



pennsylvania

DEPARTMENT OF ENVIRONMENTAL PROTECTION



Bureau of Waterways Engineering and Wetlands

Chapter 105 Draft Technical Guidance Overview

Water Resources Advisory Committee
April 11, 2014

Programmatic Enhancements

- * Development of Technical Guidance
 - * Resource Condition Assessments
 - * Function Based Compensation Protocol
- * In Lieu Fee Prospectus
 - * PIESCES

Aquatic Resources

- * Riverine
 - * Intermittent and perennial wadeable watercourses and their floodways/floodplains
- * Palustrine/Tidal
 - * Wetland environments including unvegetated forms (i.e. mudflats)
- * Lacustrine
 - * Lakes, reservoirs and non-wadeable rivers

Condition Assessments

- * Regulatory Program Uses
 - * Environmental Assessment
 - * Compensation requirements
 - * Reduction of individual biases
 - * Standard approach across resource types

Condition Assessments

- * Level 2 Rapid Condition Assessments
 - * Palustrine (Doc # 310-2137-002)
 - * Riverine (Doc # 310-2137-003)
 - * Lacustrine (Doc # 310-2137-004)

Condition Assessments

- * Standardized Protocols
 - * Standard scoring approach
 - * Utilized same indices where possible
 - * Condition category definitions
- * Qualitative – rapid and low cost
 - * Addresses most permit applications

Condition Assessments

- * Riverine Condition Indices
 - * Channel Condition
 - * **Riparian Vegetation (floodplain)**
 - * **Riparian ZOI Vegetation**
 - * Instream Habitat
 - * Channel Alteration

Condition Assessments

- * Palustrine Condition Indices
 - * **Wetland Zone of Influence (ZOI)**
 - * Roadbed Presence
 - * Vegetation Condition
 - * Hydrologic Modification
 - * Sediment Stressor
 - * Water Quality Stressor

Condition Assessments

- * Lacustrine Condition Indices
 - * Average Depth Condition
 - * **Riparian Shoreline Vegetation**
 - * **Riparian ZOI Vegetation**
 - * Shoreline and Near-shore Alterations

Scoring

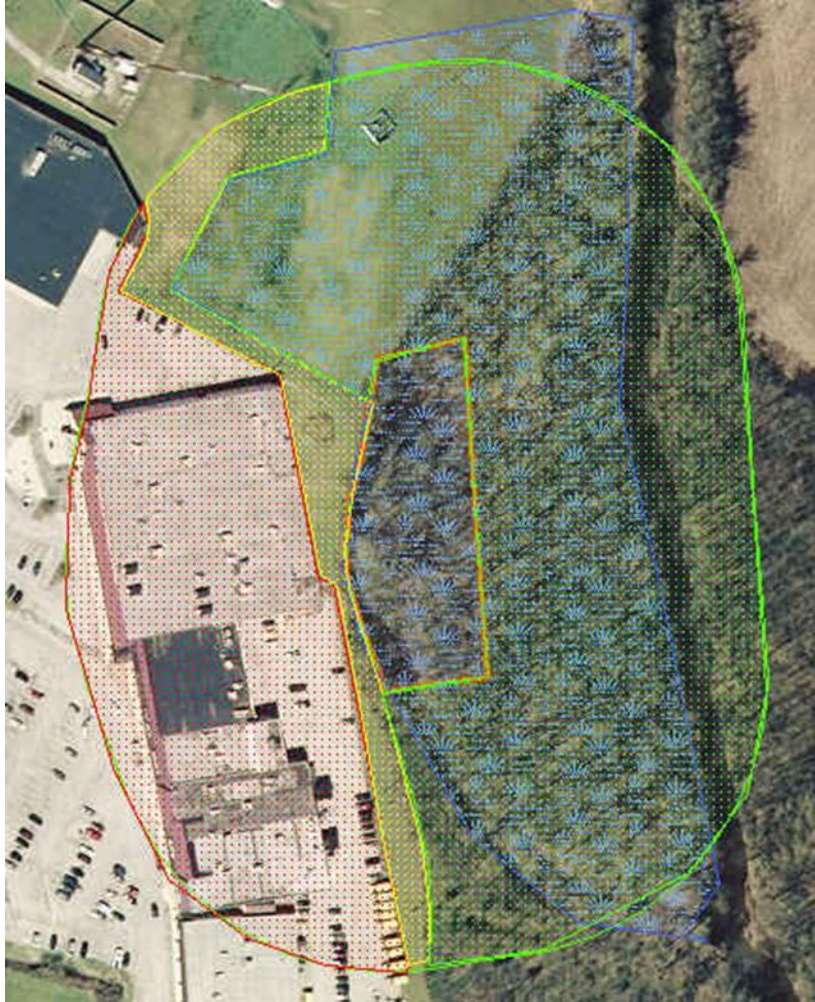
- * Uses 1-20 scoring then converted to index (0.05-1)
- * Assessor determines applicable condition category, then selects score from category range

Optimal					Suboptimal					Marginal					Poor				
20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Scoring

Wetland Zone of Influence (300 foot area around AA perimeter)	Optimal	Suboptimal		Marginal		Poor														
	ZOI areas with tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Waterways and wetlands located within the ZOI area	<u>High Suboptimal:</u> ZOI areas with tree stratum (dbh > 3 inches) present, with greater than or	<u>Low Suboptimal:</u> ZOI areas with tree stratum (dbh > 3 inches) present, with greater than or	<u>High Marginal:</u> Non-maintained, dense herbaceous vegetation with either a shrub layer	<u>Low Marginal:</u> Non-maintained, dense herbaceous vegetation, riparian areas lacking shrub	<u>High Poor:</u> Lawns, mowed, and maintained areas, nurseries; no-till cropland; actively	<u>Low Poor:</u> Impervious surfaces, mine spoil lands, denuded surface, row													
					understory.															
SCORE ____	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
1. Identify all applicable Condition Category areas within the wetland zone of influence using the descriptors above. 2. Estimate the % area within each condition category. Calculators are provided for you below. 3. Enter the % ZOI Area in decimal form (0.00) and Score for each category in the blocks below.																				
Condition Category:		Optimal	High Marginal	Low Marginal															Totals	
Scoring:	% ZOI Area >	65%	25%	10%															100%	
	Score >	20	9	6																CI
	% Area * Score =	13	2.25	0.6															15.85	0.79

Scoring



- * Wetland ZOI (Extends 300 feet from AA)
- * Area with desktop Condition Category classification
- * Optimal, High and Low Poor

Function Based Compensation

- * Pennsylvania Function Based Compensation Protocol (Doc # 310-2137-001)
 - * Standardized Mitigation Process
 - * Predictive Expectations
 - * Builds on Statewide Consistency
 - * Reduces Application Review Time
 - * Reduces Applicant/DEP Conflicts
 - * Maximizes Information Use

➤ Function Based Compensation

- * Pennsylvania Function Based Compensation Protocol (Doc # 310-2137-001)
- * Common Resource Language
- * Utilized by ILF, Banking and Permittee Responsible Mitigation
- * Transparent Compensation Process

Defining Resource Functions

- * Stream Restoration Function Objectives
 - * Identified over 60 riverine functions in five groupings (3 key functions identified below)

Summary of Primary Functions				
System Dynamics	Hydrologic Balance	Sediment Processes and Character	Biological Support	Chemical Processes and Pathways
Stream Evolution Processes	Surface Water Storage Processes	Sediment Continuity	Biological Communities and Processes	Water and Soil Quality
Energy Management	Surface / Subsurface Water Exchange	Substrate and Structural Processes	Necessary Habitats for all Life Cycles	Chemical Processes and Nutrient Cycles
Riparian Succession	Hydrodynamic Character	Quality and Quantity of Sediments	Trophic Structures and Processes	Landscape Pathways

Defining Resource Functions

* Hydrogeomorphic (HGM) Wetland Function Models

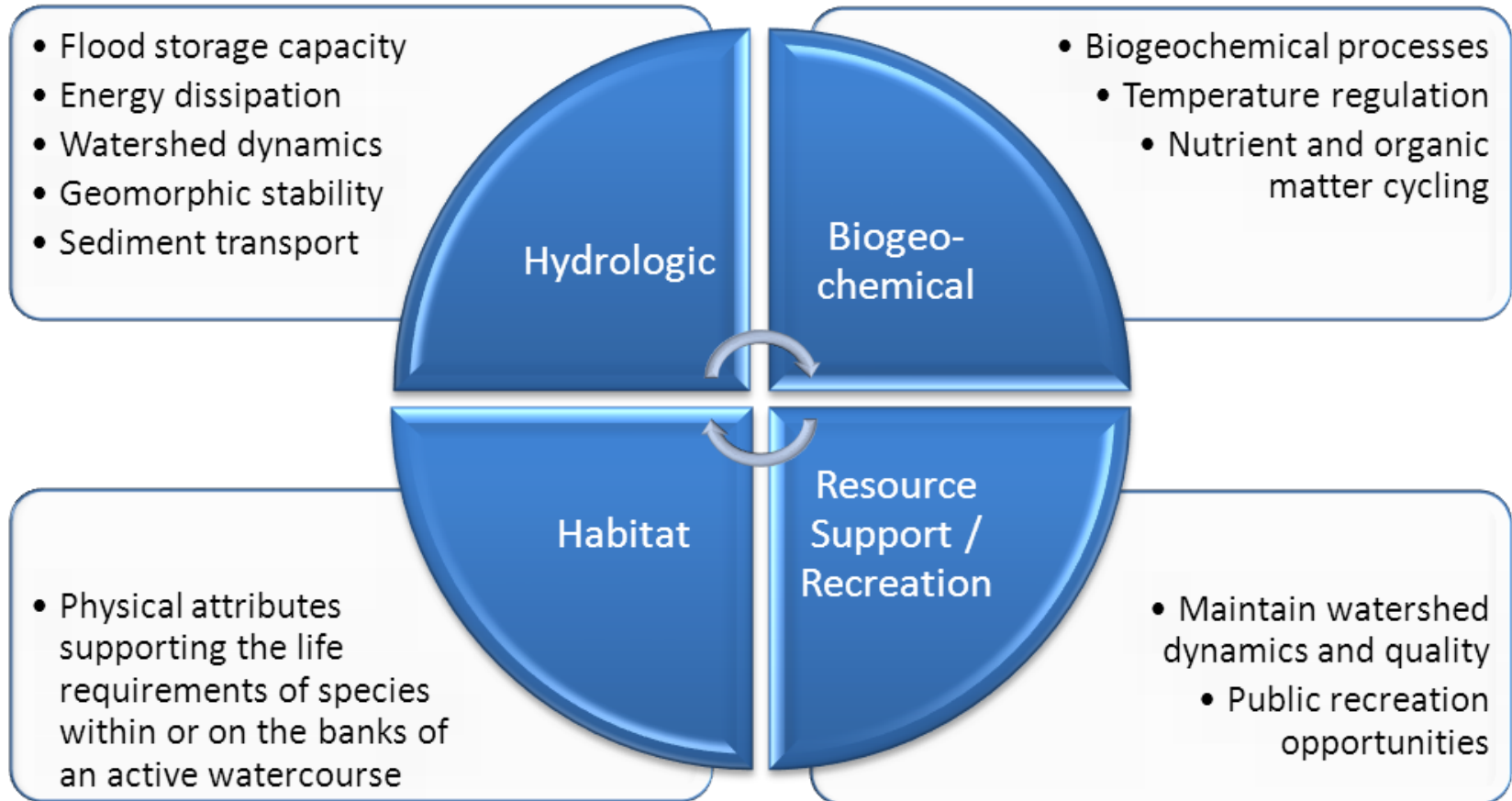
Group	Function	Description
Hydrologic	F1	Energy Dissipation/Short-Term Surface Water Detention
	F2	Long Term Surface Water Storage
	F3	Maintain Characteristic Hydrology
	F4	Reserved
Biogeochemical	F5	Removal of Imported Inorganic Nitrogen
	F6	Solute Adsorption Capacity
	F7	Retention of Inorganic Particulates
	F8	Export of Organic Carbon (dissolved and particulate)
Habitat	F9	Maintain Characteristic Native Plant Community Composition
	F10	Maintain Characteristic Detrital Biomass
	F11	Vertebrate Community Structure and Composition
	F12	Maintain Landscape Scale Biodiversity

Standardized Function Approach

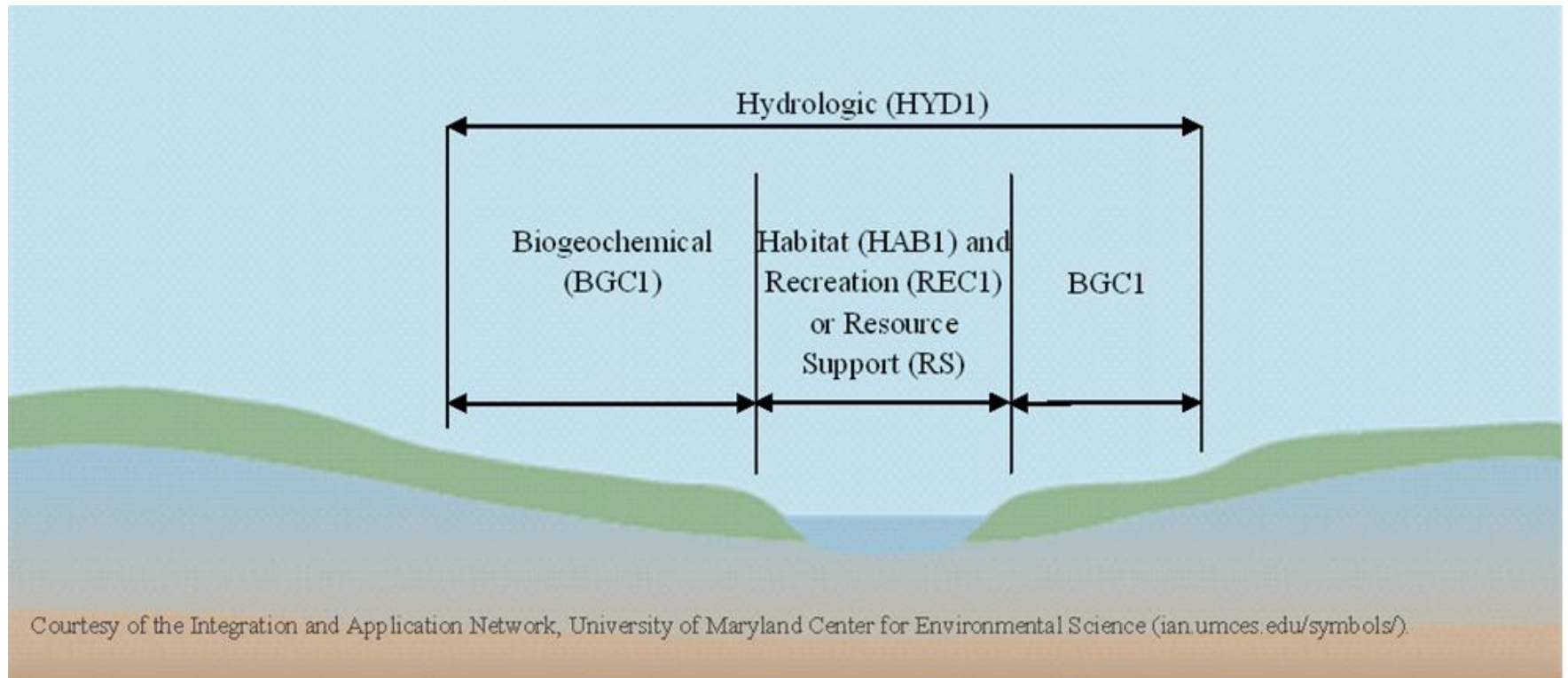
- * Establishes the same framework for all resource types

Function Group	Wetland	Riverine	Lacustrine	Description
Hydrologic (HYD)	√	√		Hydrodynamics, storage, baseflow
Biogeochemical (BGC)	√	√		Vegetation, soils and hydrology
Habitat (HAB)	√	√	√	Community and species level
Recreation (REC)		√	√	Public recreational opportunities
Resource Support (RS)		√		Role in maintaining water quality

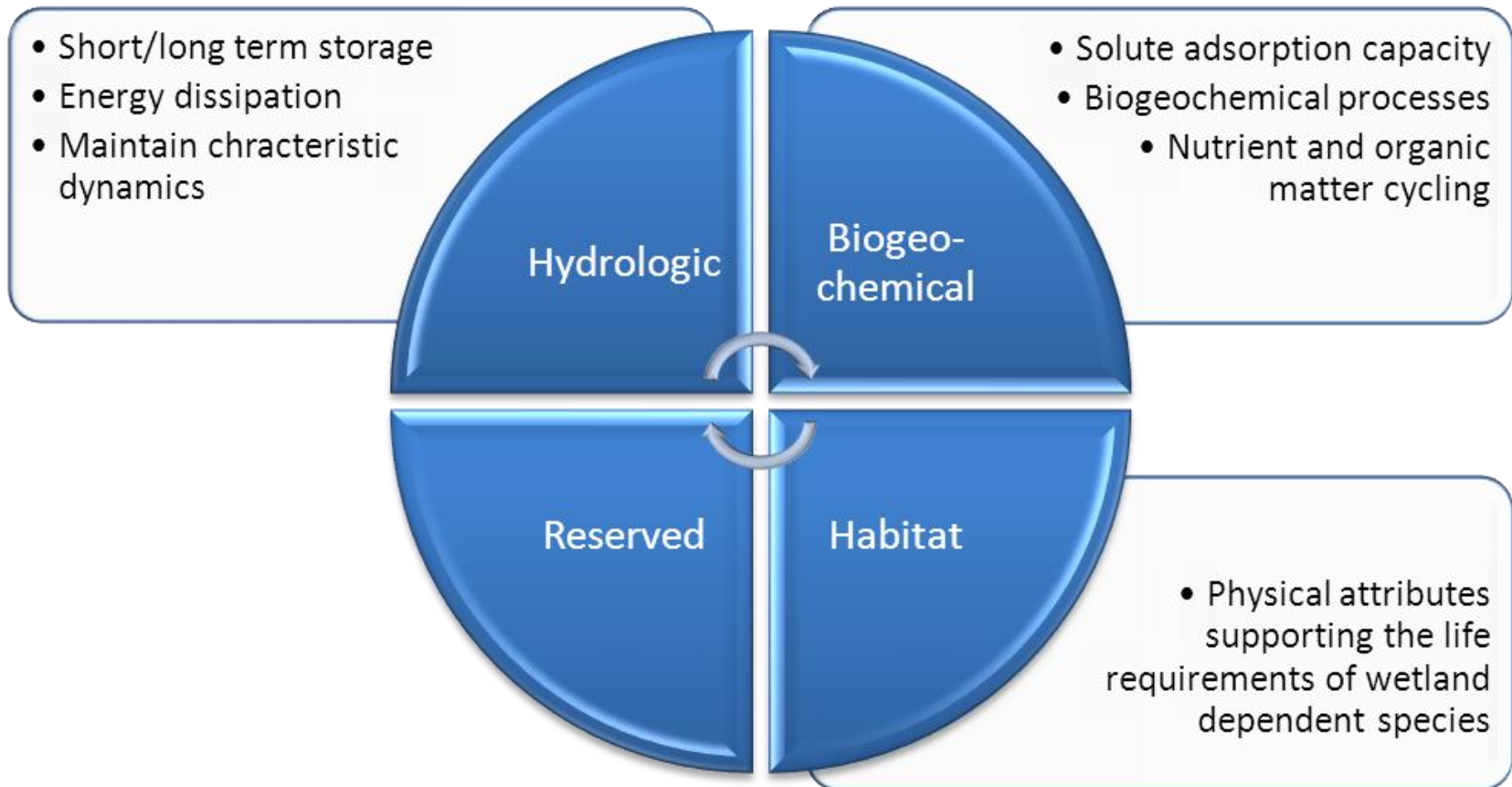
Riverine Function Groups



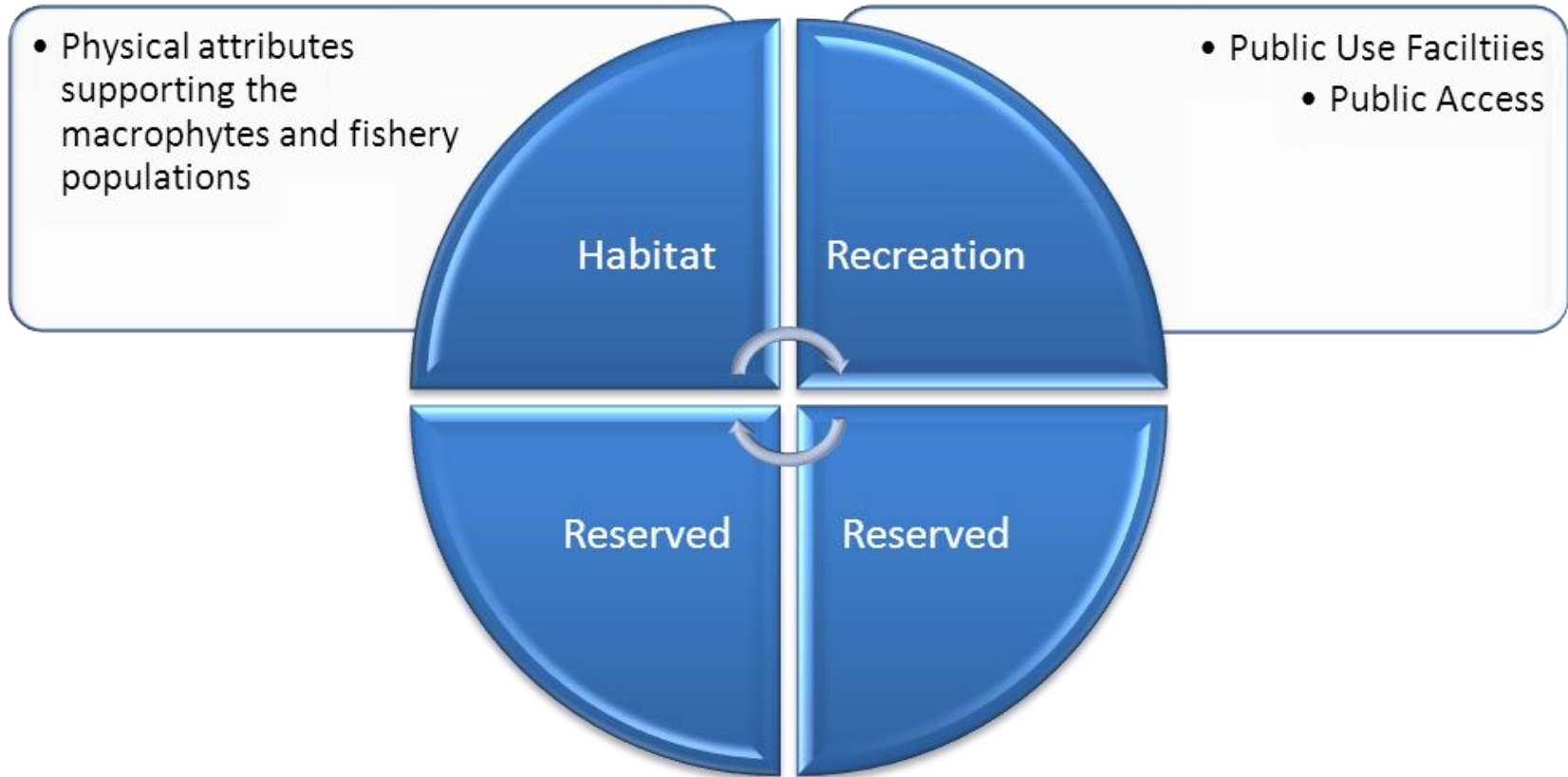
Standardized Function Approach



Wetland Function Groups



Lacustrine Function Groups



Compensation Factors

- * Compensation Determination by Resource Function Group
 - * Impact Area – by Resource Function and Impact Type (acres)
 - * Project Effect Factor (Scale 0-3)
 - * Resource Value (Scale 1-3)
 - * Resource Condition Index (Scale 0.05-1)

Establishing Impacts

- * Impacts categorized as
 - * **Direct** – loss of resource **area** and function
 - * Occurs through filling, draining, impounding
 - * **Indirect** – loss of resource function only
 - * Occurs through alteration of chemical, physical or biological components of the resource

Project Effect Factor

- * **Specific** Criteria to assign the level of project effect for each resource function group
 - * Criteria for both Direct and Indirect impacts
 - * Severe – complete loss of area and function
 - * Moderate
 - * Limited
 - * Minimal –small to no loss of area, rapid recovery of altered function(s)

Severe Project Effect Factor - Criteria Example

Severe Effect				Minimal Effect					
Function Group	Riverine	Function Group	Wetland	Function Group	Riverine	Function Group	Wetland	Function Group	Lacustrine
HYD1	1. Fills or structures that result in any increase in the 100-year frequency water surface elevation in a delineated FEMA mapped floodway; or	HYD2	1. Wetland area converted to open water or dry land (non-wetland) through inundation or filling; or	HYD1	1. Fills or structures that do not result in a rise in the 100-year frequency water surface elevation of the natural unobstructed water surface elevation and fills are not located in portions of the floodplain of streams with ≤ 6,400 acre drainage areas.	HYD2	1. No hydrologic modification through draining, flooding, topographic modification or from stormwater discharges.	N/A	
	2. Fills that eliminate significant portions of the floodplain of streams with ≤ 6,400 acre drainage areas extending along > 500 linear feet of stream length.		2. Wetland connection to stream/floodplain or other natural surface drainage features contributing to hydrologic source of wetland lost; or						
			3. Wide spread hydrologic modification through draining, flooding or topographic modification.	BGC1	1. Floodplain tree canopy closure maintained; or 2. Potential for tree canopy closure remains and area restored with native tree and shrub species plantings.	BGC2	1. Typical hydrology, hydrodynamics and vegetation structure maintained for HGM subclass and vegetation type.		
BGC1	1. Floodplain ability to support vegetation eliminated through filling/development; or	BGC2	1. Wetland area converted to open water or dry land (non-wetland); or	HAB1	1. Bridges spanning the channel and floodplain, no instream piers.	HAB2	1. Less than or equal to 10% of the individual delineated wetland area effected by vegetation clearing or long term vegetation management.		
	2. Floodplain converted to open body of water through inundation; or		2. Wide spread activities effecting surface roughness (vegetation clearing or maintenance, clearing or grubbing (macro and microtopography reduction); or	REC1	1. Recreational uses unimpeded or maintained without altering recreational use.	N/A	REC2	1. Recreational uses unimpeded or maintained without altering recreational use.	
	3. Floodplain vegetation isolated from accessing groundwater table via activities that lower groundwater table levels (e.g. dredging of stream channel, filling of floodplain areas).		3. Wide spread hydrologic modification through draining, flooding or topographic modification (project results in 4 or more hydrologic stressors from Level 2 RAP).	RS	1. Stream not eliminated, enclosed or disconnected from the groundwater table; or 2. Cumulative total of a project less than 100 feet in any one State Water Plan watershed.		N/A		
HAB1	1. Stream substrate replaced with concrete, metal, plastic, riprap, buried with fill, etc.; or	HAB2	1. Wetland area converted to open water or dry land (non-wetland); or	HAB3	1. Bottom substrate of near shore areas replaced with concrete, metal, plastic, riprap, buried with fill, etc.; or				
	2. Stream bank armoring along > 1000 linear feet of stream bank (each bank length measured independently).		2. Greater than 60% of the individual delineated wetland area effected by vegetation clearing or long term vegetation management.		2. Structure that causes extensive shading of near shore bottom prohibiting macrophyte growth resulting from project.				
REC1	1. Recreational use potential eliminated or altered to the point of unavailability or non-use.	N/A		REC2	1. Recreational use potential eliminated or altered to the point of unavailability or non-use.				
RS	1. Greater than 500 feet of continuous stream eliminated, enclosed or disconnected from the groundwater table; or 2. Cumulative effect of a project is > 2,000 linear feet of stream in any one State Water Plan watershed.			N/A					

Resource Value

- * Resource Value
 - * Varies by resource type
 - * Foundation in regulations, science and public interest (e.g.. Special Protection, Rare wetland communities, special fishery designations)
 - * Standardized list of values

Resource Condition

- * Use Rapid Condition or Intensive Measures
 - * Since index based, other approaches usable
 - * Process can adapt to utilize best approaches
- * Provides reasonableness to compensation
 - * Low quality resources result in reduced amount
 - * High Quality resources result in increased amount

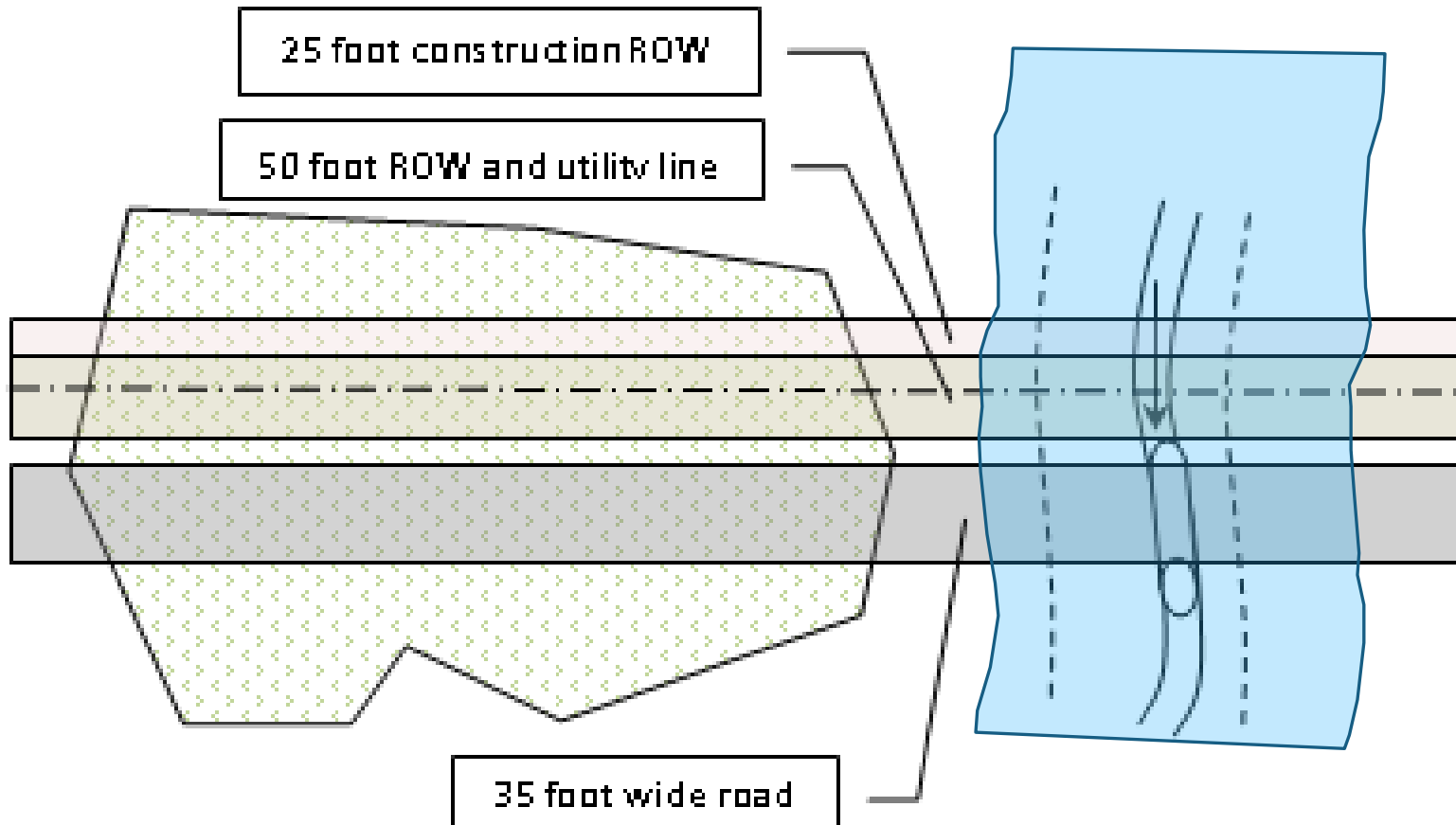
Standard Compensation Equation

- * **(CR) = AI x PE x RV x CI**
 - * CR = Compensation Requirement
 - * AI = Area of Impact (in acres, 0.00)
 - * PE = Project Effect Factor
 - * RV = Resource Value
 - * CI = Condition Index Value (0.00) (from applicable resource condition assessment)

Establishing Compensation

- * Compensation evaluation performed for each resource function group affected by project
- * Process designed to ensure resource/functional equivalency provided as compensation

Project Example



Riverine Impacts

Riverine Resource Impacts

Resource Area	Road	Perm ROW	Temp ROW
Floodway	35 x 275	50 x 275	25 x 275
Acreage	0.22	0.32	0.16
Stream Channel	35 x 60	50 x 60	25 x 60
Acreage	0.05	0.07	0.03
RECI	0.75		
Resource Value*	2.00		

*Small streams with greater than 1,280 acre drainage areas but less than or equal to 6,400 acre drainage areas, streams designated Trout Stocked Fisheries (TSF) under Ch. 93 and streams with other recreation valued species present with sufficient populations to provide recreational opportunities.

Resource Value

Aquatic Resource Value Category			Value
Quality Resource Waters			2.0
Waterways	Wetlands	Large Rivers/Reservoirs	
Small streams with greater than 1,280 acre drainage areas but less than or equal to 6,400 acre drainage areas, streams designated Trout Stocked Fisheries (TSF) under Ch. 93 and streams with other recreation valued species present with sufficient populations to provide recreational opportunities.	This category includes all other wetlands not categorized as significant, special, support or minimal resource wetlands. Wetlands that support a quality aquatic community based upon upon scoring equal to or greater than greater than or equal to 0.42 but less than 0.58 using the DEP's Wetland Condition Level 2 Rapid Assessment Protocol.	Includes all other waters not categorized as significant, special, support or minimal resource waters.	

Project Effect Values

- * Project Effect Factor assigned to each function group for related activities
 - * PE values can vary from function group to function group

Riverine Project Effect

Project Activity	P _E Function Group			
	HYD1	BGC1	HAB1	REC1
Road	1.0	3.0	3.0	3.0
Temporary ROW	0.0	1.0	0.0	0.0
Permanent ROW	0.0	2.0	1.0	0.0

Calculating Compensation

* Road

$$* \text{HYD1} = 0.27 \times 1.0 \times 2.0 \times 0.75 = 0.41$$

$$* \text{BGC1} = 0.22 \times 3.0 \times 2.0 \times 0.75 = 0.99$$

$$* \text{HAB1} = 0.05 \times 3.0 \times 2.0 \times 0.75 = 0.23$$

$$* \text{REC1} = 0.05 \times 3.0 \times 2.0 \times 0.75 = 0.23$$

$$(\text{CR}) = \text{AI} \times \text{PE} \times \text{RV} \times \text{CI}$$

Calculating Compensation

- * *Temporary ROW*

- * $\text{HYD1} = 0.19 \times \mathbf{0.0} \times 2.5 \times 0.75 = 0.0$

- * $\text{BGC1} = 0.16 \times 1.0 \times 2.5 \times 0.75 = 0.30$

- * $\text{HAB1} = 0.03 \times \mathbf{0.0} \times 2.5 \times 0.75 = 0.0$

- * $\text{REC1} = \mathbf{0.0} \times \mathbf{0.0} \times 2.5 \times 0.75 = 0.0$

$(\text{CR}) = \text{AI} \times \text{PE} \times \text{RV} \times \text{CI}$

Calculating Compensation

- * *Permanent ROW*

- * $\text{HYD1} = 0.39 \times \mathbf{0.0} \times 2.5 \times 0.75 = 0.0$

- * $\text{BGC1} = 0.32 \times 2.0 \times 2.5 \times 0.75 = 1.20$

- * $\text{HAB1} = 0.07 \times 1.0 \times 2.5 \times 0.75 = 0.13$

- * $\text{REC1} = 0.07 \times \mathbf{0.0} \times 2.5 \times 0.75 = 0.0$

$(\text{CR}) = \text{AI} \times \text{PE} \times \text{RV} \times \text{CI}$

Riverine Summary

- * Compensation requirement in the form of unitless resource function credits

Riverine Summary

Project Activity	Compensation Requirement Credits			
	HYD1	BGC1	HAB1	REC1
Road	0.41	0.99	0.23	0.23
Temporary ROW	0.00	0.30	0.00	0.00
Permanent ROW	0.00	1.20	0.13	0.00
Total Credits	0.41	2.49	0.36	0.23

Palustrine/Tidal Impacts

Wetland Resource Impacts			
	Road	Perm ROW	Temp ROW
Wetland	35 x 350	50 x 350	25 x 350
Acreage	0.28	0.4	0.2
WCI	0.68		
Resource Value*	2.50		

* Wetland supports a high quality aquatic community based on Level 2 assessment.

Resource Value

Special Resource Waters			
Riverine	Wetland	Lacustrine	
<p>Waters with a designated or existing use of High Quality under Chapter 93 (relating to water quality standards). Waters with a designated or existing use of Migratory Fish and used by migratory fish populations for reproduction (not just passage). Waters designated with special regulations by the PA FBC as big bass waters or trophy trout waters. Geographically unique or rare fisheries (i.e. salmon or steelhead waters, naturally reproducing northern pike</p>	<p>Wetlands that are located in or along the floodplain of the reach of waters with a designated or existing use listed as high quality under Chapter 93 (relating to water quality standards). Wetlands that support a high quality aquatic community based upon scoring equal to or greater than 0.58 but less than 0.87 using the DEP's Wetland Condition Level 2 Rapid Assessment Protocol. Wetlands characterized by the DCNR's natural community classification system and designated a State Rank of S3 Vulnerable.</p>	<p>Waters with a designated or existing use of High Quality under Chapter 93 (relating to water quality standards). Waters designated with special regulations by the PA FBC as big bass waters or trophy trout waters.</p>	2.5

Project Effect Values

- * Project Effect Factor assigned to each function group for related activities
 - * PE values will vary from function group to function group

Wetland Project Effect

Project Activity	P _E Function Group		
	HYD2	BGC2	HAB2
Road	3.0	3.0	3.0
Temporary ROW	0.0	1.0	0.0
Permanent ROW	0.0	2.0	1.0

Calculating Compensation

- * *Road*

- * $\text{HYD}_2 = 0.28 \times 3.0 \times 2.5 \times 0.68 = 1.43$

- * $\text{BGC}_2 = 0.28 \times 3.0 \times 2.5 \times 0.68 = 1.43$

- * $\text{HAB}_2 = 0.28 \times 3.0 \times 2.5 \times 0.68 = 1.43$

$$(\text{CR}) = \text{AI} \times \text{PE} \times \text{RV} \times \text{CI}$$

Calculating Compensation

- * *Temporary ROW*

- * $\text{HYD}_2 = 0.20 \times 0.0 \times 2.5 \times 0.68 = 0.0$

- * $\text{BGC}_2 = 0.20 \times 1.0 \times 2.5 \times 0.68 = 0.34$

- * $\text{HAB}_2 = 0.20 \times 0.0 \times 2.5 \times 0.68 = 0.0$

$$(\text{CR}) = \text{AI} \times \text{PE} \times \text{RV} \times \text{CI}$$

Calculating Compensation

- * *Permanent ROW*

- * $\text{HYD}_2 = 0.40 \times \mathbf{0.0} \times 2.5 \times 0.68 = 0.0$

- * $\text{BGC}_2 = 0.40 \times 2.0 \times 2.5 \times 0.68 = 1.36$

- * $\text{HAB}_2 = 0.40 \times 1.0 \times 2.5 \times 0.68 = 0.68$

$$(\text{CR}) = \text{AI} \times \text{PE} \times \text{RV} \times \text{CI}$$

Palustrine/Tidal Summary

- * Compensation requirement in the form of unitless resource function credits

Wetland Summary

Project Activity	Compensation Requirement Credits		
	HYD2	BGC2	HAB2
Road	1.43	1.43	1.43
Temporary ROW	0.00	0.34	0.00
Permanent ROW	0.00	1.36	0.68
Total Credits	1.43	3.13	2.11

Producing Function Credits

- * **(FCG) = AP x CV x RV x CI**
 - * FCG = Function Credit Gain
 - * AP = Area of project gain (in acres, 0.00)
 - * CV = Compensation Value Factor
 - * RV = Resource Value
 - * CIDIFF = Condition Index Differential Value (0.00) (difference between existing condition and projected/measured condition)

Producing Function Credits

- * Area of project gain
 - * Defining discrete areas of gains
 - * 2008 Mitigation rule definitions
 - * Existing resource conditions
 - * Established for each resource function group
 - * Can vary in a given unit of area
 - * Must be demonstrated through measurable methodologies

Producing Function Credits

- * Compensation Value
 - * Considers extent of project
 - * Multiple resources and function groups
 - * Project type – re-establishment, rehabilitation, etc.
 - * Established for project unless resources are distantly located from each other and considered independent sites.

Producing Function Credits

- * Resource Value
 - * Utilizes same Resource Value table and criteria (1-3)
 - * Established for each resource not carried from one type of resource to another.
 - * Resources not interconnected or areas of larger related resources with disparate conditions may have differing resource values (i.e. wetland complexes, isolated wetland areas, stream reaches distantly located).

Producing Function Credits

- * Condition Differential
 - * Level 2 Condition Assessment Use
 - * Generally for planning purposes, not intended for final credit determination
 - * Existing Condition must be established in order to project and establish resource improvement.
 - * As design proceeds identification of causal sources and restorative approaches provides basis for selection of key parameters that provide quantitative measure of improvement and selection of performance measures and success criteria.

Next Steps

- * Comment period ends May 7th
- * Revisions
- * Comment Response Document
- * Application Form Revisions
- * Training and Outreach
- * Final Publication

Questions?

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