KEEPING THE BALANCE

Feature-based water balance in the planning process

SESSION 1: How do I know if I have to do an FBWB?
And what is the right scope?

Presented by: **Laura Del Giudice, B.Sc., M.F.C.**
Sr. Manager, Watershed Planning & Reporting

June 20, 2019

Environment Canada Environnement Canada

Toronto and Region Conservation Authority

Session 1 Objectives

When does FBWB study occur within the planning process?

How do I scope a FBWB study using the *Risk Evaluation*?

What information and data are required?

What is the purpose of monitoring and When do I need to start?

How do I apply the *Risk Evaluation?*

Risk Evaluation

- Approved by TRCA Board of Directors in November 2017
- One of a series of tools developed collaboratively with our External Stakeholder Committee
- Purpose is to clarify and help streamline approval process

WETLAND WATER BALANCE RISK EVALUATION

Toronto and Region Conservation Authority
November 2017

Toronto and Region Conservation for The Living City

Risk Evaluation: 4-Step Process

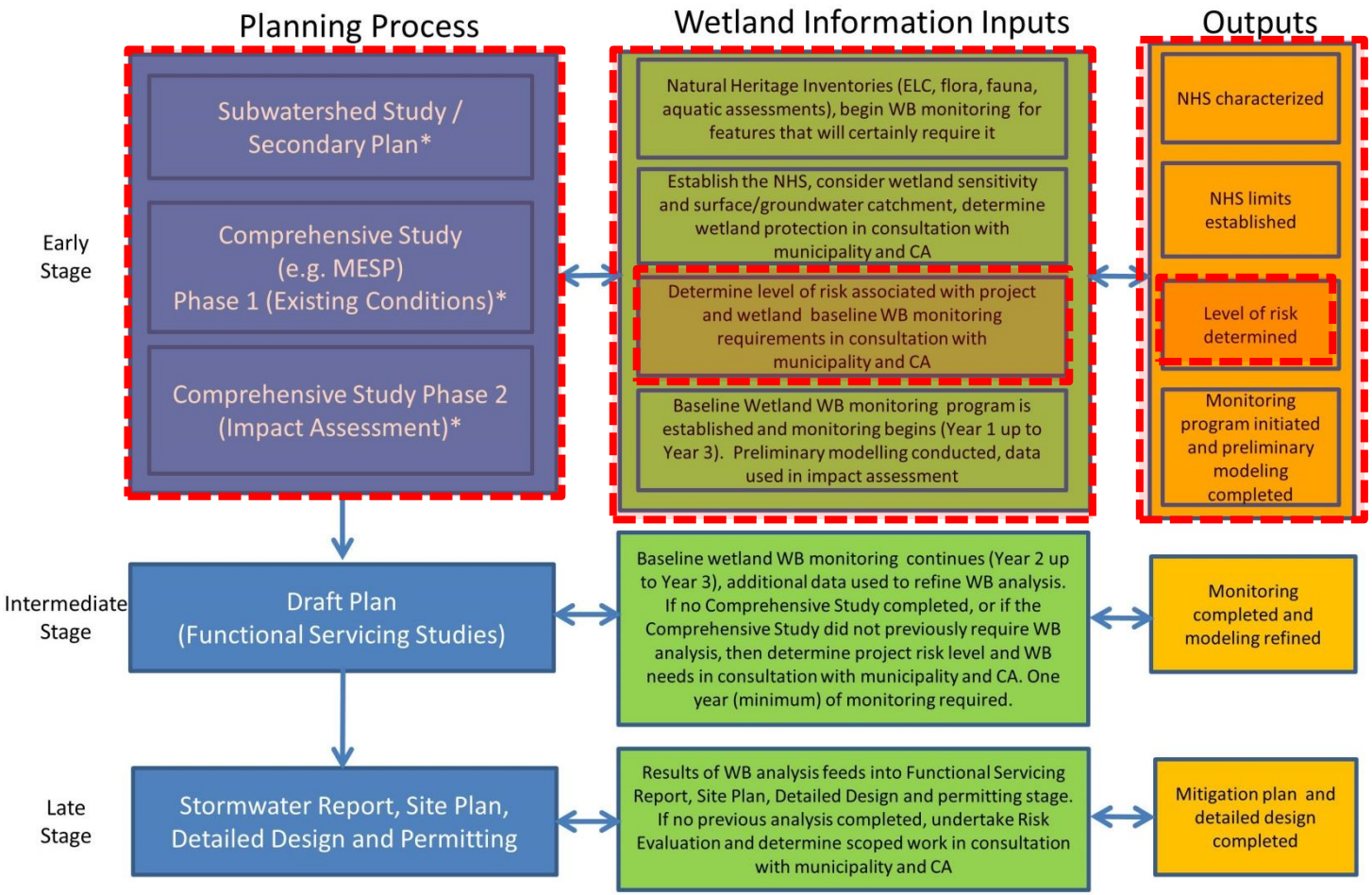
1.  Determining which wetland(s) will be impacted by the proposed development.

2.  Determining the magnitude of potential hydrological change.

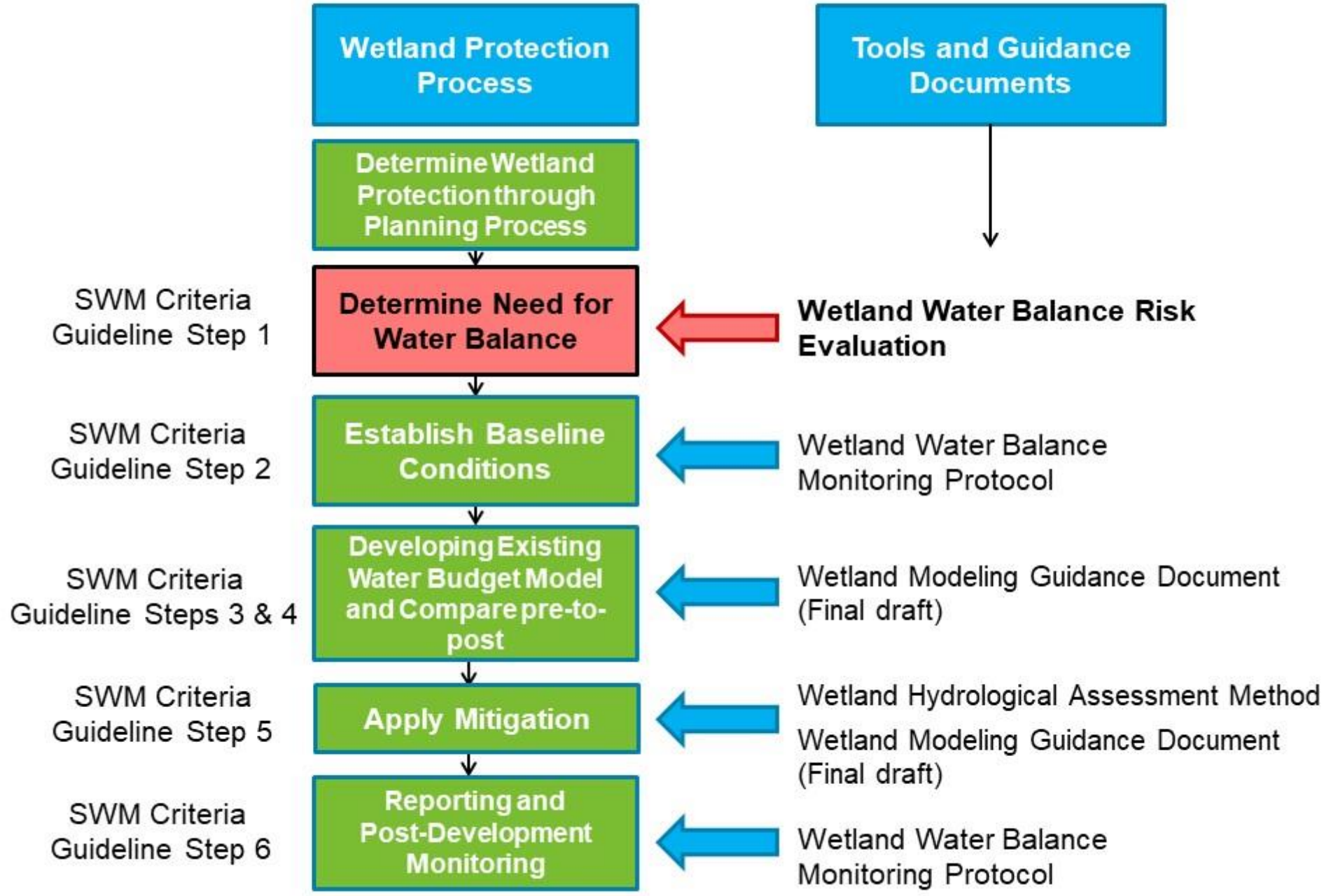
3.  Determining the sensitivity of the wetland and its associated flora and fauna to hydrological change.

4.  Integrating information from step 2 and 3 to assign a level of risk that the proposed development poses to the wetland.

Feature-based Water Balance in the Planning Process

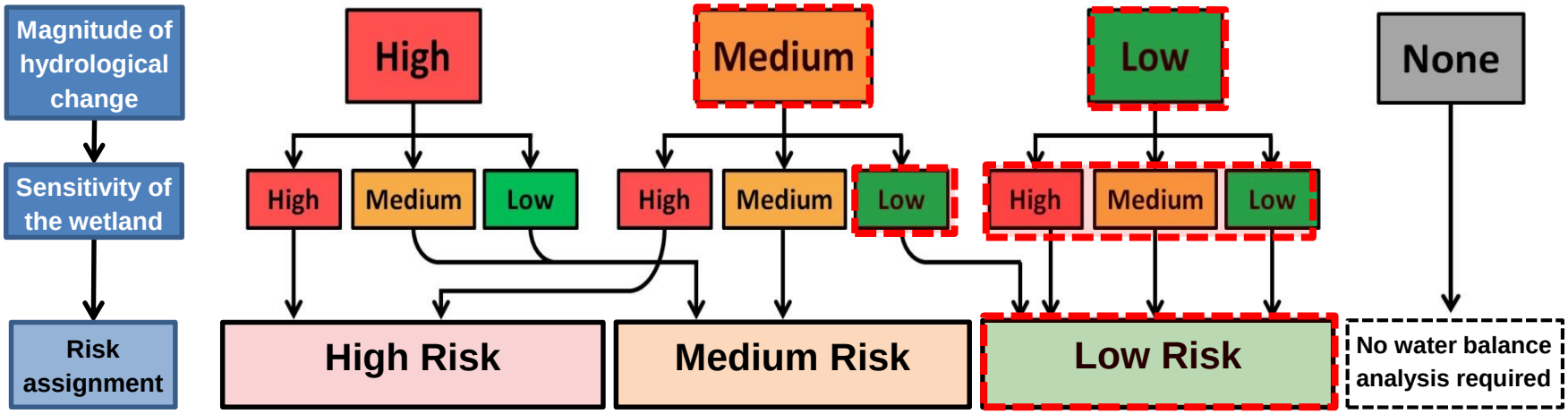


*Note: The scale and level of detail of information provided for the early planning stage will vary by municipal jurisdiction.


Wetland Protection Process
Tools and Guidance Documents
Determine Wetland Protection through Planning Process
SWM Criteria Guideline Step 1
Determine Need for Water Balance
Wetland Water Balance Risk Evaluation
SWM Criteria Guideline Step 2
Establish Baseline Conditions
Wetland Water Balance Monitoring Protocol
SWM Criteria Guideline Steps 3 & 4
Developing Existing Water Budget Model and Compare pre-to-post
Wetland Modeling Guidance Document (Final draft)
SWM Criteria Guideline Step 5
Apply Mitigation
Wetland Hydrological Assessment Method
Wetland Modeling Guidance Document (Final draft)
SWM Criteria Guideline Step 6
Reporting and Post-Development Monitoring
Wetland Water Balance Monitoring Protocol

TRCA Wetland Water Balance Risk Evaluation

Decision Tree



TRCA Wetland Water Balance Risk Evaluation

High Risk

- Pre-development hydrology monitoring required
- Characterization of groundwater interaction emphasized
- Approved continuous hydrology model is required; integrated hydrology model may be required where GW-interaction is high
- Design mitigation plan to maintain water balance as outlined in SWM Criteria Document
- Interim mitigation plan may be required

Medium Risk

- Pre-development hydrology monitoring required
- Approved continuous hydrology model is required
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Low Risk

- Monitoring *not* required.
- Non-continuous hydrology model (e.g. Thornthwaite Mather / spreadsheet approach) required
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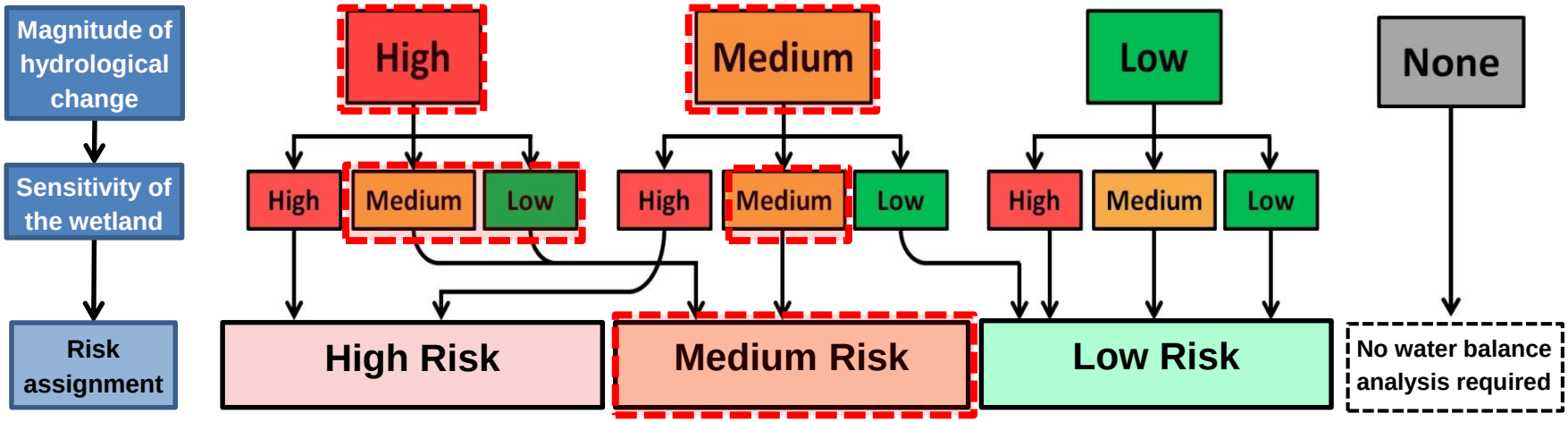

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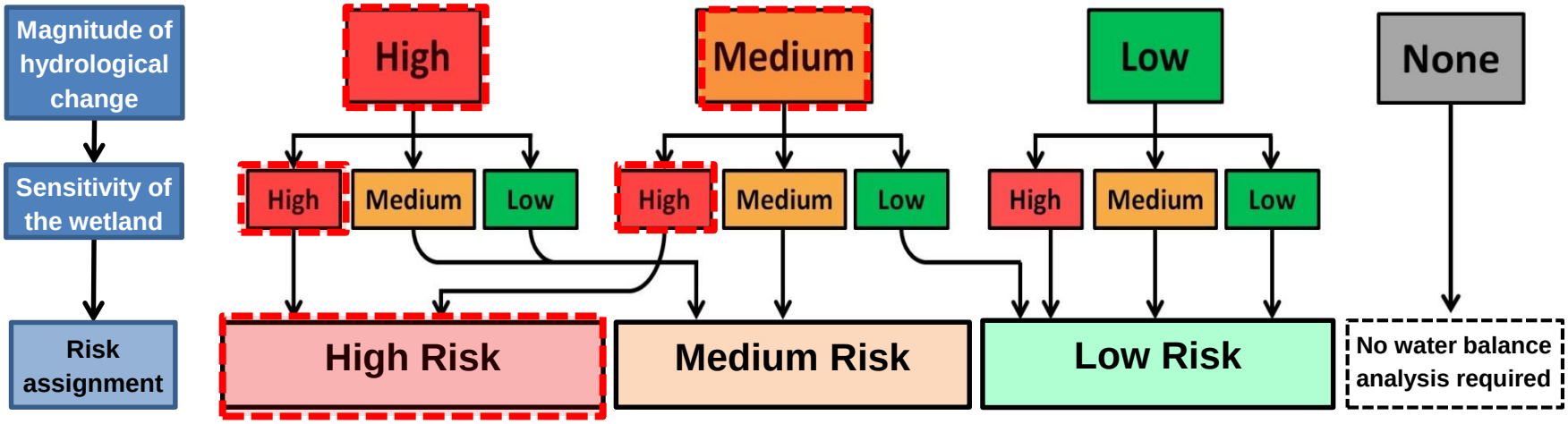

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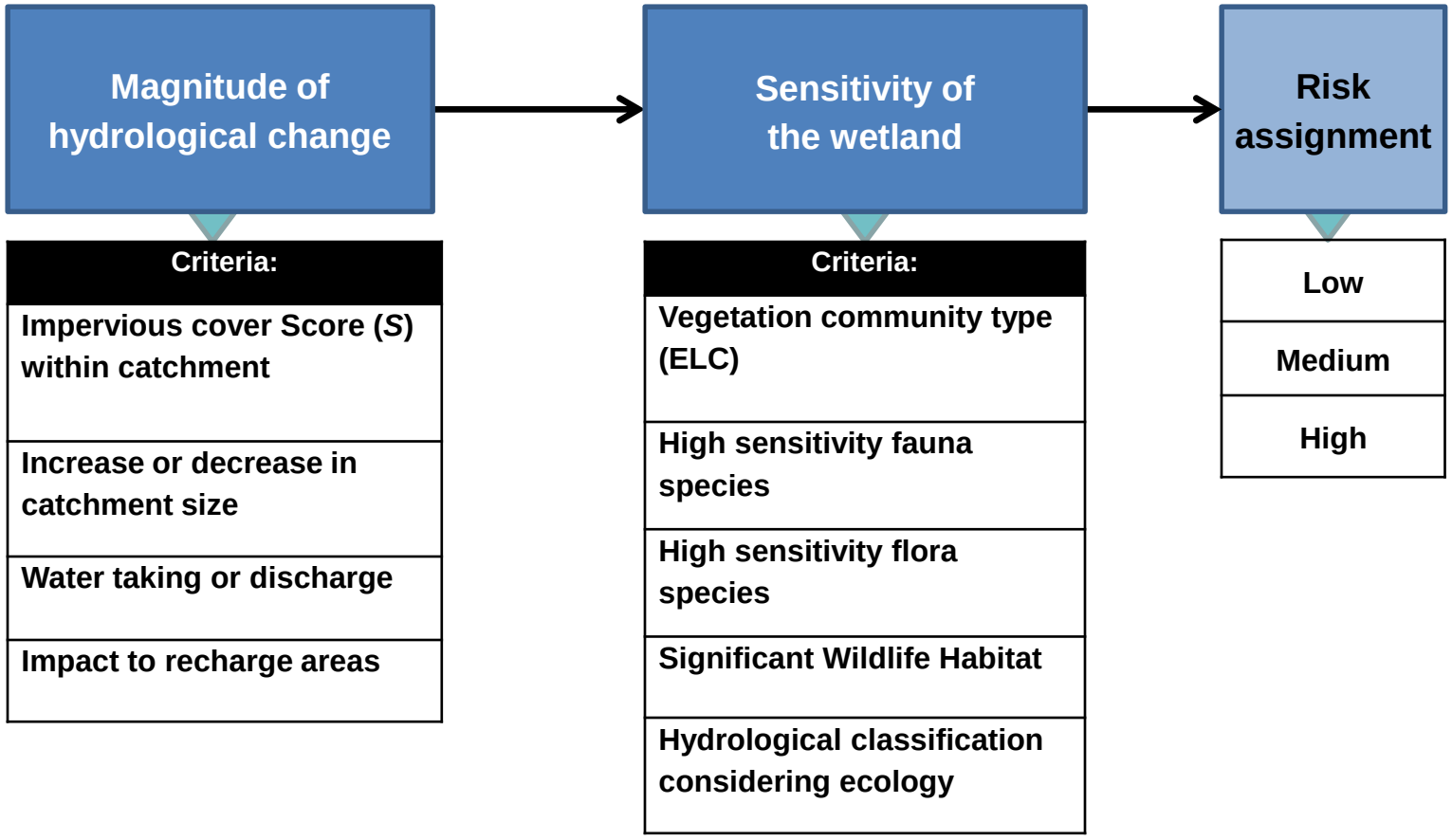
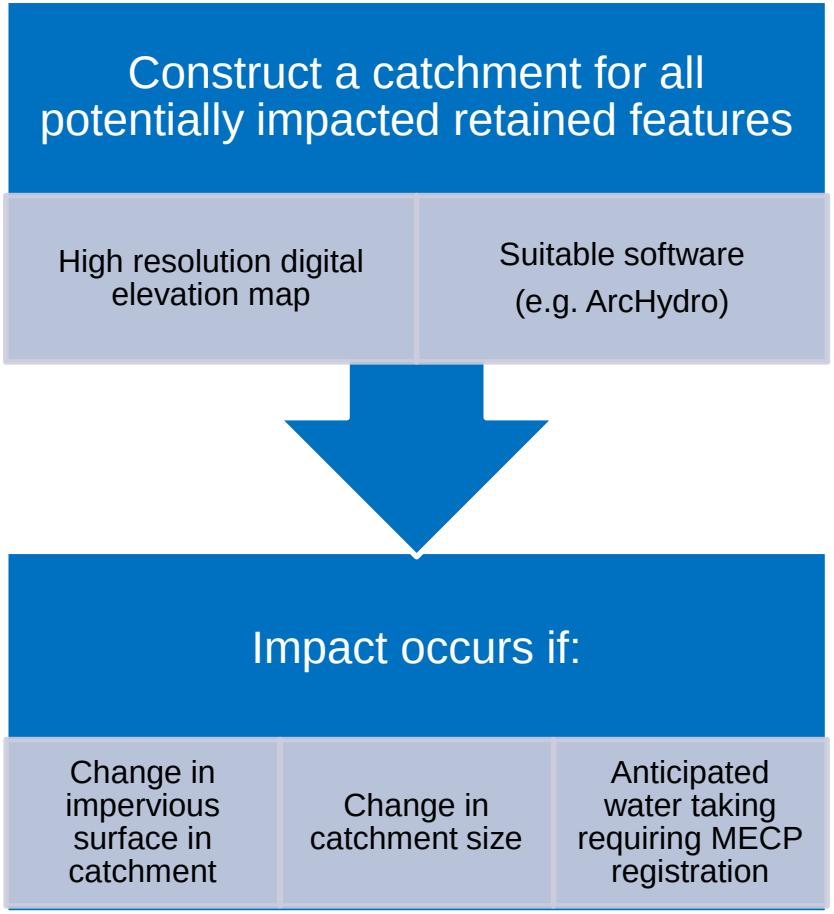
TRCA Wetland Water Balance Risk Evaluation



Risk Evaluation: 4-Step Process

1. **Determine which wetland(s) will be impacted by the proposed development.**
2. Determine the magnitude of potential hydrological change.
3. Determine the sensitivity of the wetland and its associated flora and fauna to hydrological change.
4. Integrate information from steps 2 and 3 to assign a level of risk that the proposed development poses to the wetland.

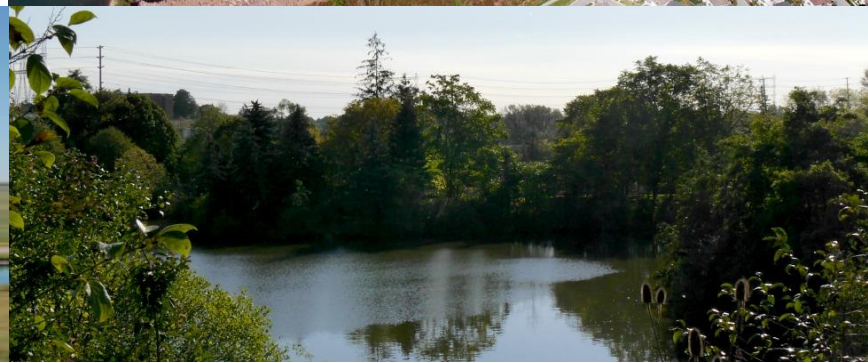
Step 1: Which feature(s) will be impacted?



Step 1: Which feature(s) will be impacted?

Exclusions – water balance not considered for:

- Lacustrine wetlands on Lake Ontario
- Riverine wetlands on streams of Strahler order ≥4, or with catchments >2500 ha
- Stormwater management ponds
- Wastewater polishing wetlands



Risk Evaluation: 4-Step Process

1. Determine which wetland(s) will be impacted by the proposed development.
2. **Determine the magnitude of potential hydrological change.**
3. Determine the sensitivity of the wetland and its associated flora and fauna to hydrological change.
4. Integrate information from steps 2 and 3 to assign a level of risk that the proposed development poses to the wetland.

Step 2: Magnitude of potential hydrological change

- Four evaluation criteria
  - Proportion of impervious cover proposed within catchment
  - Change in catchment size
  - Water taking from or discharge directly to connected surface water bodies or aquifers (best available info)
  - Impervious cover proposed in recharge areas

Step 2: Magnitude of potential hydrological change

i. Proportion of impervious cover proposed in catchment

Criteria	High magnitude	Medium magnitude	Low magnitude
Impervious cover score (S) within catchment* ***Determined using Equation 1**	**>25%**	**10-25%**	**<10%**

$$S = \frac{IC \cdot C_{dev}}{C}$$

IC – impervious cover proposed on proponent's lands within catchment (0-100)

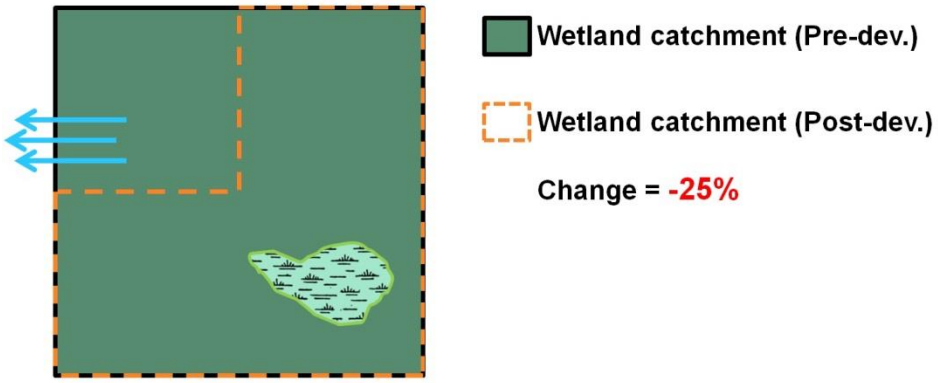
C_{dev} – Area of catchment outside NHS (ha)

C – Total area of catchment (ha)

Step 2: Magnitude of potential hydrological change

ii. Change in catchment size

Criteria	High magnitude	Medium magnitude	Low magnitude
Increase or decrease in catchment size	>25%	10-25%	<10%



Step 2: Magnitude of potential hydrological change

iii. Water taking from or discharge to directly connected surface water bodies or aquifers (best available info)

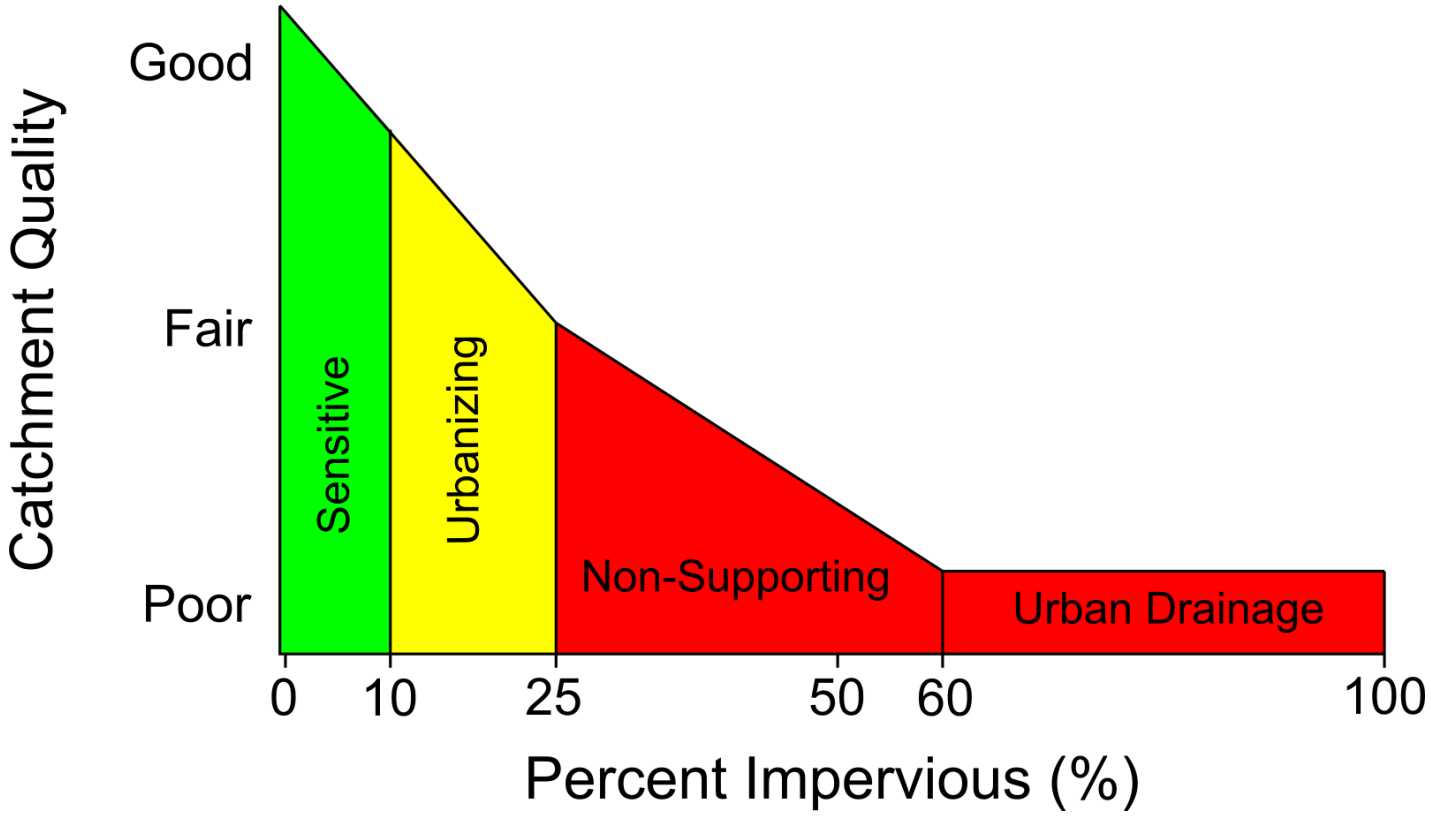
Criteria	High magnitude	Medium magnitude	Low magnitude
Water taking or discharge	Dewatering exceeding MECP EASR limits **(>400,000 L/day**) for **>6** months anticipated	Dewatering within MECP EASR limits (**50,000 - 400,000 L/day**) for **>6 months** anticipated OR Dewatering exceeding MECP EASR limits **(>400,000 L/day**) for **<6 months** anticipated	Dewatering within MECP EASR limits (**50,000 - 400,000 L/day**) for **<6 months** anticipated

Step 2: Magnitude of potential hydrological change

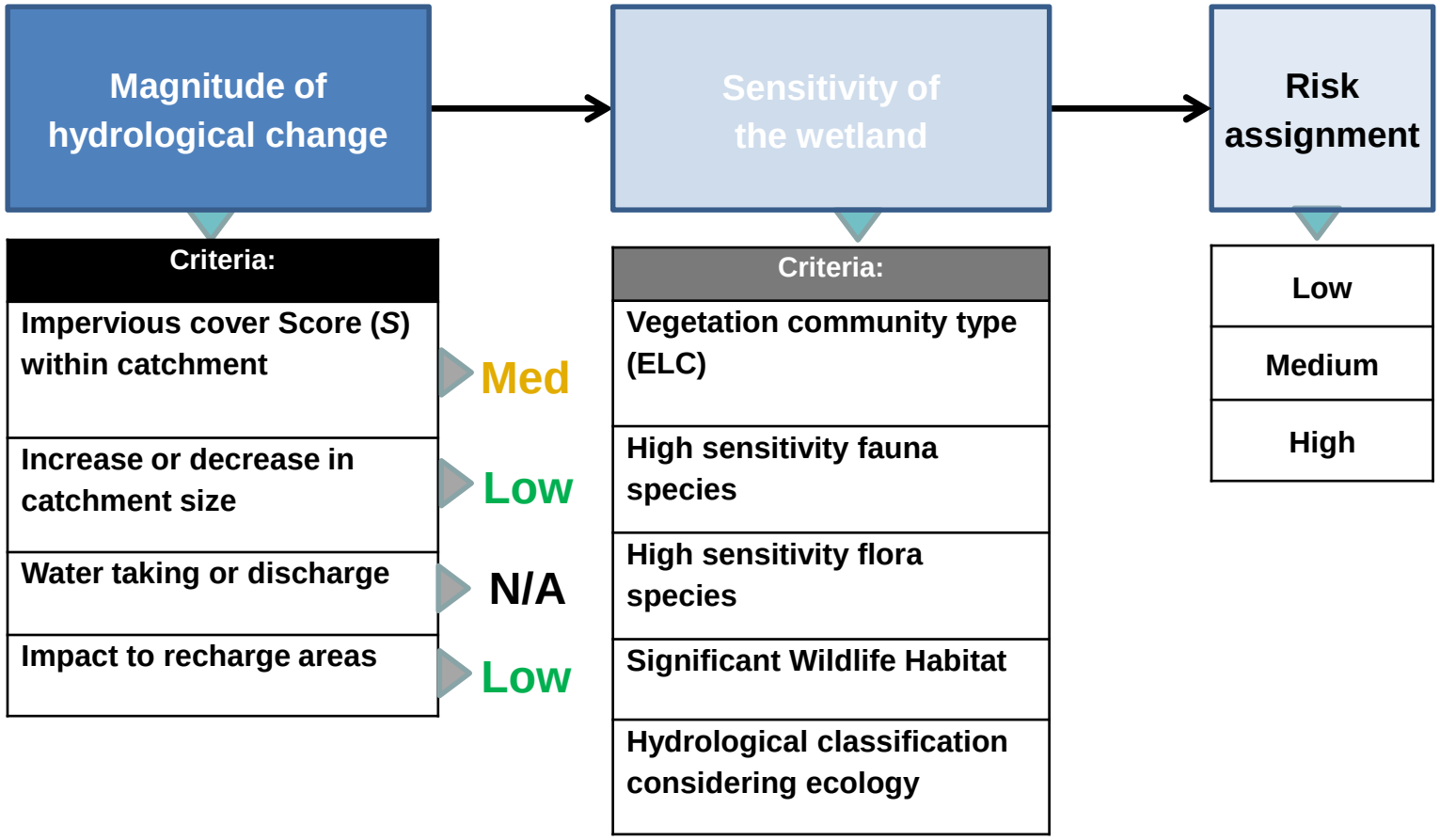
iv. Impervious cover proposed in recharge areas

Criteria	High magnitude	Medium magnitude	Low magnitude
Impact to recharge areas	Impact to **>25%** of locally significant recharge areas*	Impact to **10-25%** of locally significant recharge areas*	No impact, or impact to **<10%** of locally significant recharge areas*

Ecological Thresholds



TRCA Wetland Water Balance Risk Evaluation



Risk Evaluation: 4-Step Process

1. Determine which wetland(s) will be impacted by the proposed development.

2. Determine the magnitude of potential hydrological change.

3. **Determine the sensitivity of the wetland and its associated flora and fauna to hydrological change.**

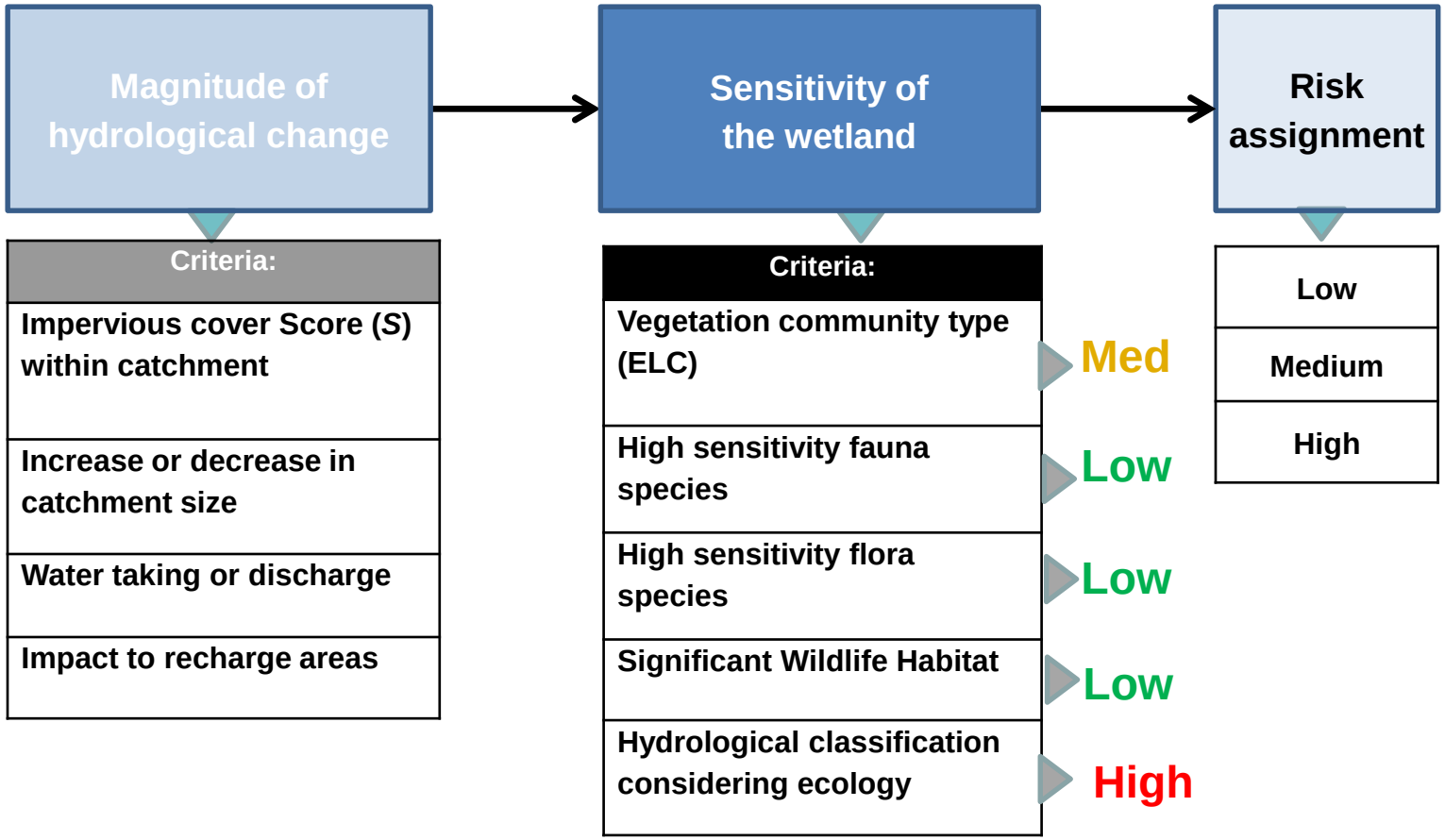
4. Integrate information from step 1, 2, and 3 to assign a level of risk that the proposed development poses to the wetland.

Wetland Sensitivity Criteria

Criteria	High sensitivity	Medium sensitivity	Low sensitivity
Vegetation community type (ELC)*	Presence of a high sensitivity vegetation community	Presence of a medium sensitivity vegetation community	No high or medium sensitivity criteria satisfied
High sensitivity fauna species**	Presence of a high sensitivity species	Presence of a medium sensitivity species	No high or medium sensitivity criteria satisfied
High sensitivity flora species**	Presence of multiple high sensitivity species	Presence of multiple medium sensitivity species OR Presence of one high sensitivity species	No high or medium sensitivity criteria satisfied
Significant Wildlife Habitat	Presence of Significant Wildlife Habitat, as defined by OMNRF (2014), for high sensitivity species**	N/A	No high criteria satisfied
Hydrological classification considering ecology	Isolated/palustrine AND Presence of medium or high sensitivity vegetation communities* OR medium or high sensitivity flora or fauna species**	Isolated/palustrine AND No medium or high sensitivity vegetation communities* AND no medium or high sensitivity flora or fauna species** present	Riverine/lacustrine

* See Appendix 2 for community rankings by hydrological sensitivity
** See Appendix 3 for species rankings by hydrological sensitivity

TRCA Wetland Water Balance Risk Evaluation



Risk Evaluation: 4-Step Process

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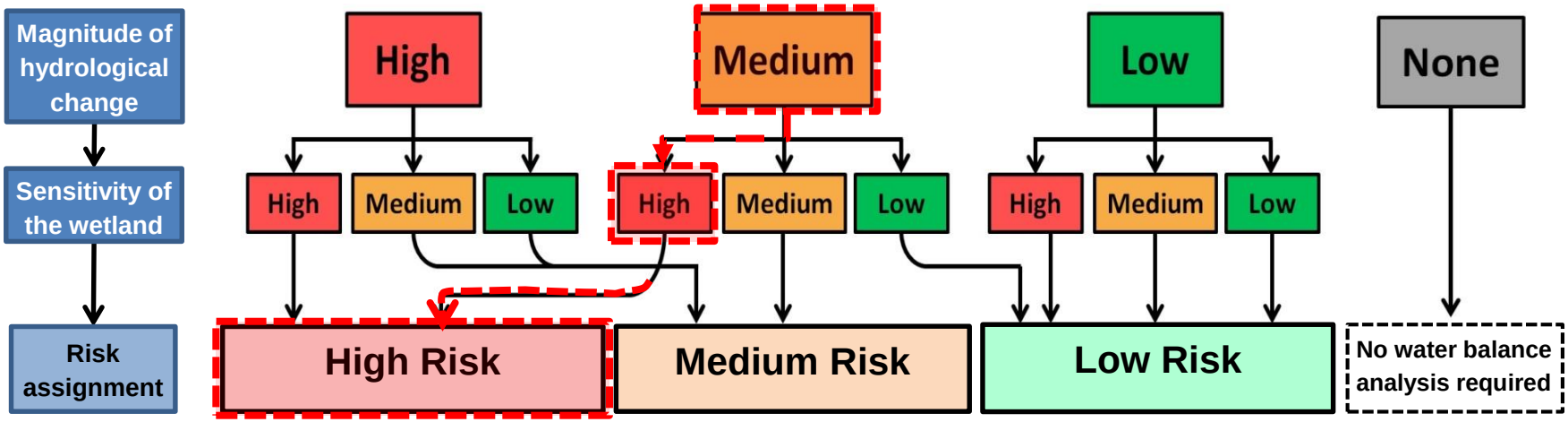
4. **Integrate information from steps 2 and 3 to assign a level of risk that the proposed development poses to the wetland.**

TRCA Wetland Water Balance Risk Evaluation

Decision Tree



What information and data are required?

- Magnitude of potential hydrological change
  - Wetland feature limits
  - Size + extent of pre-development catchment
  - Total development area of catchment (i.e. area outside NHS)
  - Area of catchment owned by proponent

What information and data are required?

- Magnitude of potential hydrological change
  - % impervious cover proposed within proponent's lands
  - Proposed post-development catchment extent / size
  - Approx. anticipated magnitude and duration of water taking
  - Location of any locally significant recharge areas

What information and data are required?

Sensitivity of wetland:

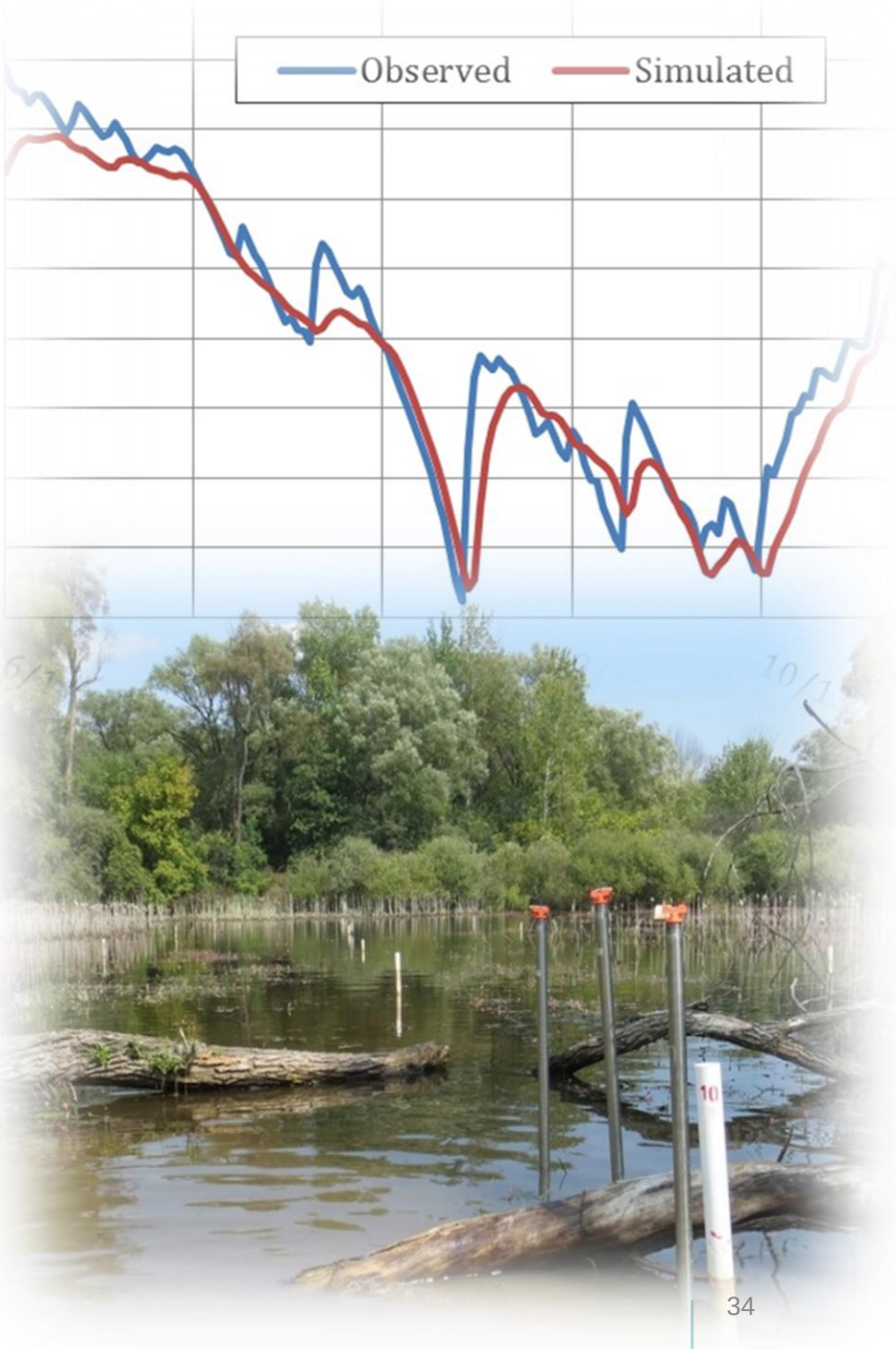
- Vegetation community type
- Fauna and flora present
- Habitat features
- Wetland hydrological type (isolated, palustrine, or riverine)

What is the purpose of monitoring?

- Monitoring of wetland hydrology required for medium & high-risk outcomes
- *Wetland Water Balance Monitoring Protocol* (TRCA, 2016)
- Informs conceptual model of wetland hydrology
- Used to calibrate continuous hydrology model (where required)
- Can inform adaptive management during & after construction

When do I need to start?

- Need to develop baseline – **3 years** pre-development standard
- Capture range of weather conditions, seasons, annual maximum and minimums, etc.
- Provide enough data to calibrate AND validate model
- Proactive monitoring recommended to ensure expedited approvals



Risk Evaluation: Applied Example

STEP 1: Determine feature protection through planning process

STEP 2: Magnitude of hydrological change

STEP 3: Sensitivity of the feature

STEP 4: Risk assignment

Risk Evaluation: Applied Example

STEP 1: Determine feature protection through planning process

Yes - feature to be protected

Risk Evaluation: Applied Example

STEP 2: Magnitude of hydrological change

Criteria:	
Impervious cover Score (*S*) within catchment	High
Increase or decrease in catchment size	Med
Water taking or discharge	Low
Impact to recharge areas*	High

High

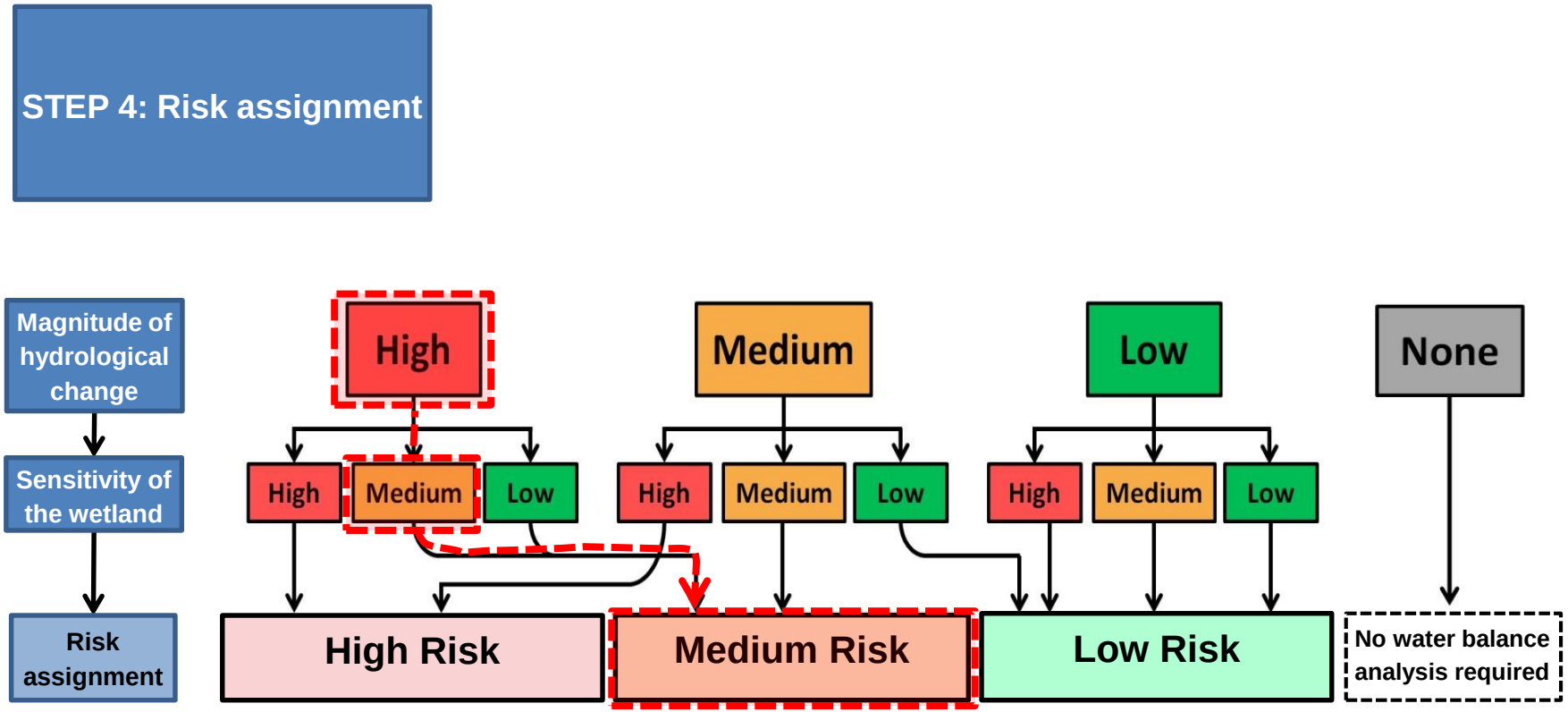
Risk Evaluation: Applied Example

STEP 3: Sensitivity of the wetland

Criteria:	
Vegetation community type (ELC)	Med
High sensitivity fauna species	Med
High sensitivity flora species	Med
Significant Wildlife Habitat	Low
Hydrological classification considering ecology	Med

Med

Risk Evaluation: Applied Example



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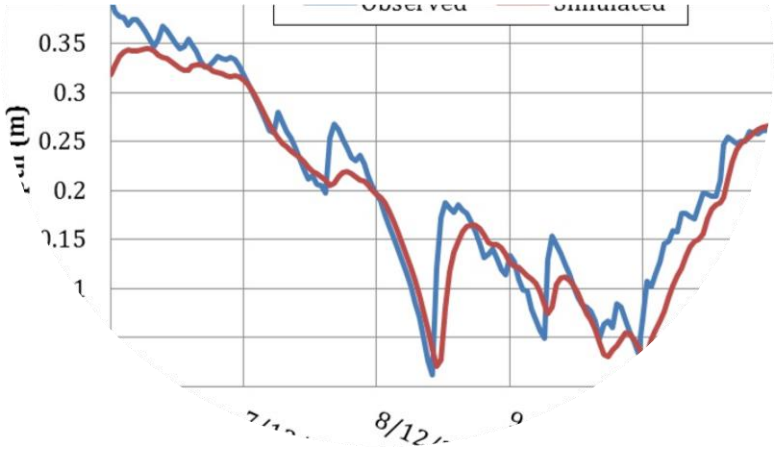
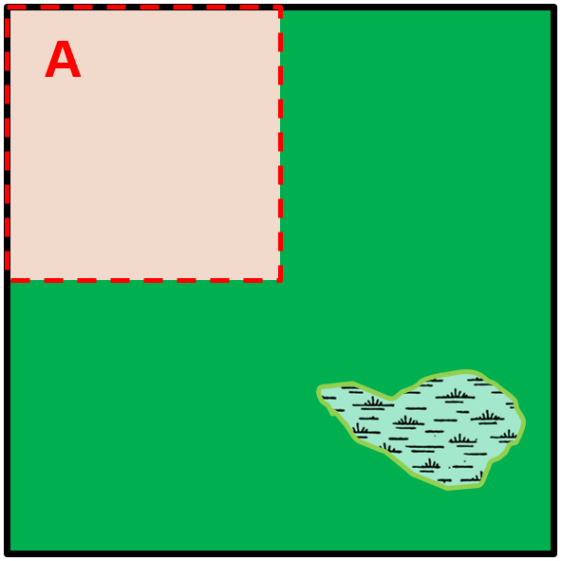


Risk Evaluation Summary

- Offers consistent basis for scoping FBWB studies; thresholds informed by best available science
- Best applied at earliest possible stage of planning process (as soon as application received by CA)
- Significantly clarifies the process and requirements to streamline approvals

Questions?

Applied example – Impervious cover score (*S*)



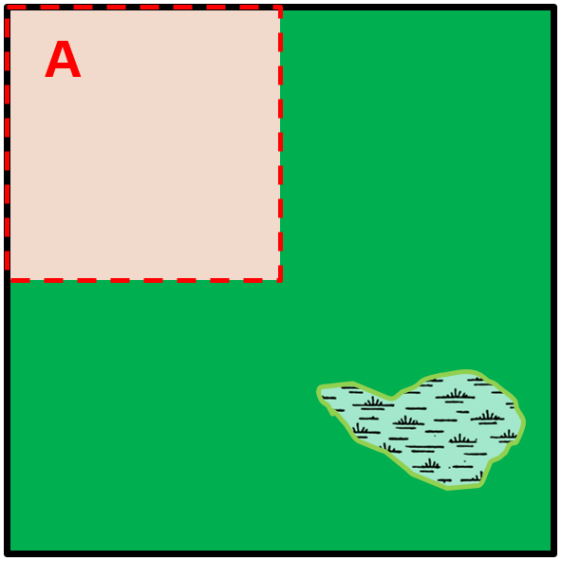
Wetland catchment (C) = 10 ha

Natural system area = 7.5 ha

Development area (C_{dev}) = 2.5 ha

A Landowner A holdings = 2.5 ha

Applied example – Impervious cover score (*S*)



Wetland catchment (**C**) = 10 ha

Natural system area = 7.5 ha

Development area (C_{dev}) = 2.5 ha

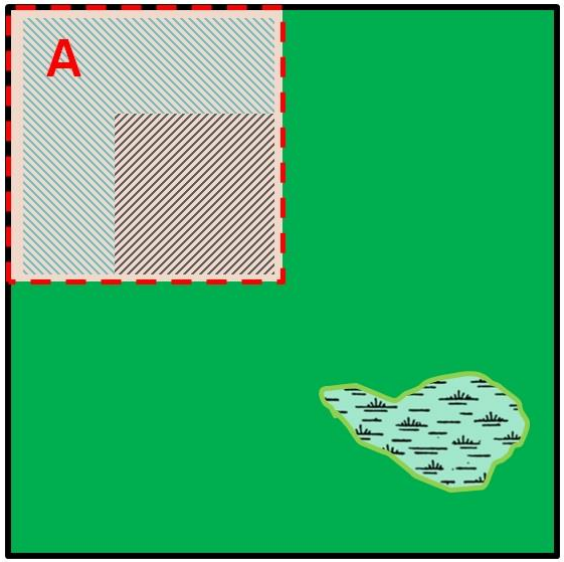
A **Landowner A holdings** = 2.5 ha

$$S = \frac{IC \cdot C_{dev}}{C}$$

S – Impervious cover **S**core

IC – proposed impervious cover on proponent's lands within catchment (0-100)

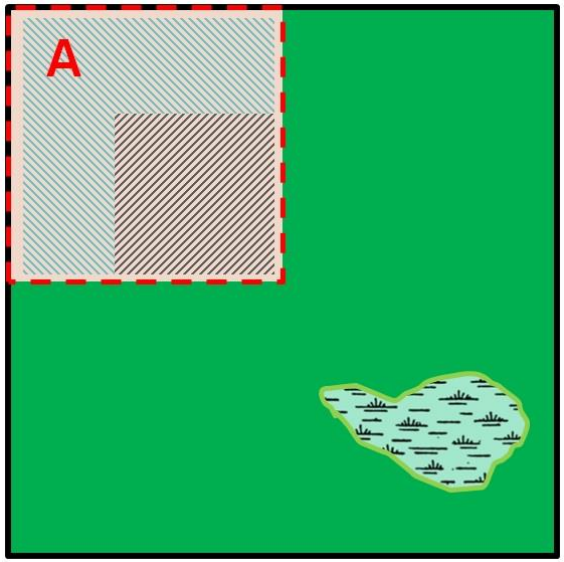
Applied example – Impervious cover score (*S*)



$$S = \frac{IC \cdot C_{dev}}{C}$$

S > 25	**High** potential hydrological change
S > 10	**Medium** potential hydrological change

Applied example – Impervious cover score (*S*)

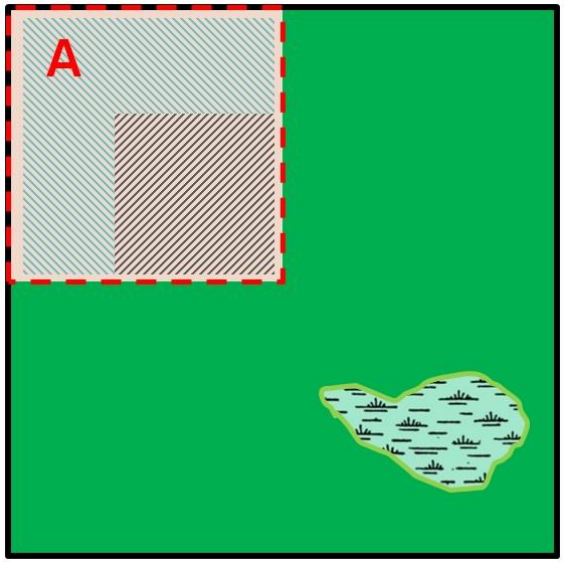


$$S = \frac{IC \cdot C_{dev}}{C}$$

S > 25 (high) $\quad 25 = \frac{\mathbf{100} \cdot 2.5}{10}$

S > 10 (medium) $\quad 10 = \frac{\mathbf{40} \cdot 2.5}{10}$

Applied example – Impervious cover score (*S*)



$$S = \frac{IC \cdot C_{dev}}{C}$$

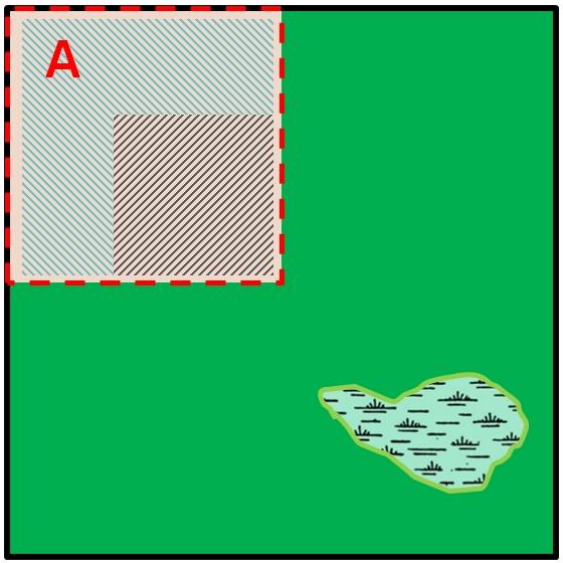
S > 25 (high) $25 = \frac{\mathbf{100} \cdot 2.5}{10}$

S > 10 (medium) $10 = \frac{\mathbf{40} \cdot 2.5}{10}$

High change threshold **= 100 % IC per ha**

Medium change threshold **= 40 % IC per ha**

Applied example – Impervious cover score (*S*)

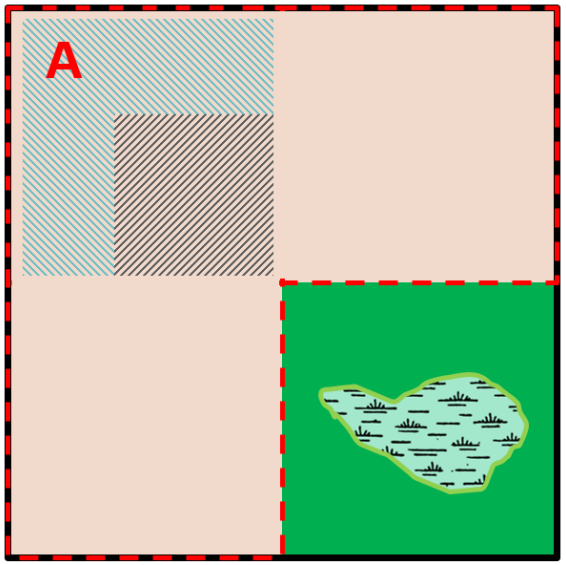


Development area (C_{dev}) = 2.5 ha

A **Landowner A holdings** = 2.5 ha

High change threshold
= 100 % IC per ha

Medium change threshold
= 40 % IC per ha



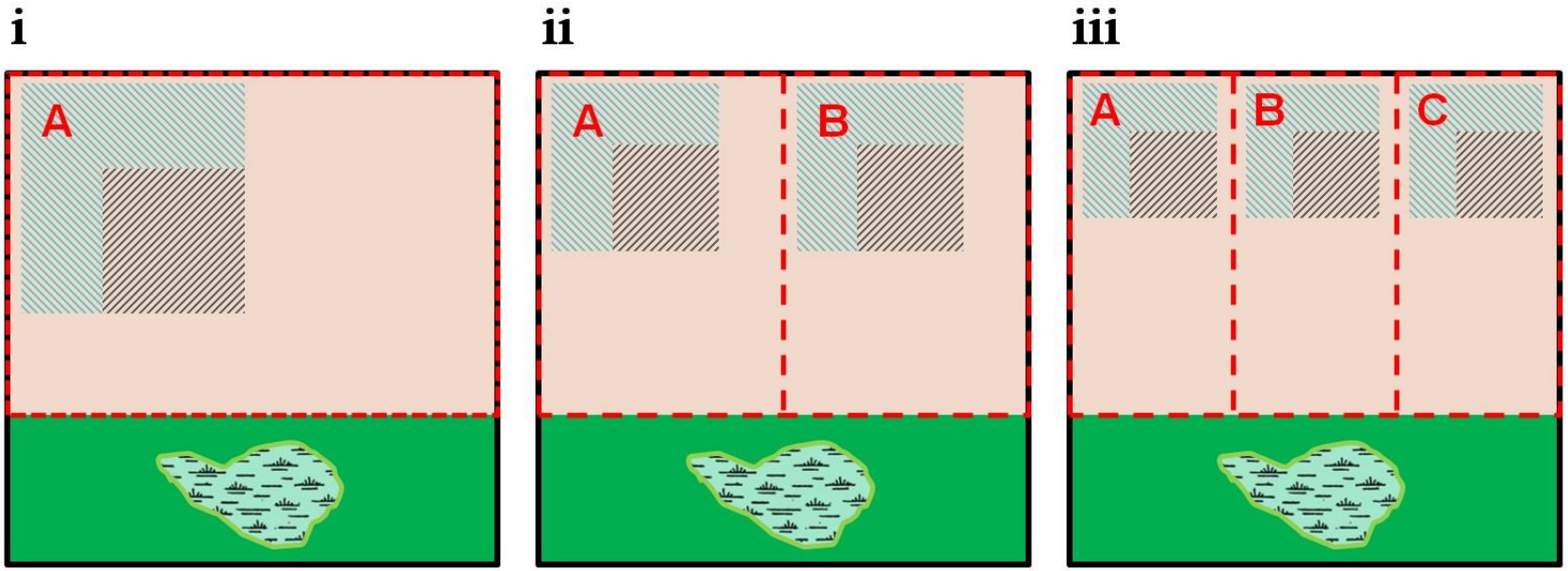
Development area (C_{dev}) = 7.5 ha

A **Landowner A holdings** = 7.5 ha

High change threshold
= 33 % IC per ha

Medium change threshold
= 13 % IC per ha

Addresses cumulative effects



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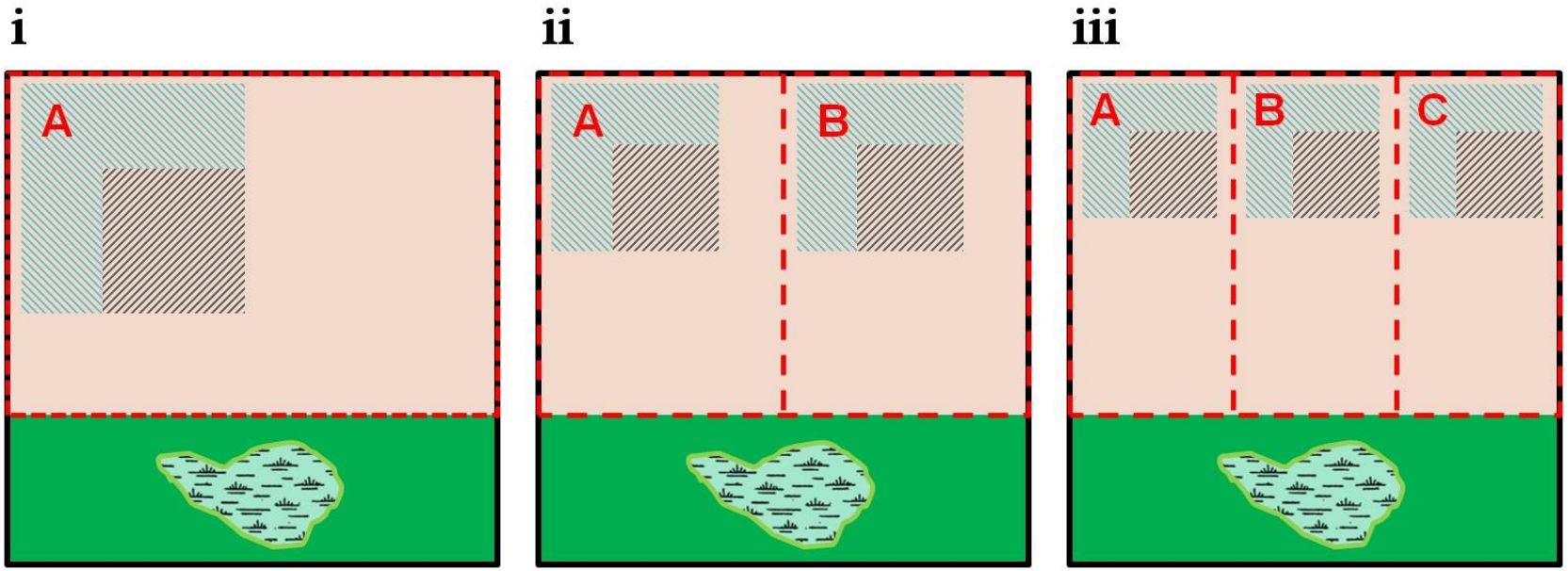

High change threshold
= 33 % IC per ha

Medium change threshold
= 13 % IC per ha

Same total imperviousness for given scope of study (i.e. med., high) within catchment, **regardless of # of landowners**

KEEPING THE BALANCE

Feature-based water balance in the planning process

Breakout Exercise #1 – Scoping an FBWB

Presented by: **Laura DelGiudice**
Sr. Manager, Watershed Planning & Reporting

June 20, 2019

Environment Canada Environnement Canada

Toronto and Region Conservation Authority

Breakout exercise #1 instructions

- Participants have **30 minutes** to evaluate two (2) development proposal scenarios using the Risk Evaluation framework.
- Objective – assign each proposal a risk category of **low, medium, or high**, with associated study requirements, based on site attributes.
- All necessary information & evaluation criteria provided.

Breakout exercise #1 instructions

- Each table provided with **site map** and **data sheet**. Data for the two scenarios are provided; only development proposal attributes change between scenarios, **wetland attributes remain the same**.

- After groups have had 30 minutes to evaluate the two development proposal scenarios, we will have 20 mins to discuss the process for assigning each scenario a risk category, and any areas of uncertainty or disagreement.

Breakout exercise #1 instructions

Evaluation Process: (as per *Wetland Water Balance Risk Evaluation*)

Step 1 – Determine feature protection (already completed)

Step 2 – Determine magnitude of hydrologic change

Step 3 – Determine sensitivity of feature

Step 4 – Evaluate risk outcome using decision tree (p. 7)

Breakout exercise #1 instructions

- Complete cells in data sheet indicated by  and/or 
- Record thought process / table discussion on back of data sheets