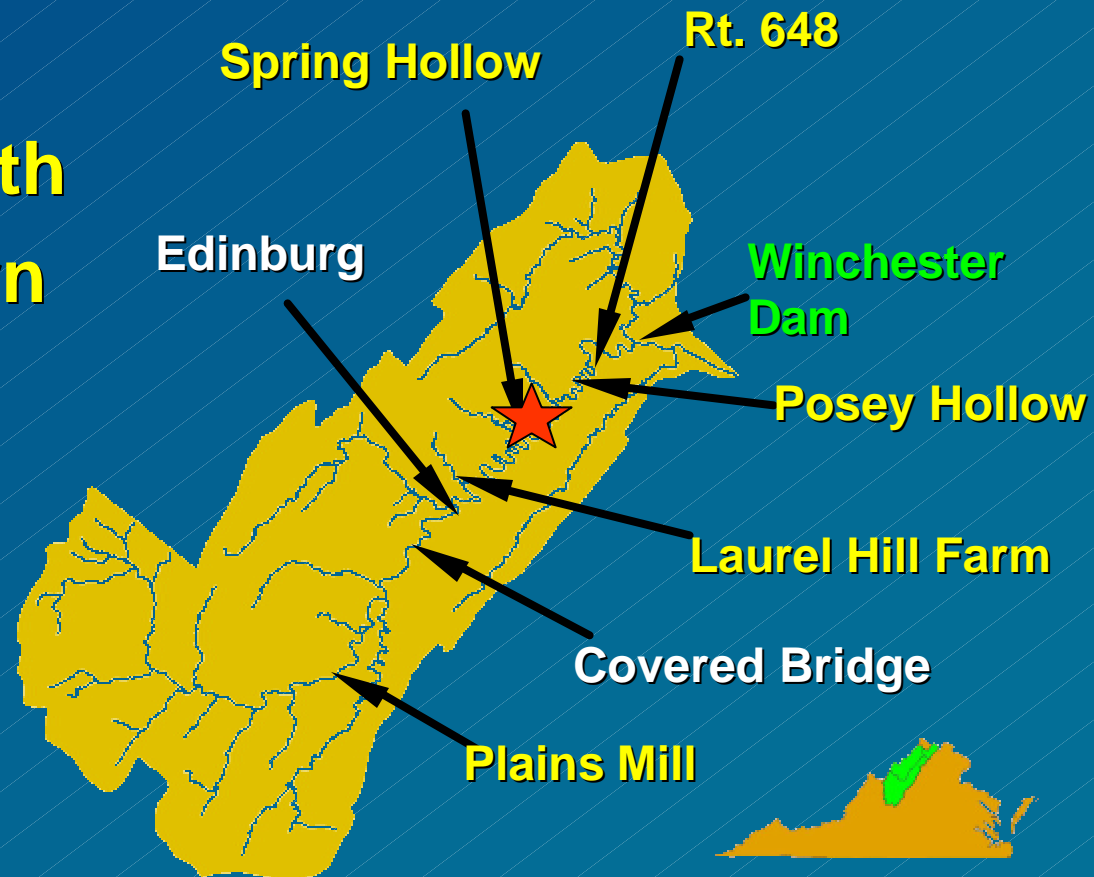


Jason Persinger, Don Orth, Tammy Newcomb

Shenandoah River Basin

- North Fork Shenandoah River

- 20% discharge
- 60% basin growth
- Growing concern
- IFIM Study



Habitat Suitability Criteria

- **Original approach**
 - Important species
- **Warmwater Streams**
 - High Diversity
 - Habitat Guilds
 - NFS 60 species
 - 4 habitat guilds



Image from Jenkins and Burkhead 1994



Objectives



- **Test guild structure**
- **Develop habitat suitability criteria for fish species and habitat guilds**
- **Compare species and guild criteria**

Methods



- Two sampling techniques

- Snorkeling



- Throwable anode electrofishing

Habitat Sampling

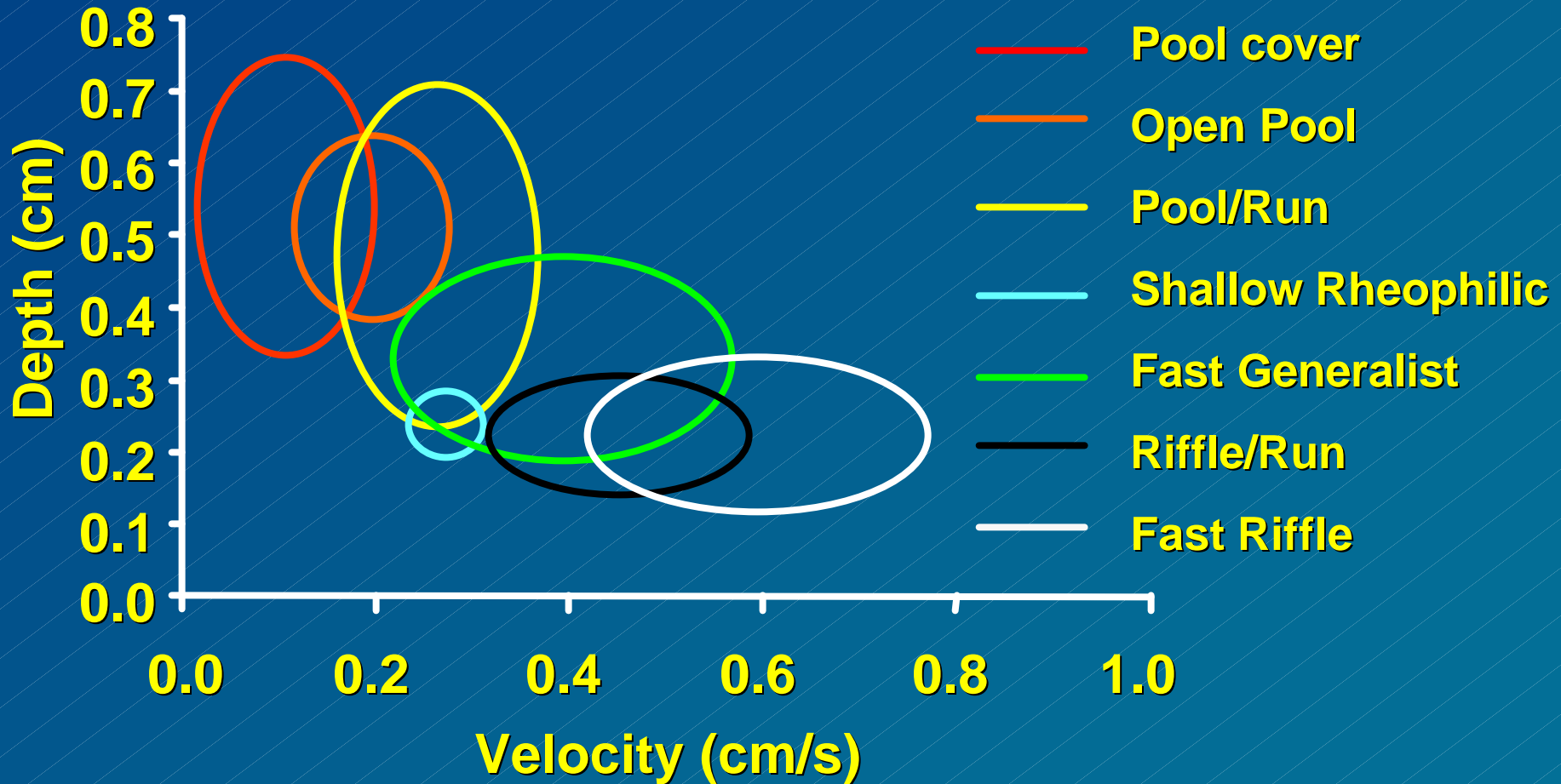
- **Habitat measurements**

- **Depth**
- **Velocity**
- **Froude #**
- **Substrate**
- **Embeddedness**
- **Cover**
- **Distance to Cover**



Guild Structure

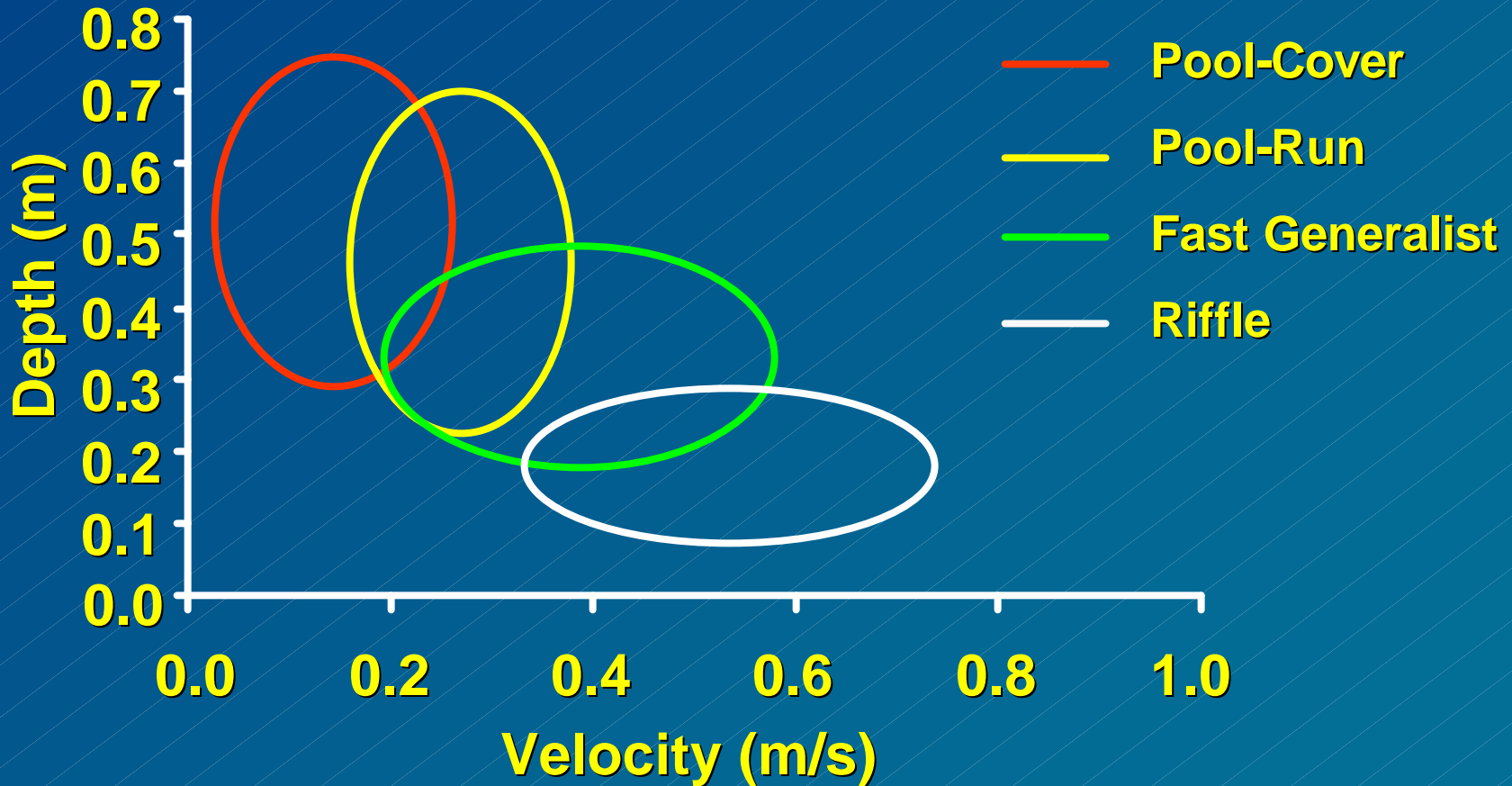
- Previously established Guilds



Vadas and Orth (2000) Guild Structure

Our Approach

- North Fork Shenandoah Guild Structure



Guild Structure Tests

- **Discriminant Analysis**
 - **Squared distance between guilds**
 - **Depth, velocity, Froude #, substrate, embeddedness, distance to cover, and cover**
 - **Misclassification matrix**

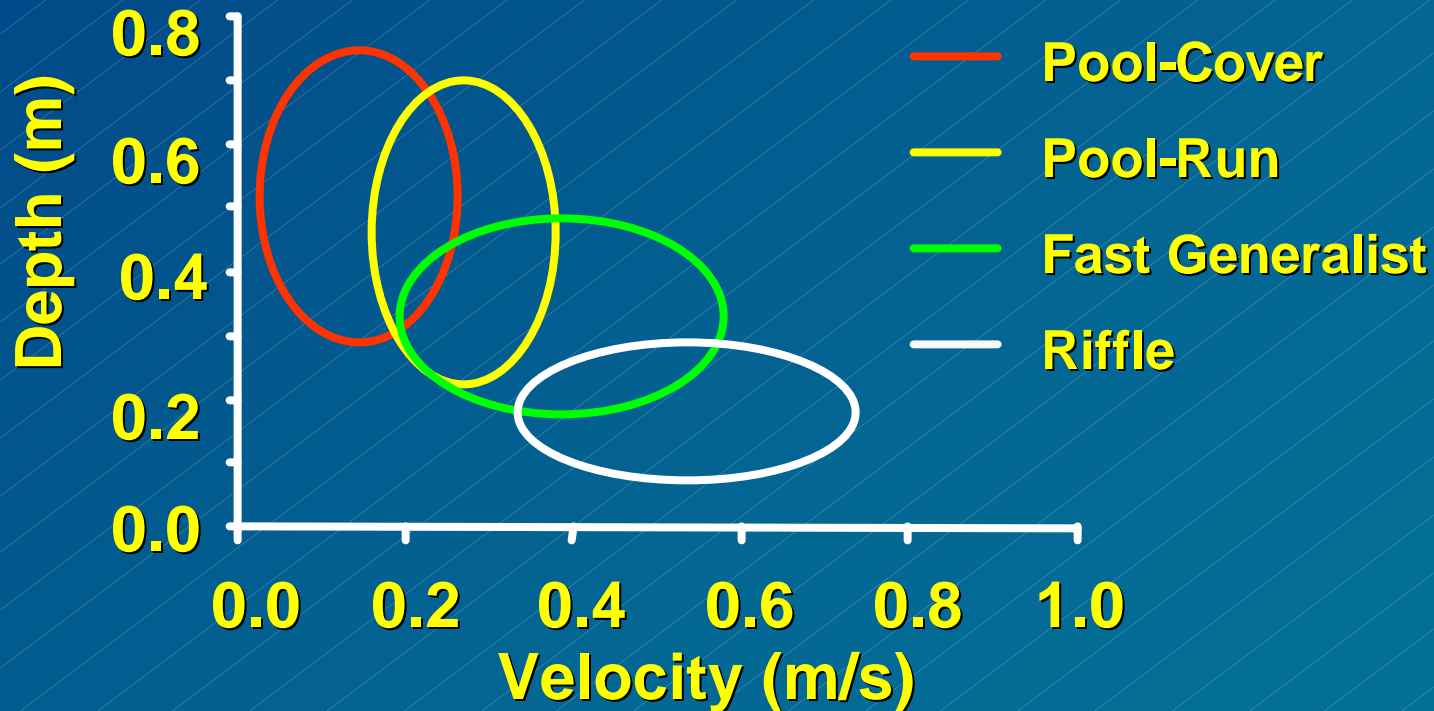
Criteria Development



- **Nonparametric Tolerance Limits**
 - Depth & velocity
- **Channel Index**
 - Substrate, cover, and embeddedness
- **PHABSIM output**

Guild Structure Results

- Squared distance
 - significant distance between guilds
 - P-values < 0.0001



Guild Structure Results

- **Misclassification Matrix**
 - Highest % of data in proper guild
 - Riffle 64.4%
 - Fast generalist 58.9%
 - Pool-cover 42.7%
 - Only exception pool-run guild

Guild Placement

- **Riffle Guild**

greenside darter

mottled sculpin

central stoneroller

bluehead chub (J)

river chub (Y)

longnose dace

Etheostoma blennioides

Cottus bairdi

Campostoma anomalum

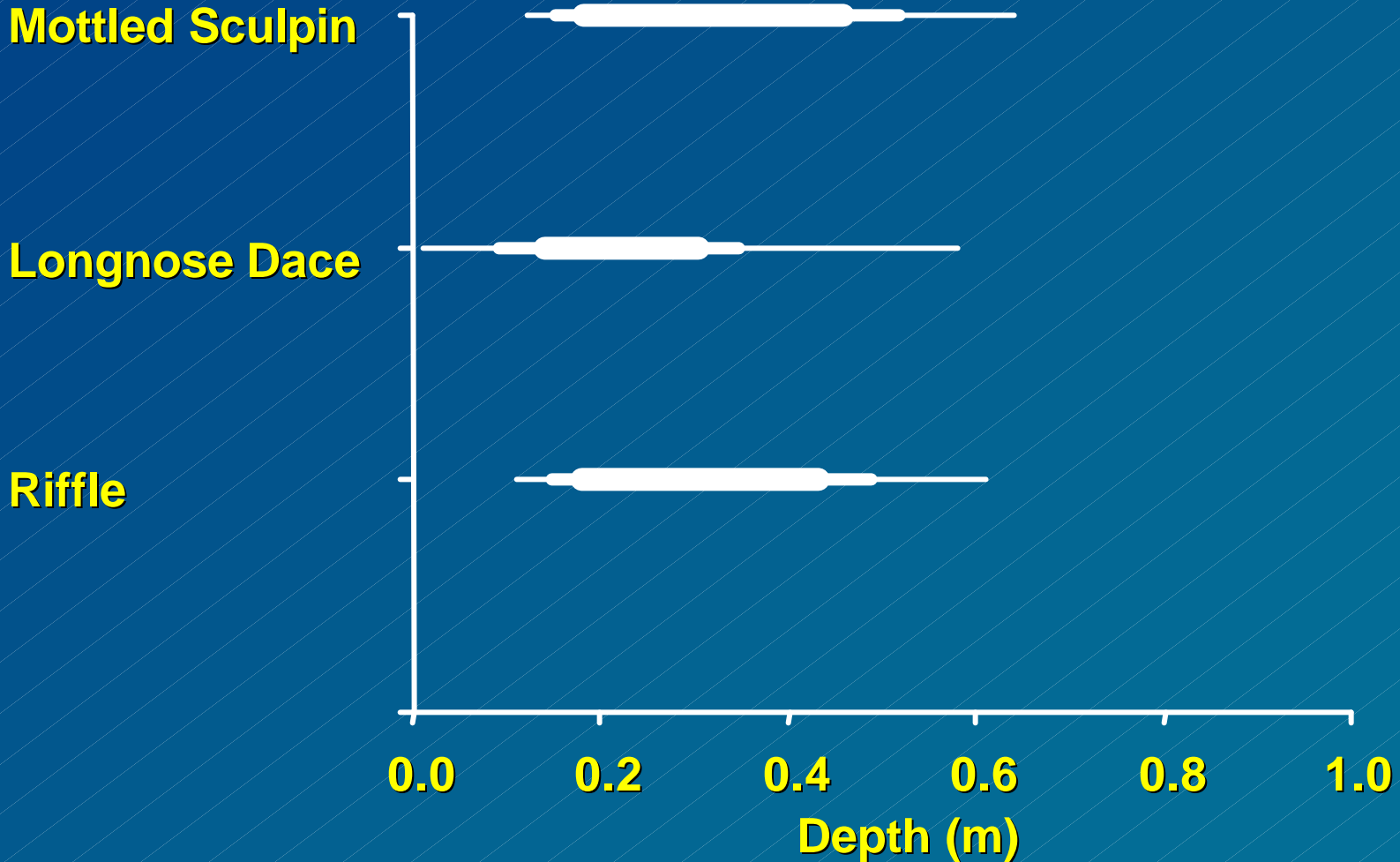
Nocomis leptocephalus

Nocomis micropogon

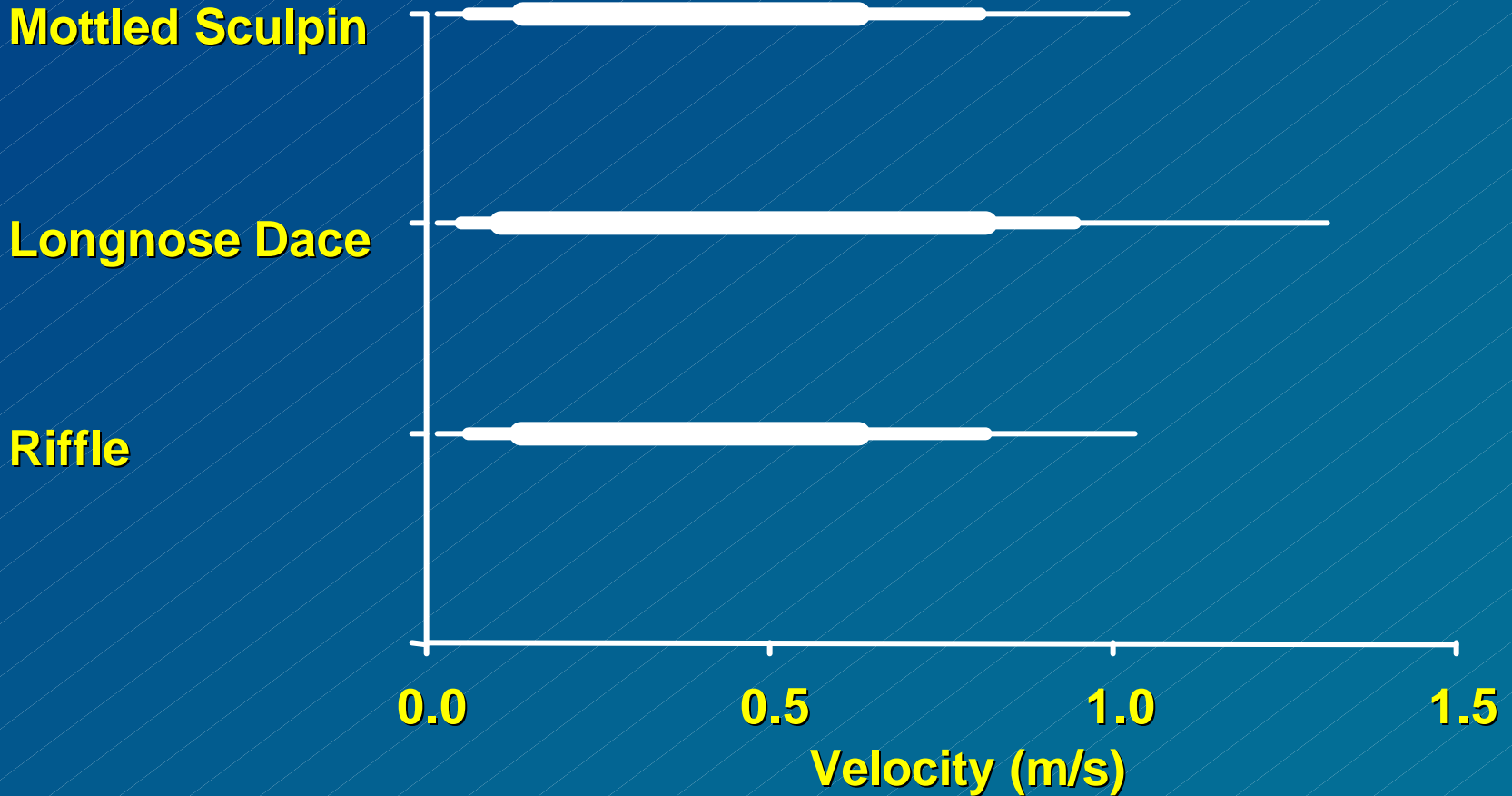
Rhinichthys cataractae



Riffle Guild Comparison

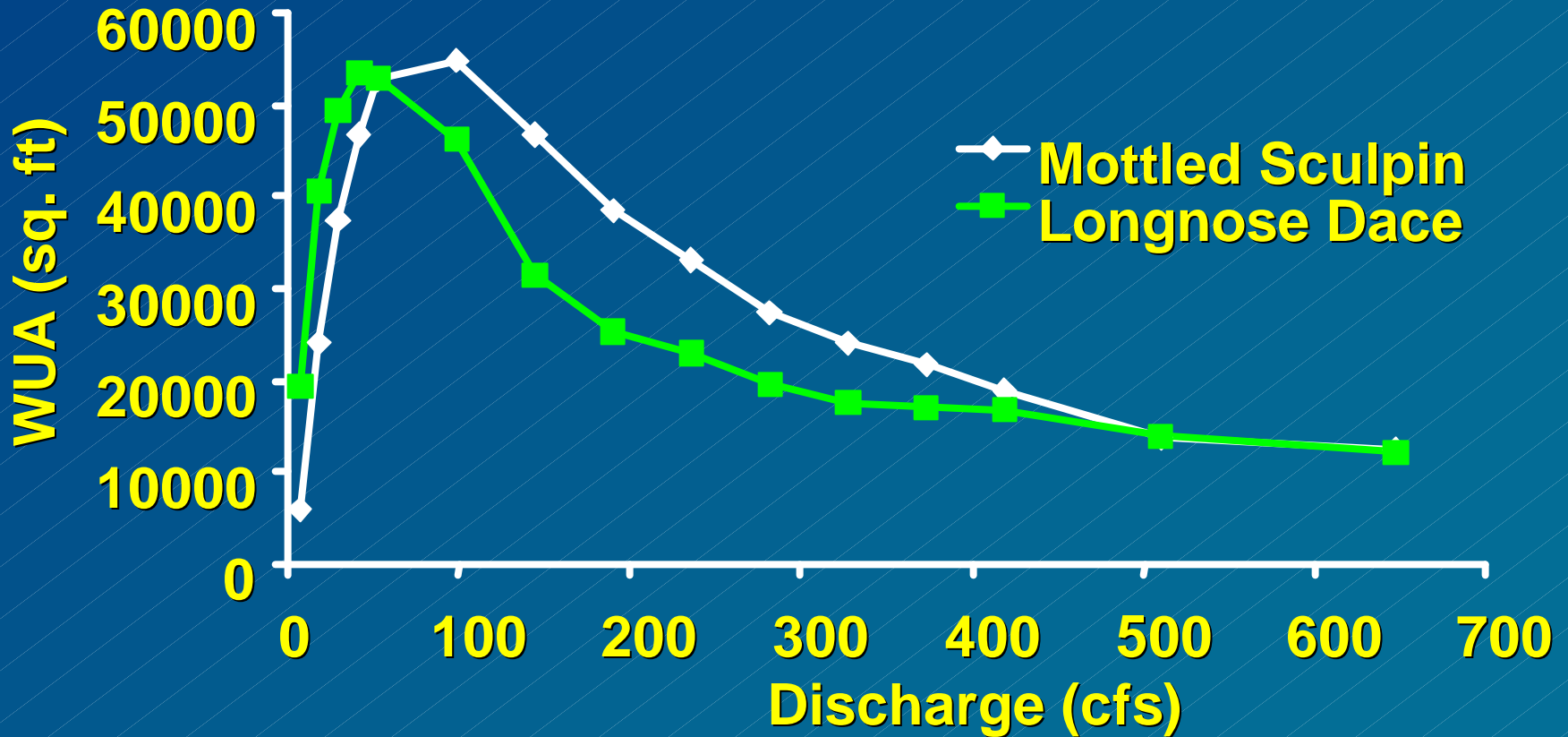


Riffle Guild Comparison



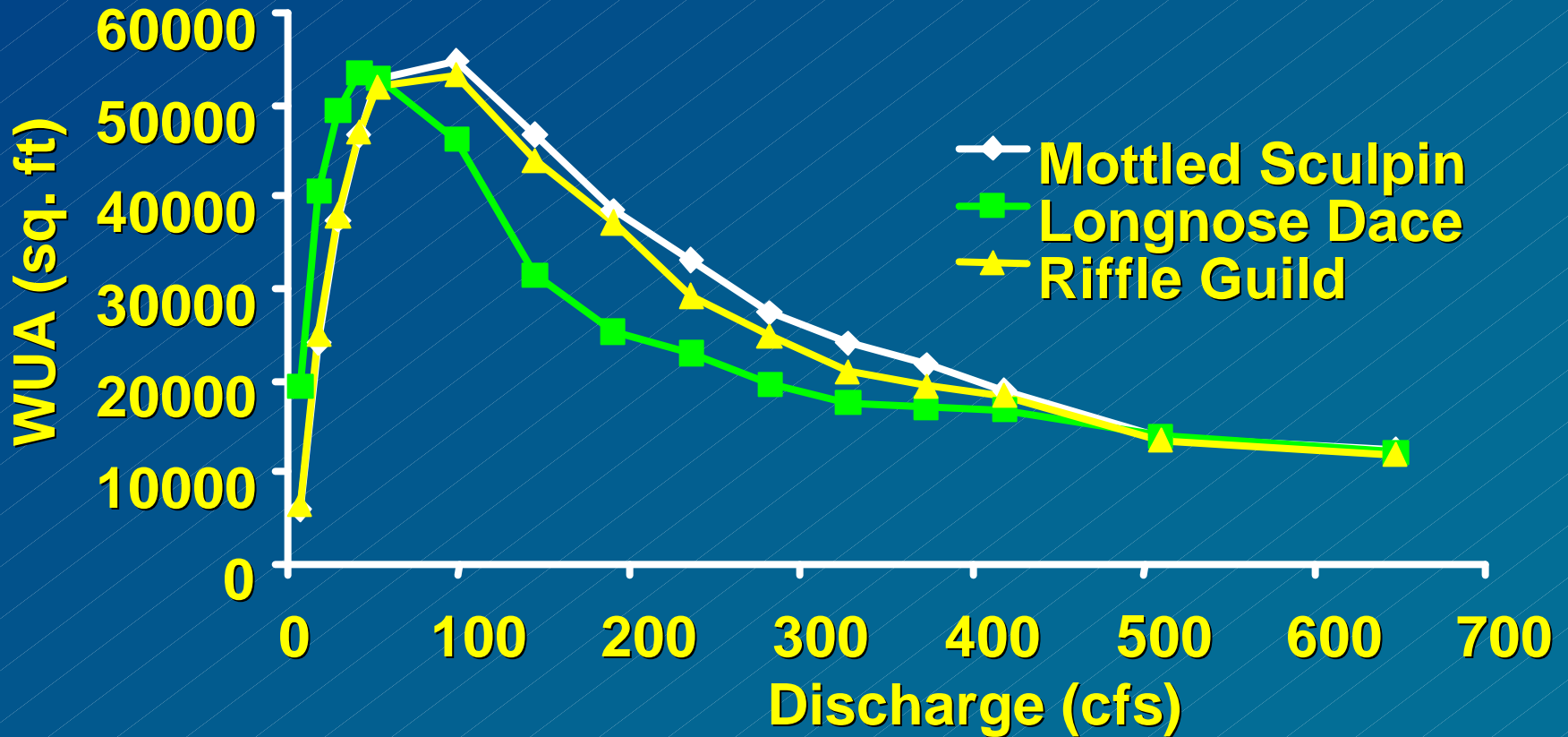
PHABSIM Model Output

Depth and Velocity criteria only



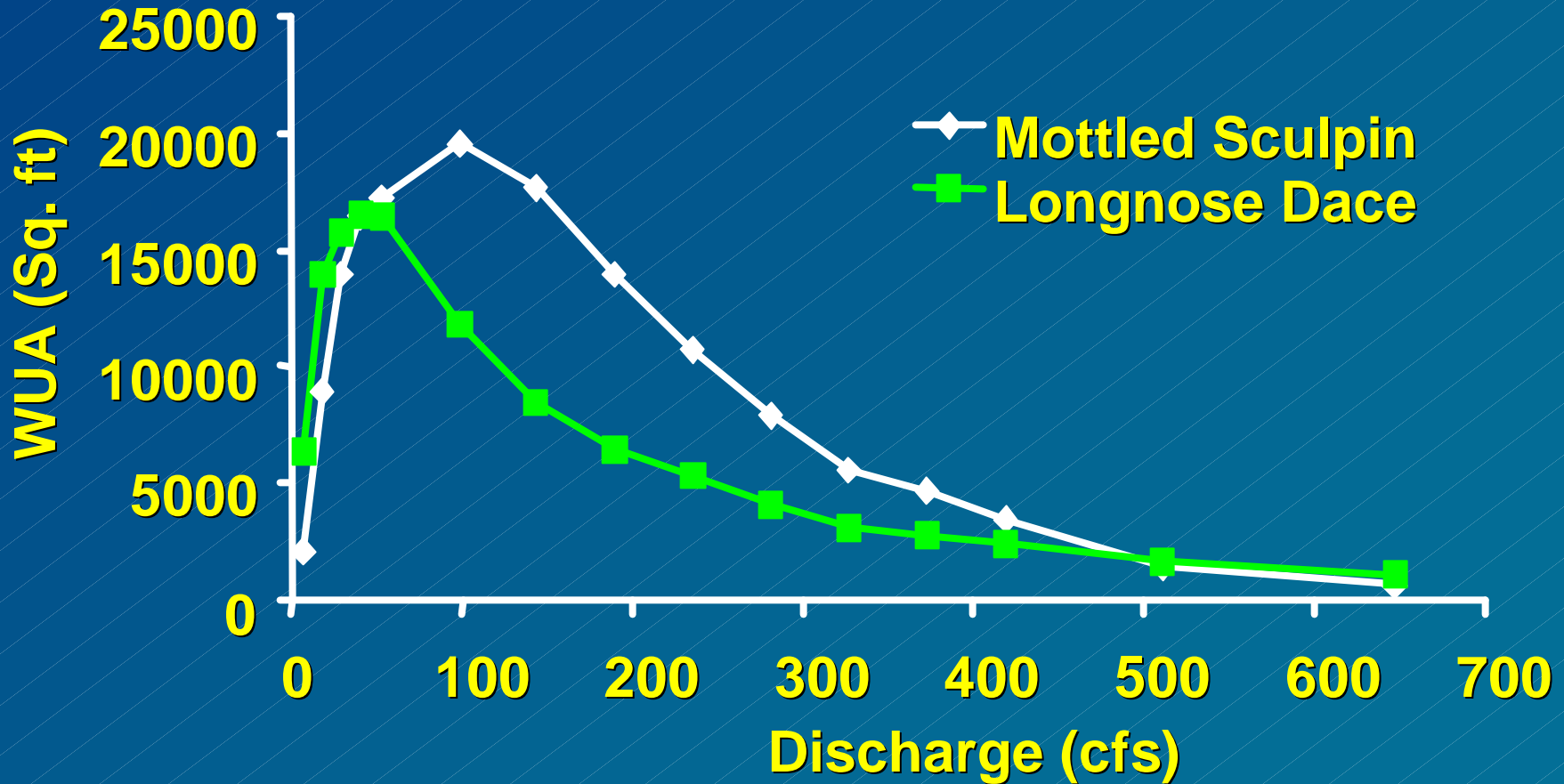
PHABSIM Model Output

Depth and Velocity criteria only



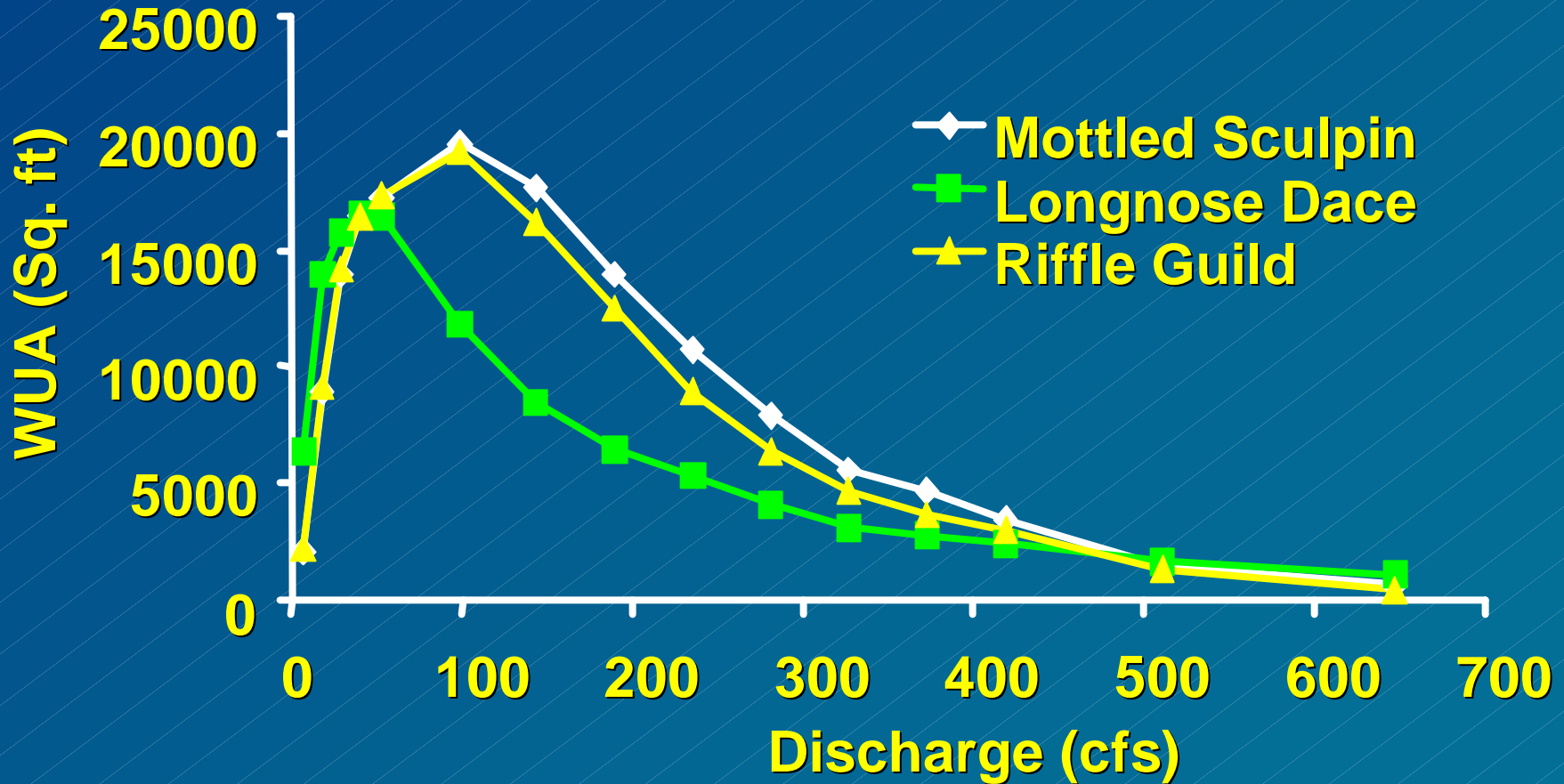
PHABSIM Model Output

Depth, Velocity, and Channel Index



PHABSIM Model Output

Depth, Velocity, and Channel Index



Guild Placement

- **Fast generalist Guild**

potomac sculpin

margined madtom

roseyface shiner

comely shiner

satinfish shiner (A)

spotfin shiner (A)

bluehead chub (A)

bull chub

fallfish (J&Y)

blacknose dace

Cottus girardi

Noturus insignis

Notropis rubellus

Notropis amoenus

Cyprinella analostana

Cyprinella spiloptera

Nocomis leptocephalus

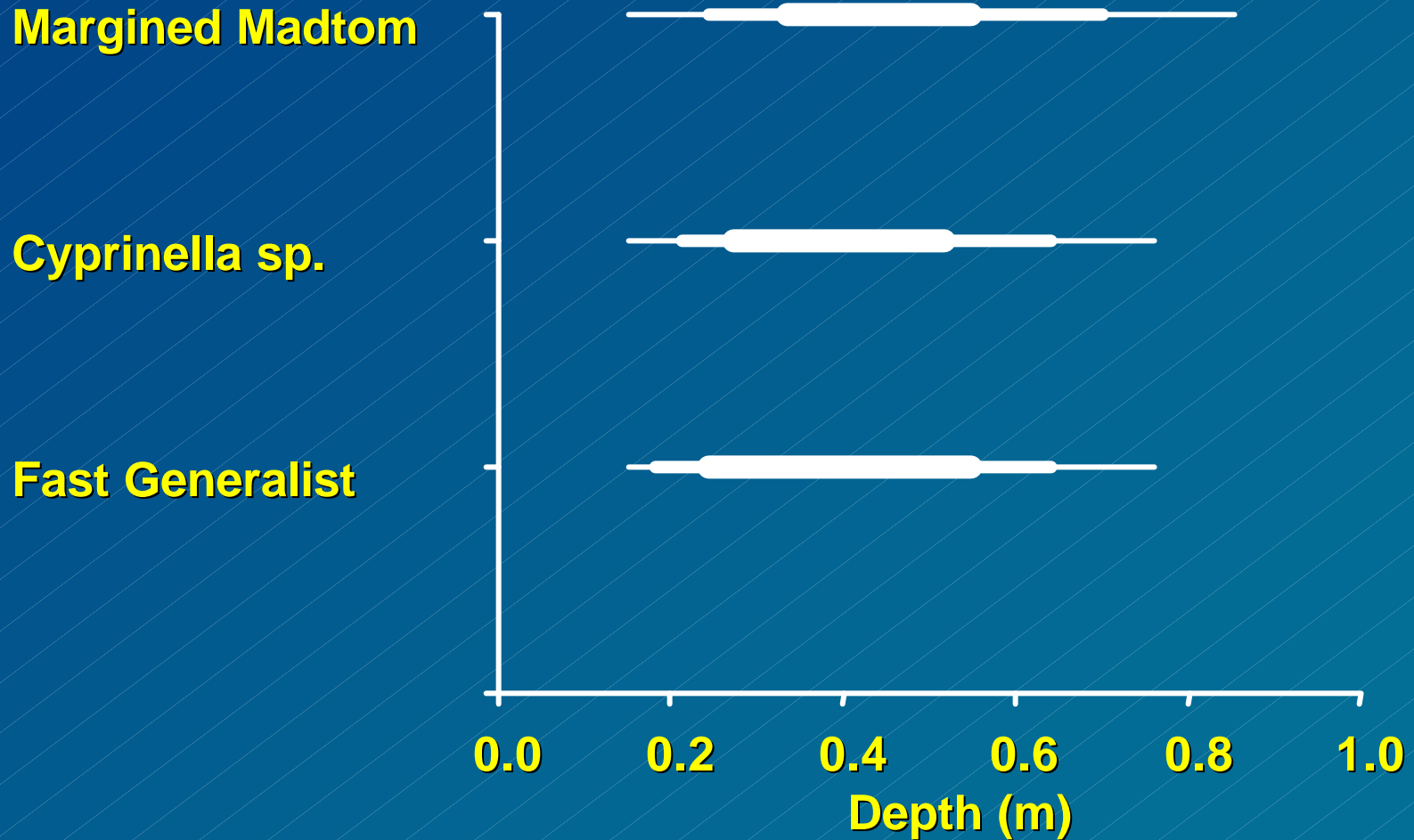
Nocomis raneyi

Semotilus corporalis

Rhinichthys atratulus



Fast Generalist Guild Comparison

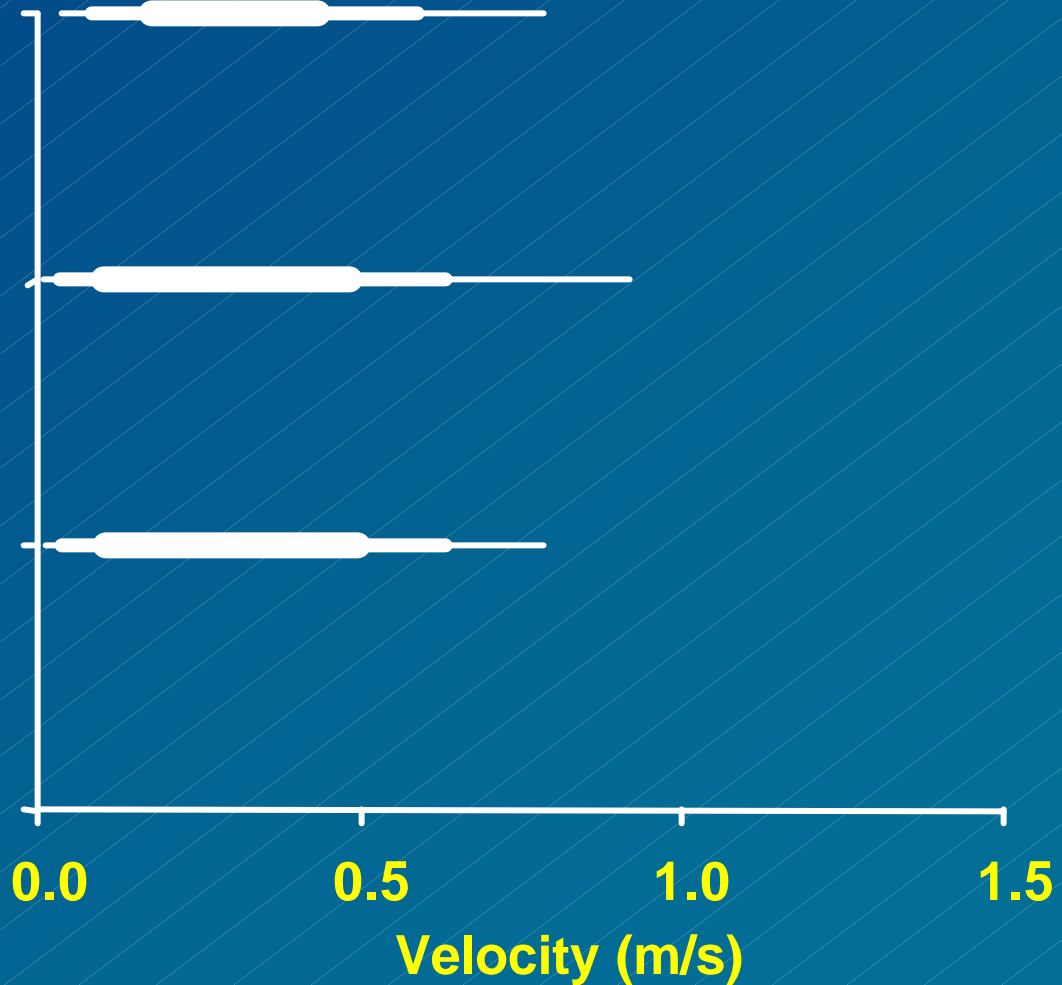


Fast Generalist Guild Comparison

Margined Madtom

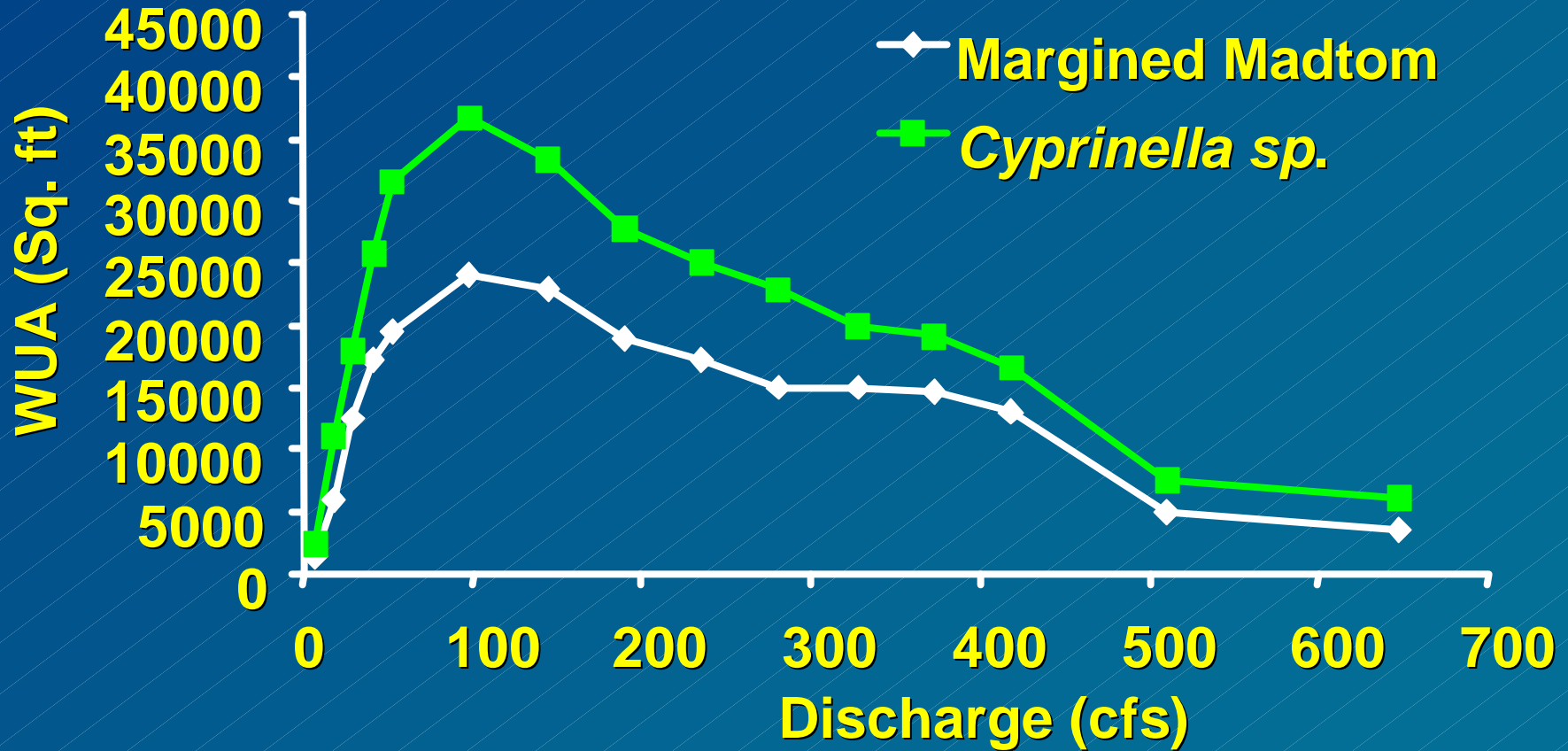
Cyprinella sp.

Fast Generalist



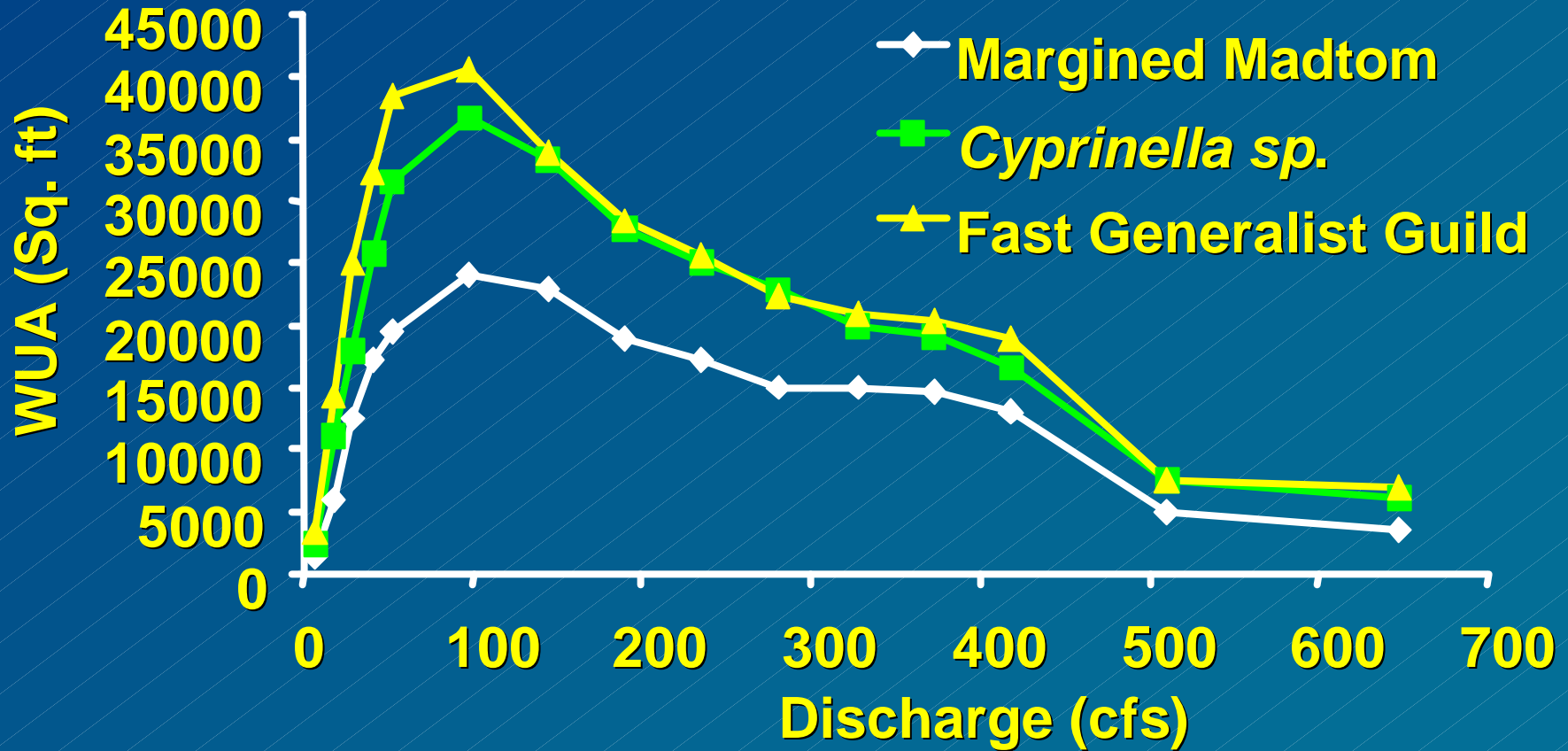
PHABSIM Model Output

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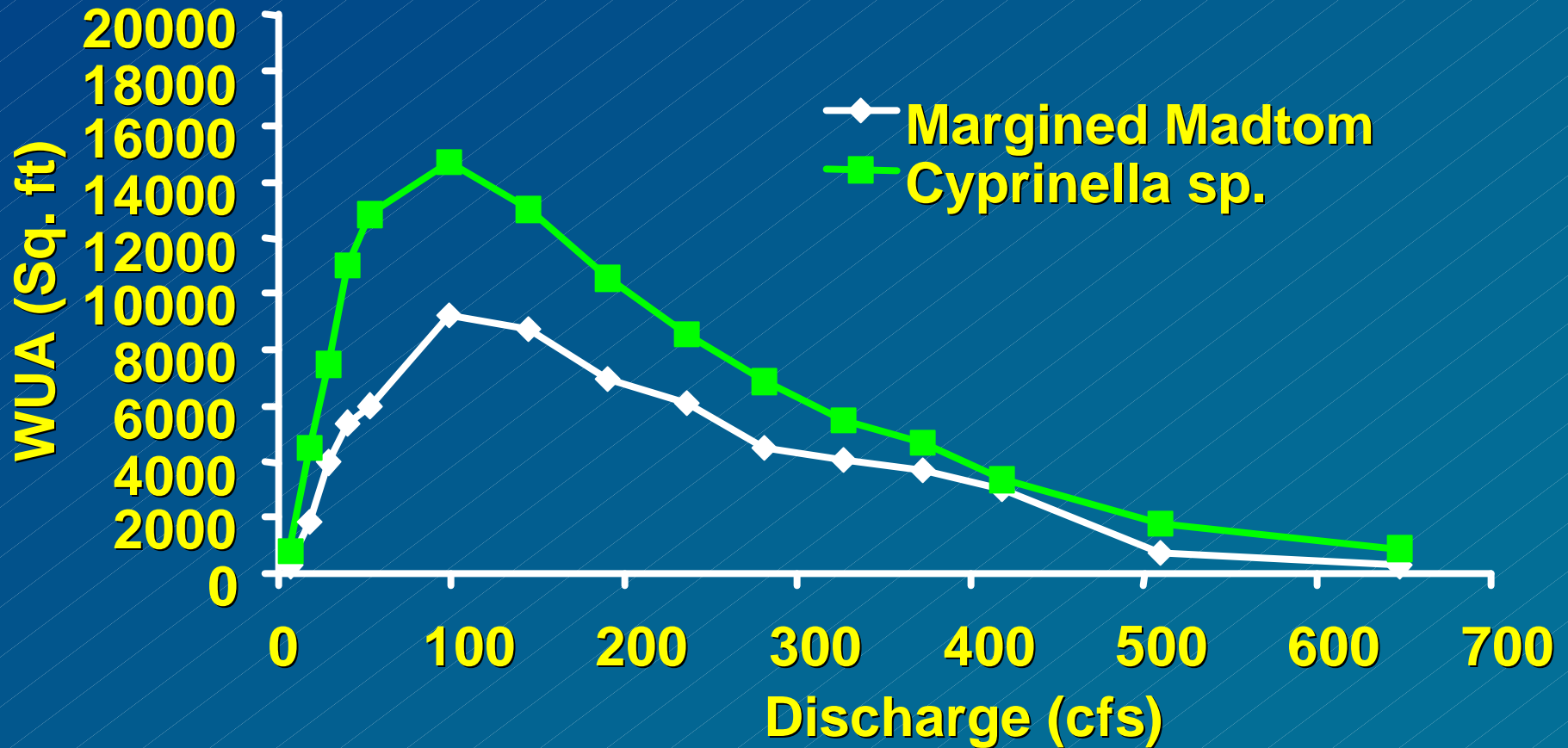
PHABSIM Model Output

Depth and Velocity criteria only



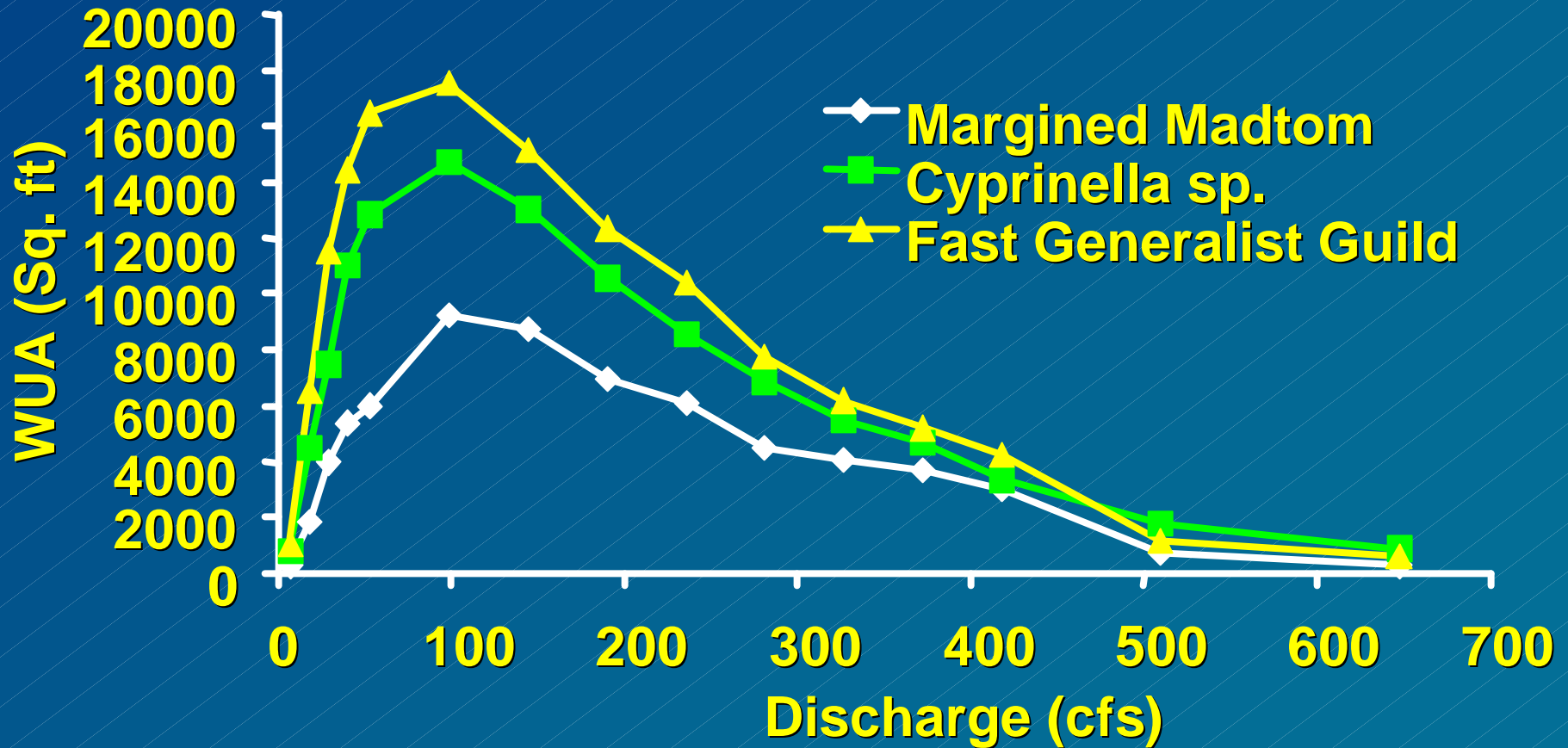
PHABSIM Model Output

Depth, Velocity, and Channel Index



PHABSIM Model Output

Depth, Velocity, and Channel Index



Summary



- **Guild structure**
 - Fish assemblage
 - Habitat differences
- **Criteria development**
 - Most abundant species
- **Species vs. Guild**
 - Response to flow very similar

Recommendations

- **Guild or Representative Criteria**
 - Viable option
- **Considerations**
 - Effect of common species
 - Importance of rare species
 - Guild structure realism

Acknowledgements

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