

Assigning Fish to Guilds for Flow-Ecology Analysis

Ecological Flows Science Advisory Board
August 28, 2012

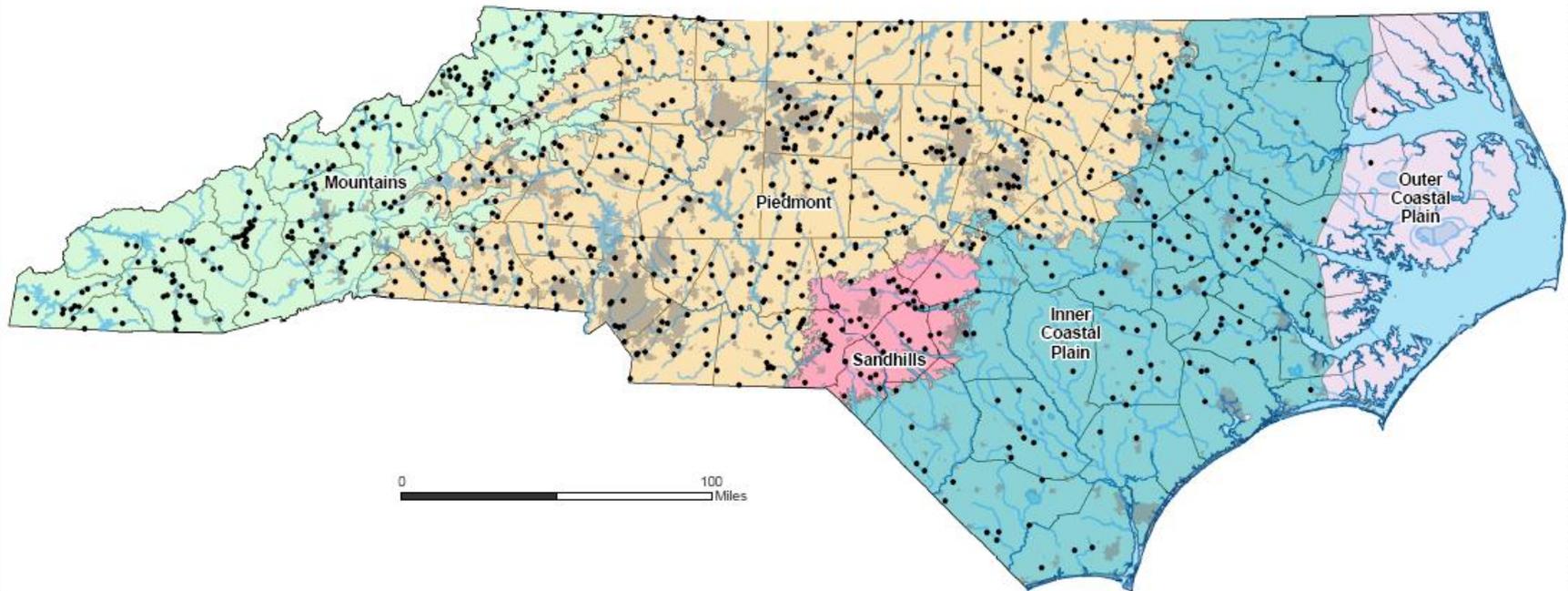
Chris Goudreau, N.C. Wildlife Resources Commission
Jennifer Phelan, RTI International
Kimberly Meitzen, The Nature Conservancy

Review

- RTI and TNC are investigating flow-ecology relationships by comparing flow metrics to fish abundance
 - RTI
 - Compare different locations, times
 - Statewide
 - TNC
 - Compare same location over time
 - Four basins (LTN, CFR, TAR, RKE)

Fish Dataset

- NCDWQ – wadeable streams; not trout



Why Use Guilds?

- Most species can be grouped by the habitats they use based on life history requirements and physiology
- “Smooths out” data compared to species data
- Allows comparison among streams, basins, provinces
- Used in habitat-based models (e.g., PHabSim)

Guild Frameworks

NCDWR (14)	ENTRIX 2003 (9)	Aadland 1993 (6)	Vadas & Orth 2000 (7)	Persinger 2010 (4)
shallow fast higher velocity	Shallow Fast Coarse	Fast Riffle	Riffle	Riffle
shallow fast moderate velocity				
shallow fast lower velocity	Shallow Fast	Slow Riffle	Riffle Run	
deep fast, fine substrate				
deep fast, gravel/cobble substrate	Deep Fast	Raceway	Fast Generalist	Fast Generalist
deep fast, coarse substrate	Deep Fast Cover			
shallow slow, coarse substrate			Shallow Rheophilic	
shallow slow, young of year	Shallow Slow			
shallow slow, aquatic vegetation cover				
shallow slow, woody debris cover	Shallow Slow Cover			
shallow slow, fine substrate, no cover	Shallow Slow Fine	Shallow Pool	Pool Run	Pool Run
deep slow, no cover	Deep Slow	Medium Pool	Open Pool	
deep slow, cover	Deep Slow Cover	Deep Pool	Pool Cover	Pool Cover
deep slow, cover (version 2)				

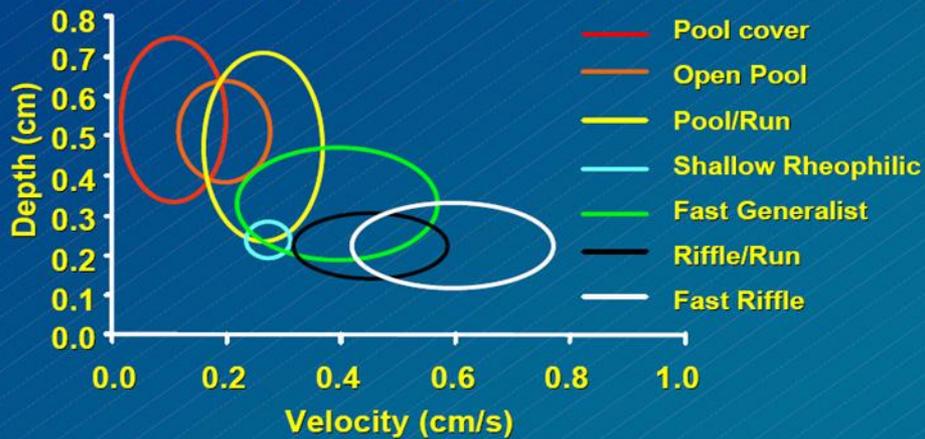
Guild Frameworks

Vadas

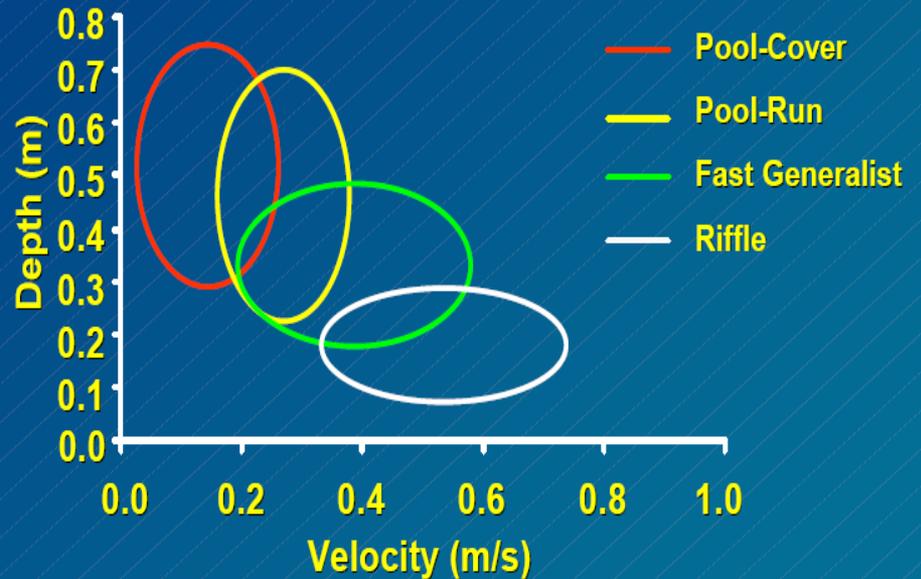
Persinger

Guild Structure

• Previously established Guilds



Vadas and Orth (2000) Guild Structure



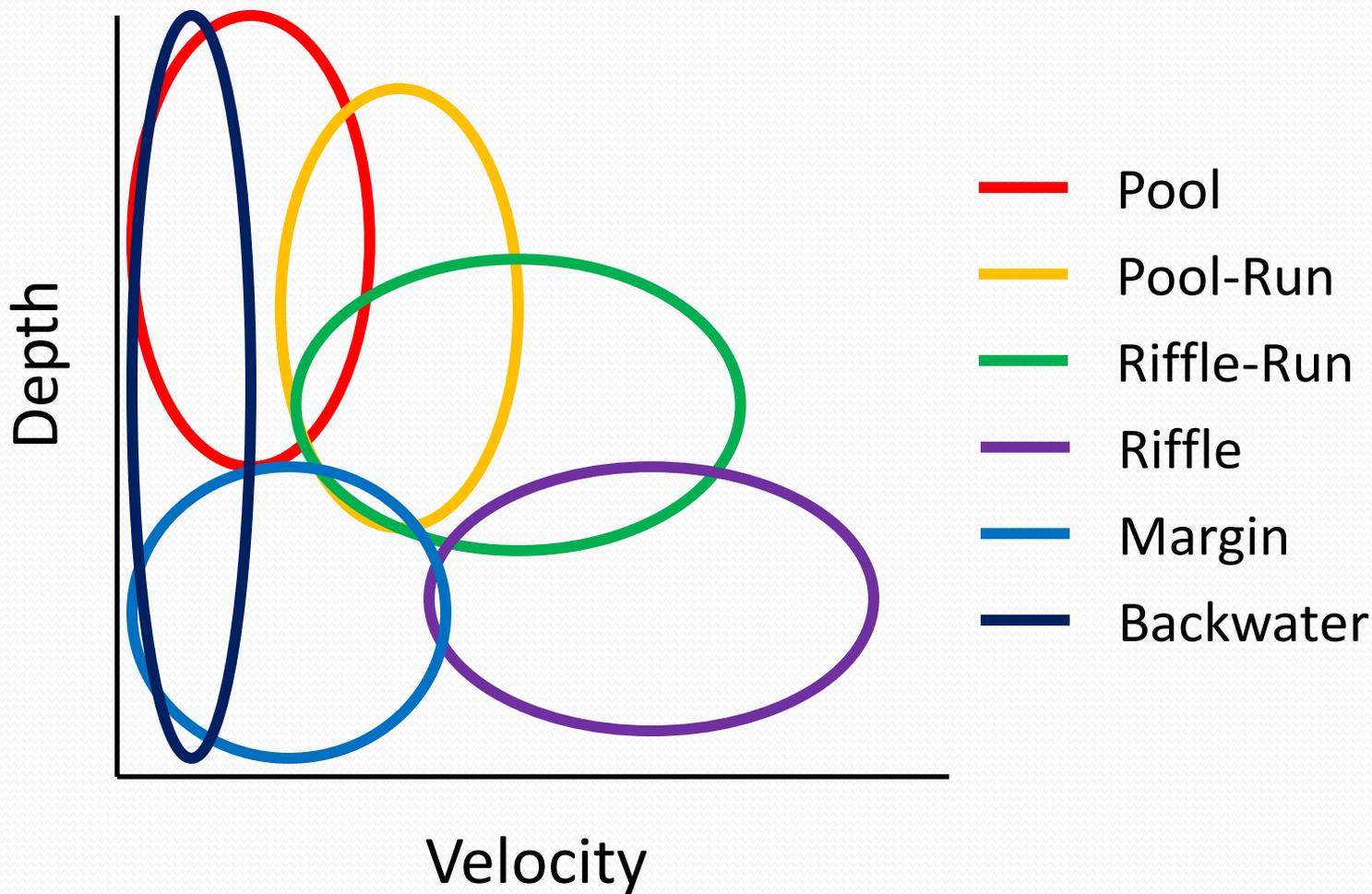
Guild Frameworks

- Decided to use simple framework
 - Reduce problems of assigning to similar adjacent types
 - Easier for public to understand
 - Restrict guilds to habitats indicative of flow (i.e., ignore substrate/cover parameters, which we can't manage)
 - All the DWR PHabSim guilds (14) can be grouped within the flow-based guilds, except for backwater

Proposed NC Guild Structure

Persinger	NC Study	Comment
Riffle	Riffle	
Fast-generalist	Riffle-run	Name change only
Pool-run	Pool-run	
Pool-cover	Pool	Name change; with or without cover
	Margin	Added; shallow-slow habitats
	Backwater	Added; mostly coastal

Proposed NC Guild Structure



Assigning Fish to Guilds

- Used “Fishes of” books
 - Freshwater Fishes of Virginia (Jenkins and Burkhead 1994)
 - The Fishes of Tennessee (Etnier and Starnes 1993)
 - Freshwater Fishes of South Carolina (Rohde et al. 2009)
 - Inland Fishes of Mississippi (Ross 2001)
 - Fishes of Alabama (Boschung and Mayden 2004)
- These books describe habitat use based on direct observation and summarizing information from other sources
- Typically habitat was described for both spawning and adult/juvenile lifestages

Assigning Fish to Guilds

- Goudreau made initial review of books and assigned guilds to spreadsheet of fish
- Rohde and Tracy reviewed/edited the spreadsheet and added assignments to those species not described in the books
- Some species use multiple habitat types
- Made notes on species that are exotic, introduced to particular basins, or estuarine

Results

	Adult/Juvenile	Spawning
Riffle	15	21
Riffle-run	25	47
Pool-run	49	41
Pool	60	33
Margin	6	7
Backwater	16	22

Note: Species using multiple guilds were assigned to predominant guild

Use of Guild Data – RTI

- Focus on Riffle-Run guild
 - Flow sensitive
 - High number of species
 - Use if either lifestage (adult or spawning) is in guild, but must only use Riffle-Run
- Select five Riffle-Run species
 - High count (>100 records)
 - Wide geographic distribution (multiple basins)
 - Creek Chub, Fantail Darter, Rosyside Dace, Central Stoneroller, Blacknose Dace

Use of Guild Data – TNC

- Focus on all Guilds, example application:
 - What is the percent occupancy by guild type at each survey site and each survey date?
 - Is guild composition and percent distribution at a site consistent over time? If not, how is it changing, and why?
 - Select sites with multiple surveys over time
 - Measure changes in guild occupancy over time at a specific locations
 - Possible controls on variation: Flow alteration, combined flow and habitat changes, seasonality and lifestage characteristics...