Developing a Regional Wetland Functional Assessment Method: Goals and Challenges

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How do you assess wetland function?

- Not all wetlands are equal
- Function vs. condition vs. services
- Qualitative vs. quantitative
- Rapid vs. long-term studies
- Opportunity vs. effectiveness
- Use of reference sites

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Goal: Quantitative Regional Assessment Method

Design Objectives

- Focus on functional capacity
- Consistent across state boundaries
- Practical, rapid, cost effective, user friendly
- Slight variations in input will not cause meaningful changes in output.
- Scientifically supported
- Objective and repeatable

Development process

TO DATE:

- Reviewed existing assessment methods
- Draft method and initial models developed
- Preliminary interagency field testing (2015)
- Analyzed results and revised draft models
- Second season of field testing (2017) plus collection of soil and water samples
- Analyze results, calibrate models, finalize method

NEXT STEPS

- Write user guide and put out to public notice for comments and testing

Basic Structure of Method

- 14 functions in 3 categories
  1. Water quality maintenance
  2. Hydrologic integrity
  3. Biota support
- Models determine a Functional Capacity Grade (FCG) from 0-10
  - Same model for all HGM subclasses
  - FCG will be 0 when function is not applicable
- Individual functions are graded separately
  - WETLANDS DO NOT RECEIVE A TOTAL FUNCTIONAL GRADE

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Future Hopes and Dreams

- Provide training and outreach to users
- Develop an electronic data-entry form and calculator/reporting tool (initial process begun in collaboration with EPA HQ)
- Develop a web-based mapping tool (initial process begun in collaboration with R1 GIS center)
- Update methods in response to additional field testing and user comments

Methodology and Models

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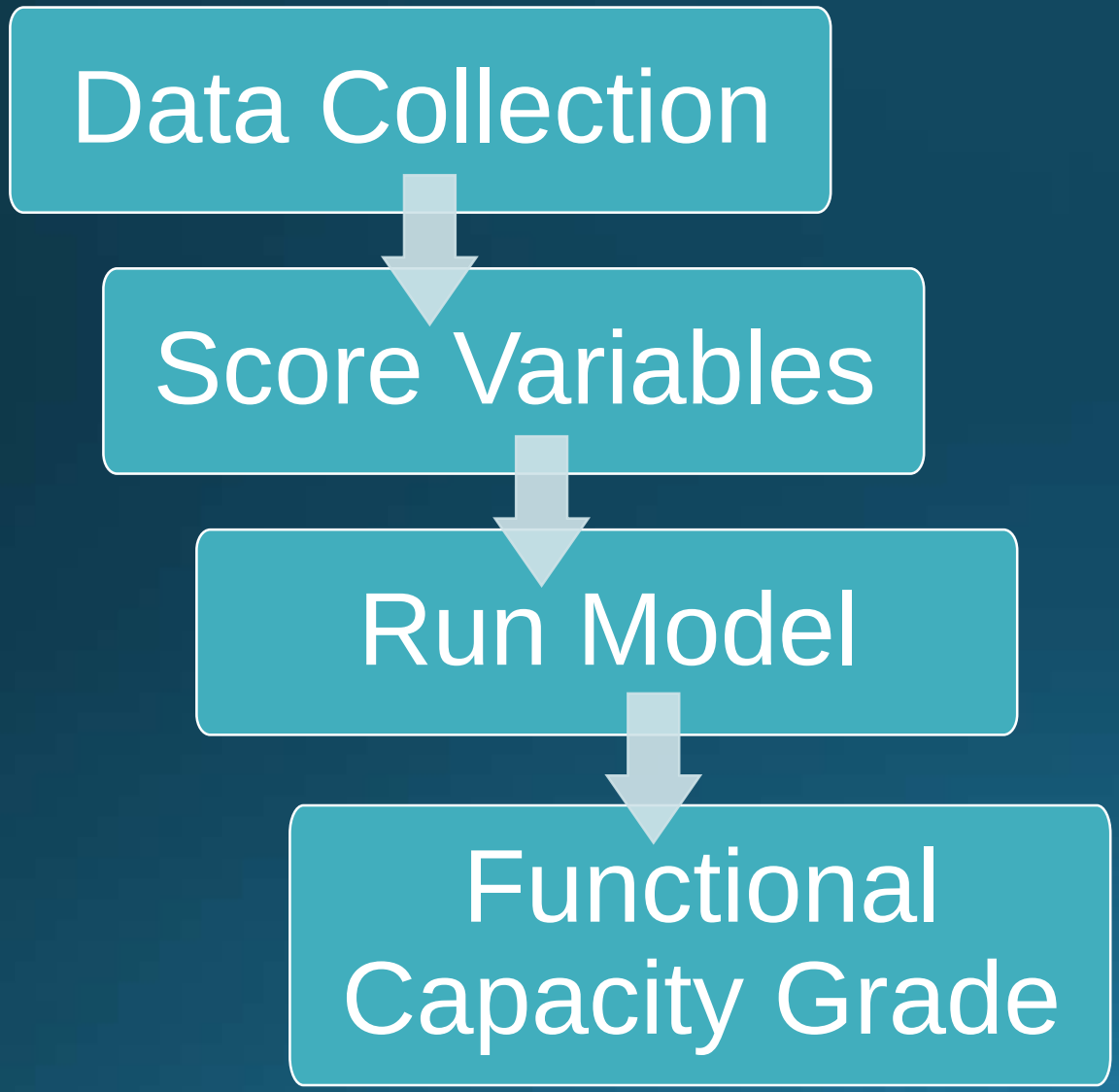
Workflow



FCG (0-10) determines Functional Category

0	Function not applicable
1 to 3	Low functioning
4 to 6	Moderate functioning
7 to 10	High functioning

FUNCTIONS ASSESSED

WATER QUALITY MAINTENANCE	HYDROLOGIC INTEGRITY	BIOTA SUPPORT
(1) Particulate Retention	(6) Groundwater Recharge	(12) Production Export
(2) Removal & Sequestration of Heavy Metals	(7) Surface Water Detention	(13) Plant Community Integrity
(3) Phosphorus Retention	(8) Streamflow Maintenance	(14) Wildlife Habitat Integrity
(4) Nitrogen Transformation	(9) Coastal Storm Surge Detention	
(5) Carbon Sequestration	(10) Bank Stabilization	
	(11) Shoreline Stabilization	

RESOURCE SPECIFIC FUNCTIONS

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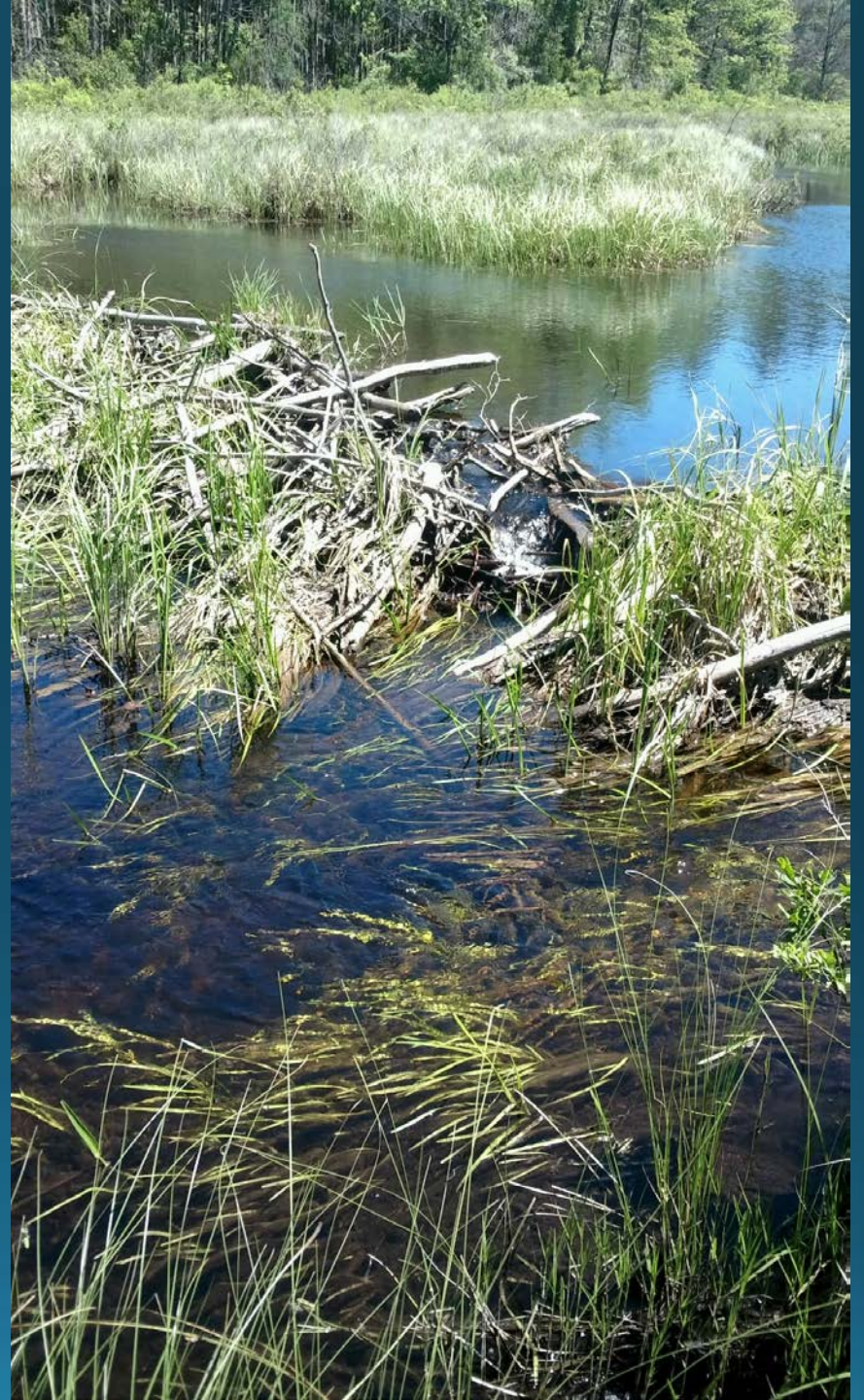
Example: Stream Flow Maintenance

The ability to provide groundwater discharge at the headwaters of one or more streams



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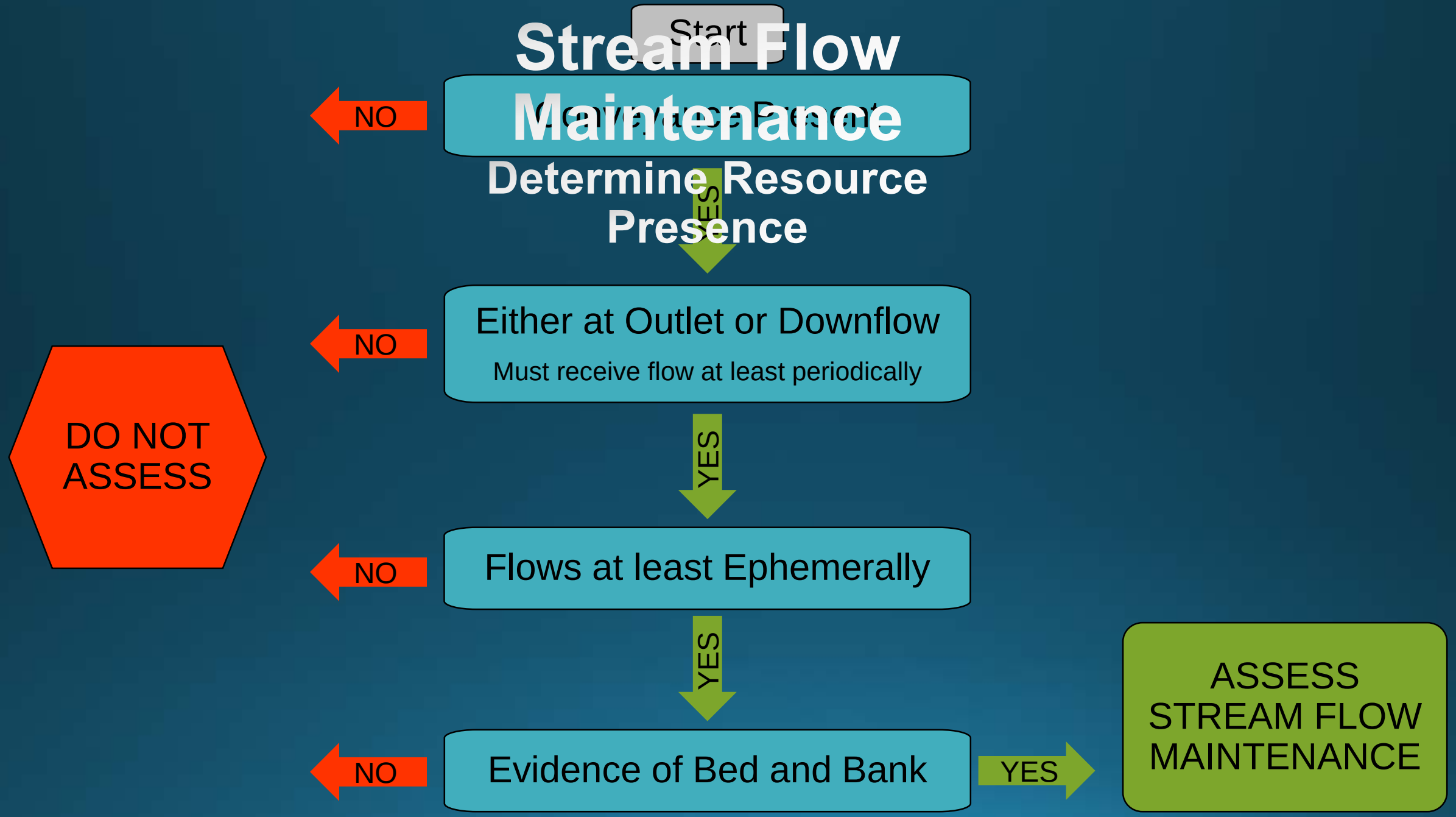
Stream Flow Maintenance



Example: Stream Flow Maintenance
Variables used (Scoring)

Functional Capacity Model

$$F = (Discharge) - \left(\frac{Evapotranspiration}{15}\right)$$

Evapotranspiration – COMPOUND VARIABLE
(2 variables combined in a simple equation)

$$Evapotranspiration = Understory + 2 * TreeCover$$

Example: Stream Flow Maintenance
Variables used (Scoring)

Functional Capacity Model

$$F = (Discharge) - \left(\frac{Evapotranspiration}{15}\right)$$

COMPLEX VARIABLE (modeled variable)

$$Discharge = \frac{2(Position) + 2(SurficialGeology) + OrganicThickness}{5}$$

Complex Variable: Groundwater Discharge

Model

$$Discharge = \frac{2(Position) + 2(SurficialGeology) + OrganicThickness}{5}$$

Position: Location of wetland on the landscape

Categorical variable – converted to numerical value based on rank

Indicate ALL present in assessment unit

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Classification Data Collection

Geomorphology and landscape relationships (see definitions in guidebook):

a. Landscape Position - check all present in AU

- ☐ Depression – Groundwater
- ☒ Depression – Surface Water
- ☐ Flat – Groundwater
- ☐ Flat – Surface Water
- ☐ Slope – Groundwater
- ☐ Slope – Surface Water
- ☒ River/Stream Floodplain
- ☒ River/Stream Fringe
- ☐ Lake/Pond Fringe
- ☐ Freshwater Tidal Fringe
- ☐ Estuarine Fringe
- ☐ Marine Fringe

Scoring – Landscape Position

Groundwater Discharge Model

Depression – GW	10
Slope - GW	10
Lake/Pond Fringe	10
River/Stream Fringe	9
FW Tidal Fringe	9
Estuarine Fringe	8
Flat – GW	5
Marine Fringe	4
River/Stream Floodplain	2
Depression - SW	2
Flat - SW	2
Slope - SW	2

Particulate Retention Model

Depression – GW	10
Depression – SW	10
Flat – GW	7
Flat - SW	7
River/Stream Floodplain	7
Estuarine Fringe	5
FW Tidal Fringe	5
Lake/Pond Fringe	2
River/Stream Fringe	1
Marine Fringe	1
Slope - GW	1
Slope - SW	1

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Example: Groundwater Discharge
Variables used (Scoring)

Model

$$Discharge = \frac{2(Position) + 2(SurficialGeology) + OrganicThickness}{5}$$

Surficial Geology	Score	Surficial Geology	Score
Outwash	10	Marine Silts/Clays	1
Loose Till	9	Beach/Dune	10
Dense Till	2	Alluvium	9
Shallow Bedrock	1	Colluvium	10
Aeolian	10	Anthropogenic - Loose	9
Lacustrine Silts/Clays	1	Anthropogenic - Dense	4

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Example: Groundwater Discharge
Variables used (Scoring)

Model

$$Discharge = \frac{2(Position) + 2(SurficialGeology) + OrganicThickness}{5}$$

Organic Thickness	Score
Deep Organic (> 130 cm)	10
Shallow Organic (41 – 130 cm)	8
Limited Organic (5 – 40 cm)	6
Mucky Mineral	4
No Organic (Fine)	2
No Organic (Sandy)	1

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Example: Groundwater Discharge

$$Discharge = \frac{2(Position) + 2(SurficialGeology) + OrganicThickness}{5}$$

Example:

Groundwater depression = 10

Loose till

Very fine sandy loam

Landscape Position	Score
Depression – GW	10
Depression - SW	2
Flat – GW	5
Flat - SW	2
Slope - GW	10
Slope - SW	2
River/Stream Floodplain	2
River/Stream Fringe	9
Lake/Pond Fringe	10
FW Tidal Fringe	9
Estuarine Fringe	8
Marine Fringe	4

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Example: Groundwater Discharge

$$Discharge = \frac{2(Position) + 2(SurficialGeology) + OrganicThickness}{5}$$

Example:

Groundwater depression = 10

Loose till = 9

Very fine sandy loam

Surficial Geology	Score
Outwash	10
Loose Till	9
Dense Till	2
Shallow Bedrock	1
Aeolian	10
Lacustrine Silts/Clays	1
Marine Silts/Clays	1
Beach/Dune	10
Alluvium	9
Colluvium	10
Anthropogenic - Loose	9
Anthropogenic - Dense	4

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Example: Groundwater Discharge

$$Discharge = \frac{2(Position) + 2(SurficialGeology) + OrganicThickness}{5}$$

Example:

Groundwater depression = 10

Loose till = 9

Very fine sandy loam = 2

$$F = \frac{2(10) + 2(9) + 2}{5} = 8$$

Value

Organic Thickness	Score
Deep Organic (> 130 cm)	10
Shallow Organic (41 – 130 cm)	8
Limited Organic (5 – 40 cm)	6
Mucky Mineral	4
No Organic (Fine)	2
No Organic (Sandy)	1

Example: Stream Flow Maintenance
Variables used (Scoring)

Functional Capacity Model

$$F = (Discharge) - \left(\frac{Evapotranspiration}{15}\right)$$

$$Discharge = 8$$

$$Evapotranspiration = Understory + 2 * TreeCover$$

Example: Stream Flow Maintenance
Variables used (Scoring)

$$F = (Discharge = 8) - \left(\frac{Understory + 2 * TreeCover}{15}\right)$$

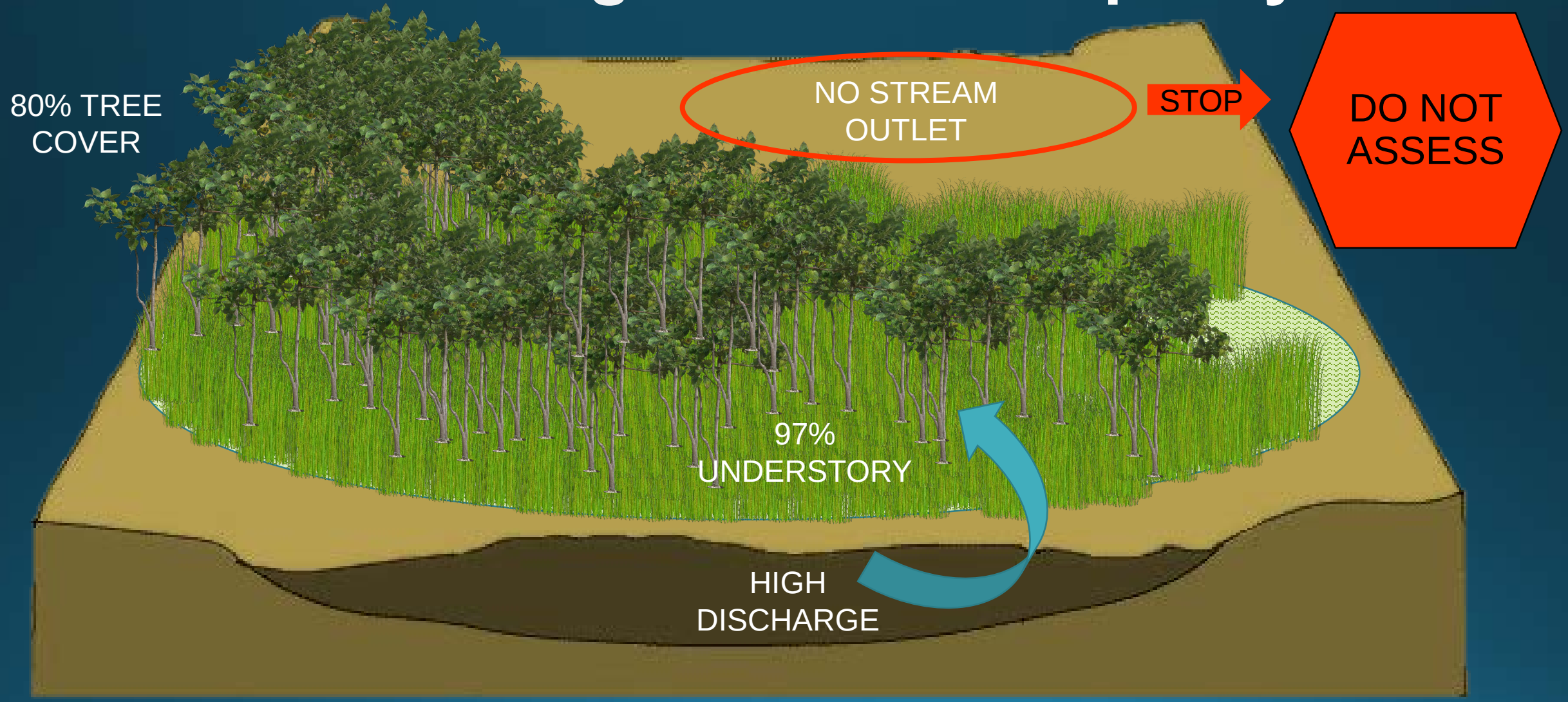
Evapotranspiration must be normalized to a maximum of 2 points

Scoring:

- Understory and TreeCover are scored using cover class
  - Determined in the field for each strata
  - One plot per vegetative community
- Calculation uses cover class midpoints
  - Weighted by community area
- Divided by 10 to determine score

Cover Class	Midpoint	Score
None	0	0
<1% (Trace)	0	0
1 – 4%	2	0
5 – 15%	10	1
16 – 25%	20	2
26 – 39%	33	3
40 – 60%	50	5
61 – 74%	67	7
75 – 84%	80	8
85 – 95%	90	9
96 – 100%	98	10

Example: Stream Flow Maintenance
Calculating Functional Capacity



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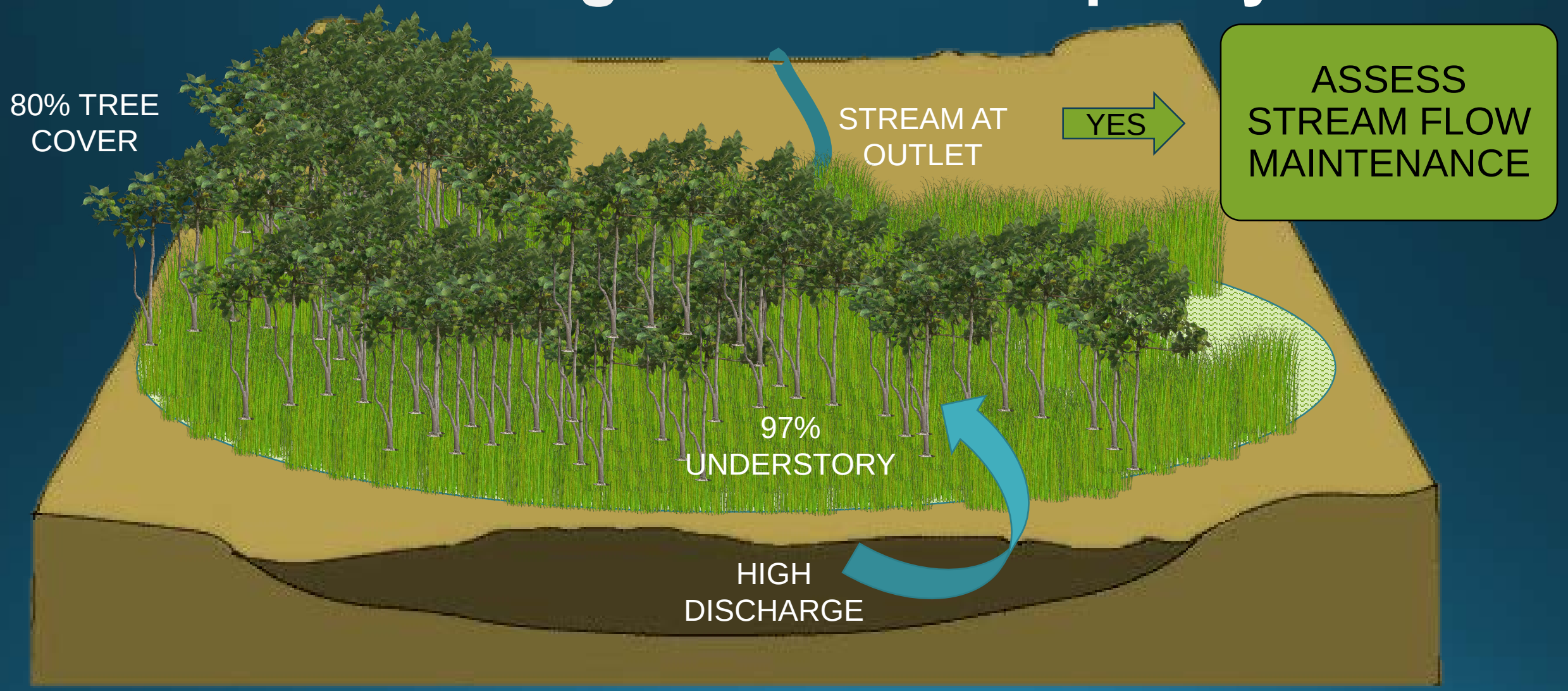
Example: Stream Flow Maintenance

Calculating Functional Capacity



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Example: Stream Flow Maintenance

$$F = (Discharge) - \left(\frac{Understory + 2 * TreeCover}{15}\right)$$

Example:

Stream at Outlet

High GW Discharge — Discharge = 8

97% Understory Cover — Understory = 10

80% Tree Cover — TreeCover = 8

$$F = (8) - \left(\frac{10 + (2 * 8)}{15}\right) = (8) - (2) = 6$$

Cover Class	Midpoint	Score
None	0	0
<1% (Trace)	0	0
1 – 4%	2	0
5 – 15%	10	1
16 – 25%	20	2
26 – 39%	33	3
40 – 60%	50	5
61 – 74%	67	7
75 – 84%	80	8
85 – 95%	90	9
96 – 100%	98	10

Capacity

Questions?

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