



Proposed Nutrient Rule (Chapter 583)

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MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION

Protecting Maine's Air, Land and Water

DEP's Nutrient Criteria Website

- <https://www.maine.gov/dep/water/nutrient-criteria/index.html>
- Current draft of Chapter 583
- Report describing how we derived the numbers used in the rule
- Presentation from the first stakeholder meeting
- Notes from the first stakeholder meeting



U.S. EPA Preliminary Criteria

- In 2001, U.S. EPA proposed criteria based on total phosphorus (TP) concentrations
- Divided country into nutrient regions
- Set criteria at 25th percentile of available data
- Included few data points from Maine
- Used the “one size fits all” approach



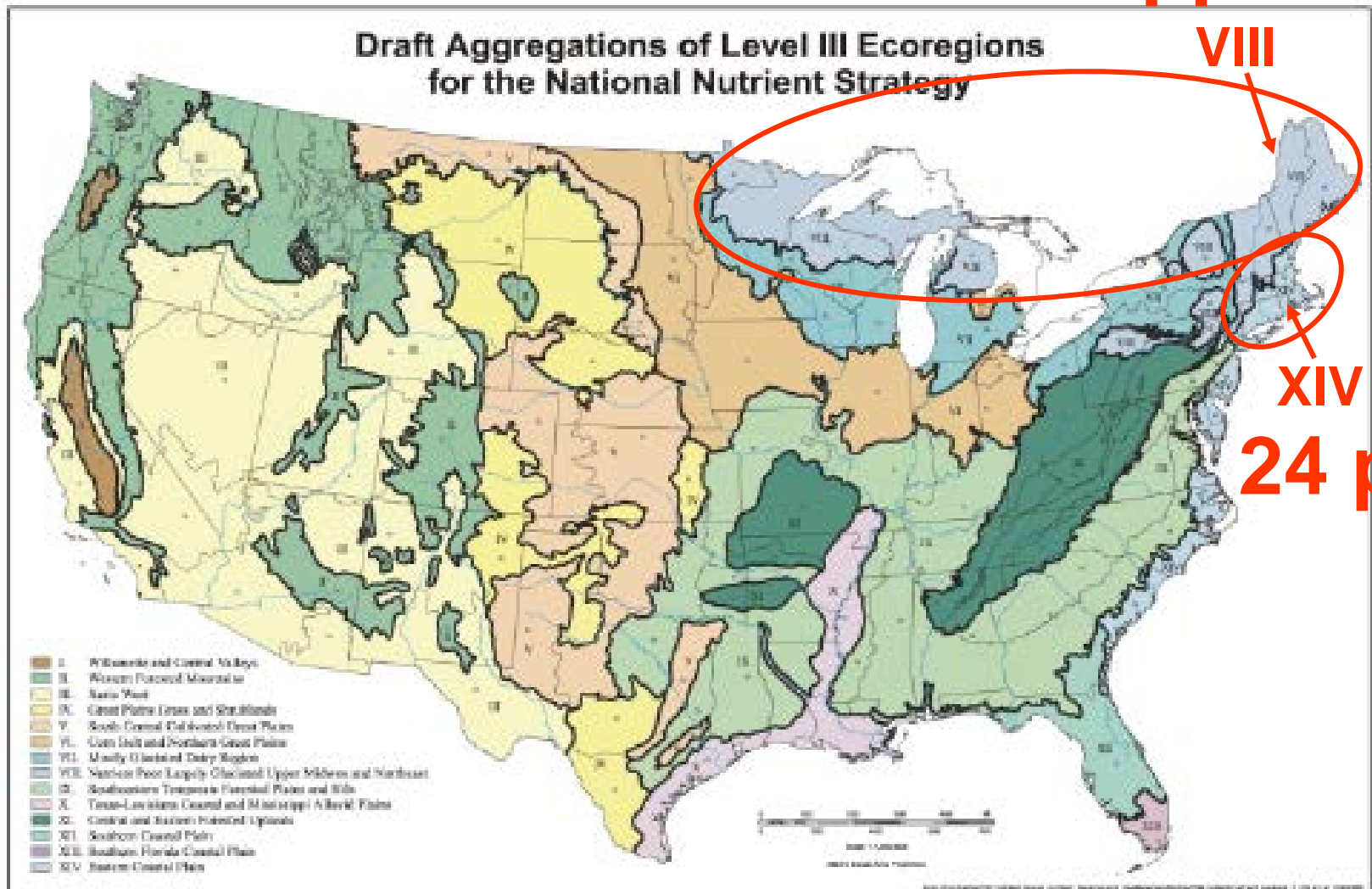
U.S. EPA Interim TP Criteria for Streams and Rivers

10 ppb

VIII

XIV

24 ppb

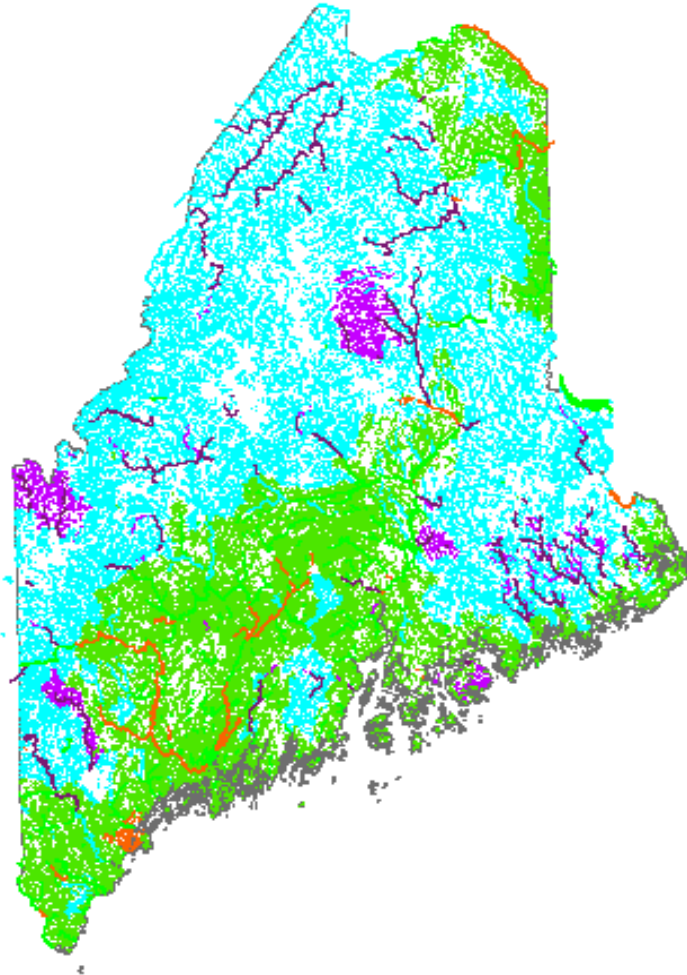


Proposed Nutrient Rule (Chapter 583)

1. Nutrient criteria for all fresh surface waters except for lakes
2. Decision framework to determine attainment of nutrient criteria
3. Process for setting site-specific nutrient values



Fresh Surface Waters of Maine (not including lakes)



% OF LINEAR MILES OF
STATUTORY
CLASSIFICATIONS OF
STREAMS AND RIVERS

Class AA = 6.3%

Class A = 47.2%

Class B = 45.3%

Class C = 1.2%



Class AA, A, B, and C Waters



Rocky streams



Sandy Streams



Deep Rivers



Impoundments



Ponds & Marshes



Section 3: Nutrient Response Indicators

- Seven nutrient response indicators
- Protect designated uses and relate to narrative criteria already in water quality standards
 - Habitat for fish and aquatic life
 - Aquatic life criteria (aka, biological criteria)
 - Recreation



Indicators That Already Are Part of Water Quality Standards

- Dissolved oxygen
- pH
- Aquatic life criteria (Biocriteria)



- Patches of filamentous bacteria (“Sewage fungus”)



“New” Nutrient Response Indicators



Secchi-disk Transparency



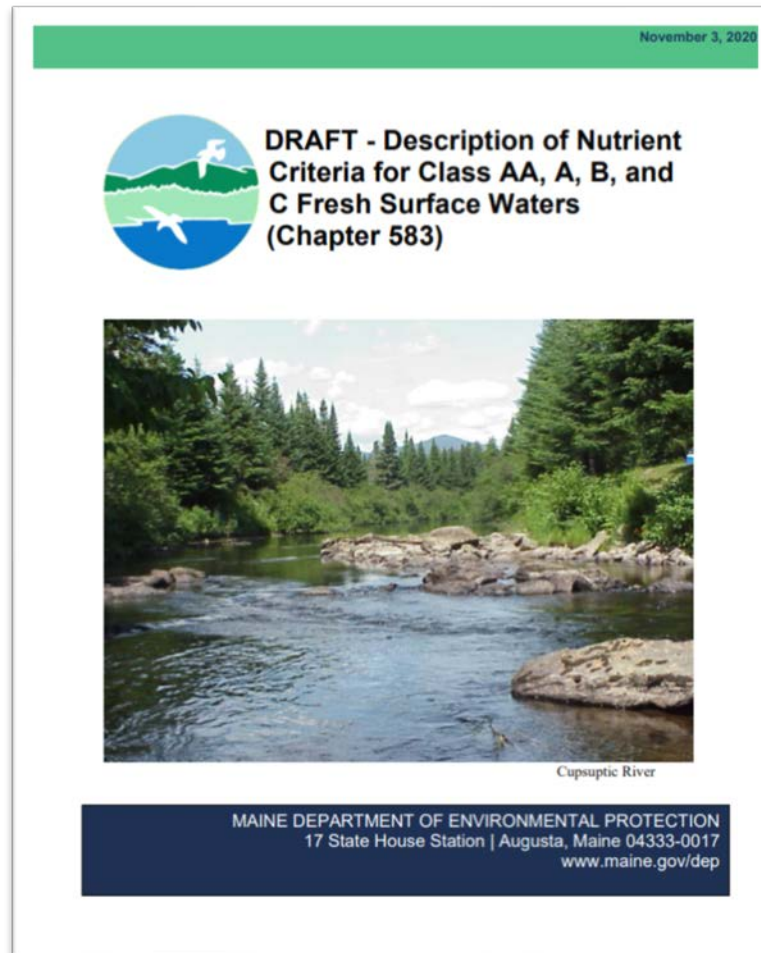
Chlorophyll *a*



Percent Nuisance
Algal Cover



Report that Describes the Response Indicators



	Shallow, rocky stream	Deep river	River impoundment	Marsh or Pond
Dissolved O ₂	✓	✓	✓	✓
pH	✓	✓	✓	✓
Aquatic life (Biocriteria)	✓	✓*	✓*	✓
“Sewage fungus”	✓	✓	✓	✓
Secchi disk transparency	--	✓*	✓	✓
Chlorophyll <i>a</i>	--	✓	✓	✓
% cover of nuisance algae	✓	--	--	--

* if conditions such as depth and current velocity are suitable for DEP methods



Section 4: Nutrient Criteria

Nutrient criteria	Statutory Class		
	AA & A	B	C
		$\leq 18.0 \mu\text{g/L (ppb) TP}^a$ <i>and</i> if the waterbody has a site-specific value for another nutrient, the mean concentration of that nutrient is less than or equal to the site-specific value <i>and</i> all applicable response indicator ^b values in this column <i>OR</i> all applicable response indicator ^b values in this column	$\leq 30.0 \mu\text{g/L (ppb) TP}^a$ <i>and</i> if the waterbody has a site-specific value for another nutrient, the mean concentration of that nutrient is less than or equal to the site-specific value <i>and</i> all applicable response indicator ^b values in this column <i>OR</i> all applicable response indicator ^b values in this column
Percent Nuisance Algal Cover	≤ 18.0	≤ 24.0	≤ 35.0
Water Column Chl <i>a</i> ($\mu\text{g/L, ppb}$)	≤ 3.5 (≤ 5.0 for low gradient streams with velocity $< 2.0 \text{ cm/sec}$ or impoundments)	≤ 8.0 (impoundments must have spatial mean ≤ 8.0 and no value > 10.0)	≤ 8.0 (impoundments must have spatial mean ≤ 8.0 and no value > 10.0)
Secchi Disk Transparency (m)	≥ 2.0		
Patches of Bacteria and Fungi	None observed		
pH	6.5 – 9.0		
Dissolved Oxygen (mg/L, ppm)	In accordance with 38 M.R.S. § 465 (2020) ^c		
Aquatic Life	In accordance with 38 M.R.S. §§ 464 and 465 (2020) ^c , and where applicable <i>Classification Attainment Evaluation Using Biological Criteria for Rivers and Streams</i> , 06-096 C.M.R. ch. 579 (effective May 27, 2003)		



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TP values

Class	TP Value	Rationale
AA/A	18 ppb	Most minimally disturbed streams have TP concentrations <18 ppb
B	30 ppb	Most streams that attain Class B aquatic life criteria (based on macroinvertebrates) have TP concentrations less than 30 ppb
C	40 ppb	Protect recreation and aquatic life



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Response Indicator	Class AA & A	Class B	Class C
Percent Nuisance Algal Cover	≤ 18.0	≤ 24.0	≤ 35.0
Water Column Chl a (µg/L, ppb)	≤ 3.5 (≤ 5.0 for low gradient streams with velocity < 2.0 cm/sec or impoundments)	≤ 8.0 (impoundments must have spatial mean ≤ 8.0 and no value > 10.0)	≤ 8.0 (impoundments must have spatial mean ≤ 8.0 and no value > 10.0)
Secchi Disk Transparency (m)	≥ 2.0		
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Section 5: Decision Framework

	Mean TP \leq the default value for the class*	Mean TP $>$ the default value for the class *
All applicable response indicators meet the values in Table 1		
One or more response indicators do not meet the values in Table 1		

* Any site-specific values for TP or another nutrient would be included in the decision



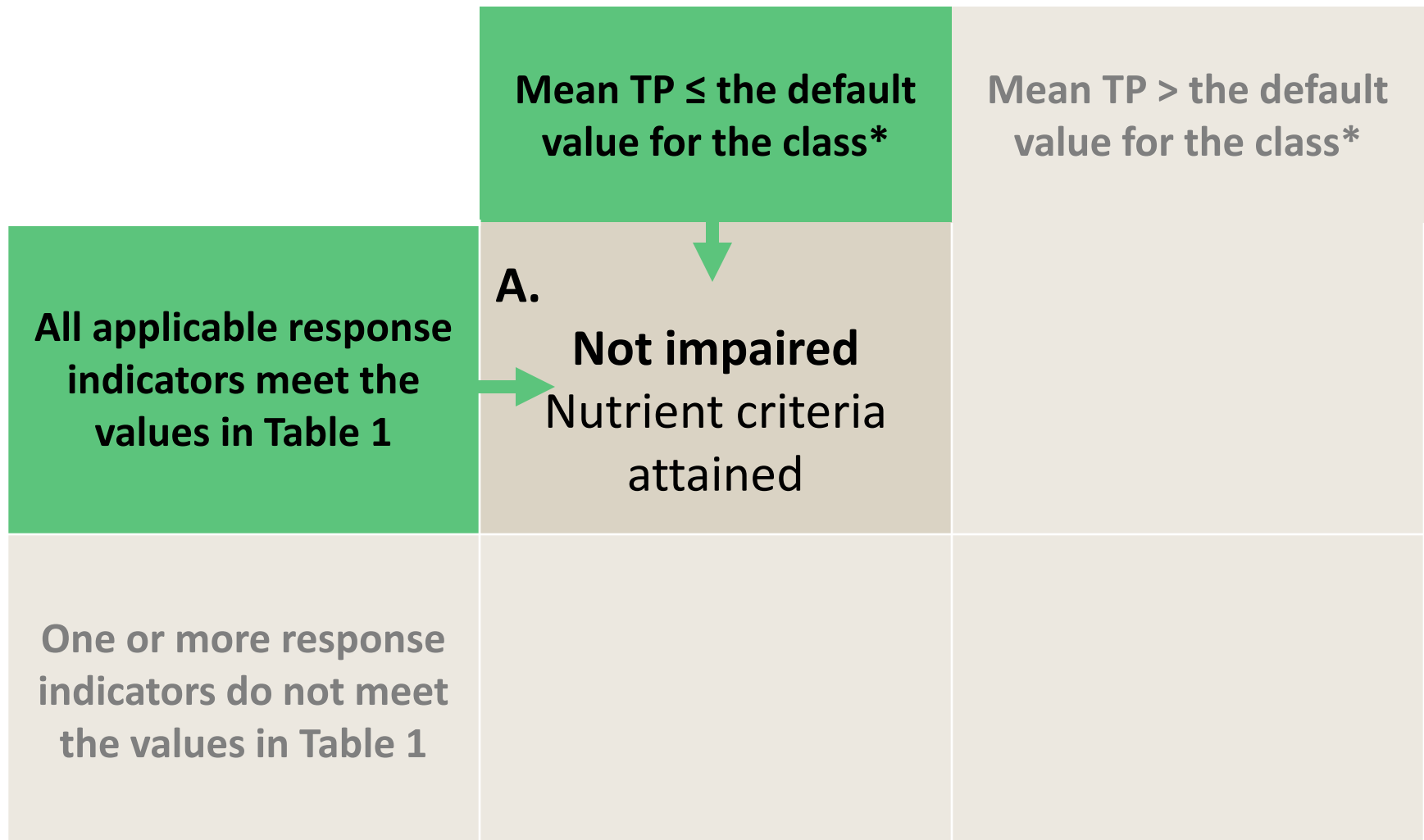
Section 5: Decision Framework

	Mean TP \leq the default value for the class*	Mean TP $>$ the default value for the class *
All applicable response indicators meet the values in Table 1	<p>A.</p> <p>Not impaired Nutrient criteria attained</p>	<p>B.</p> <p>Not impaired Nutrient criteria attained</p>
One or more response indicators do not meet the values in Table 1	<p>C.</p> <p>Impaired Determine cause of impairment</p>	<p>D.</p> <p>Impaired Nutrient criteria not attained</p>

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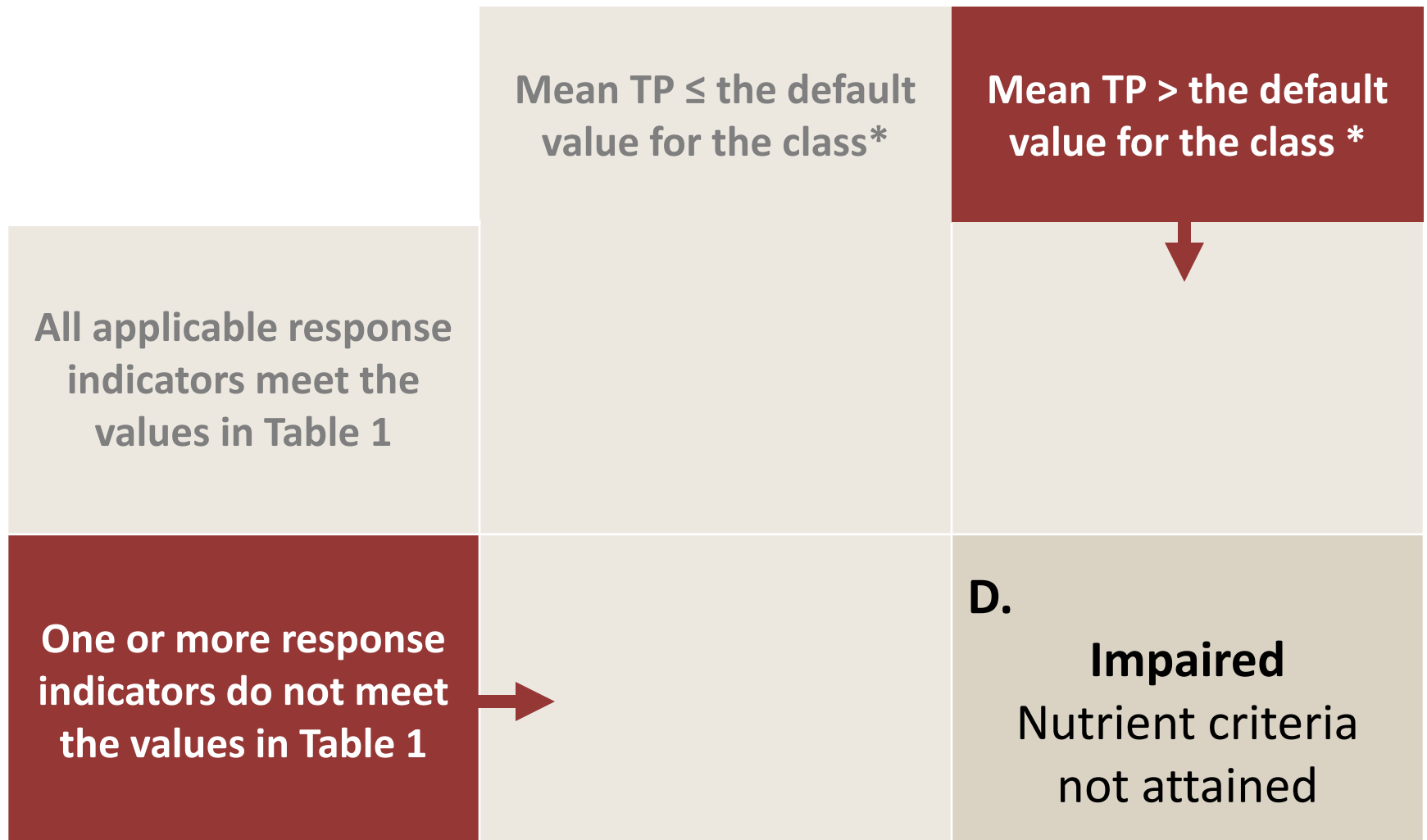
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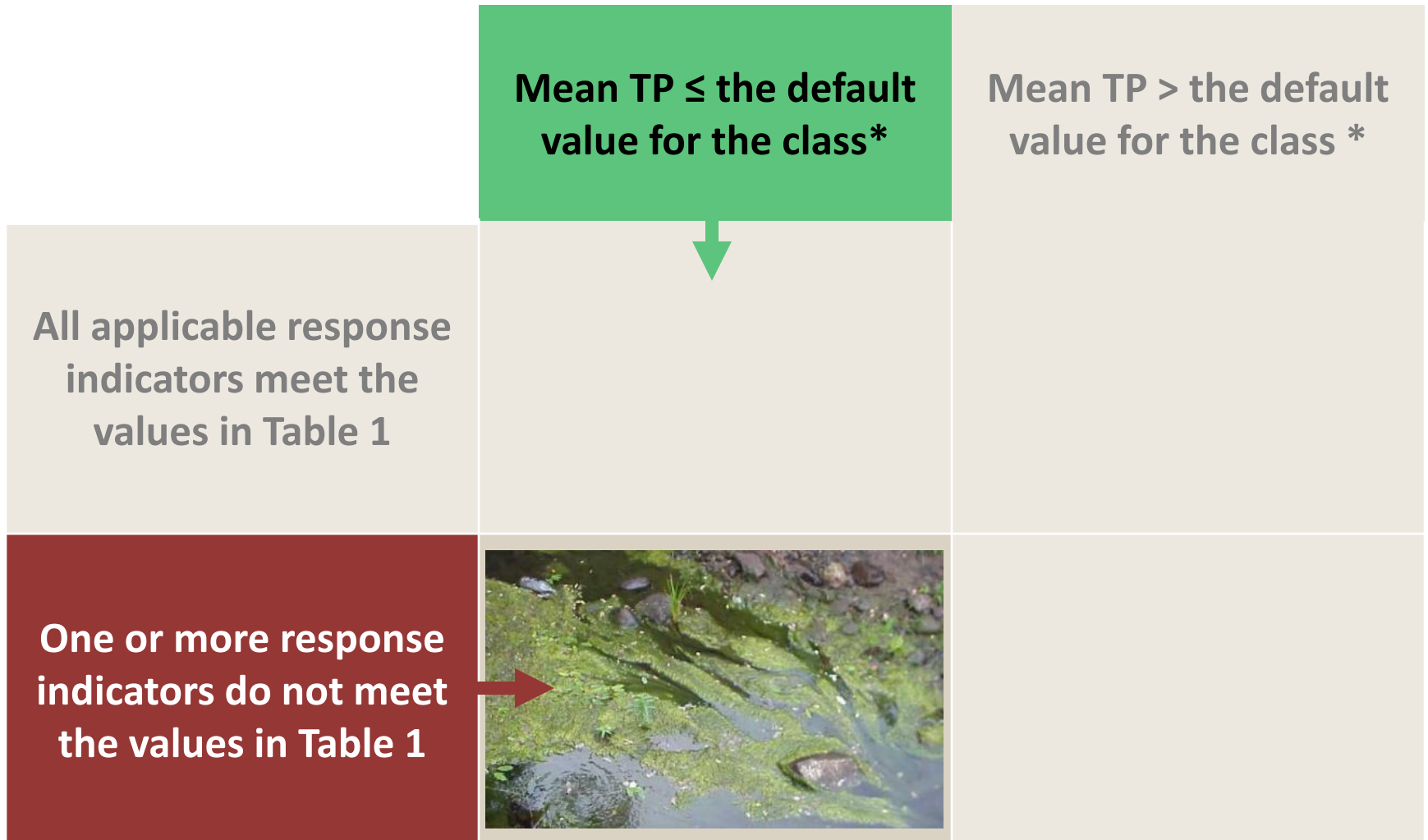
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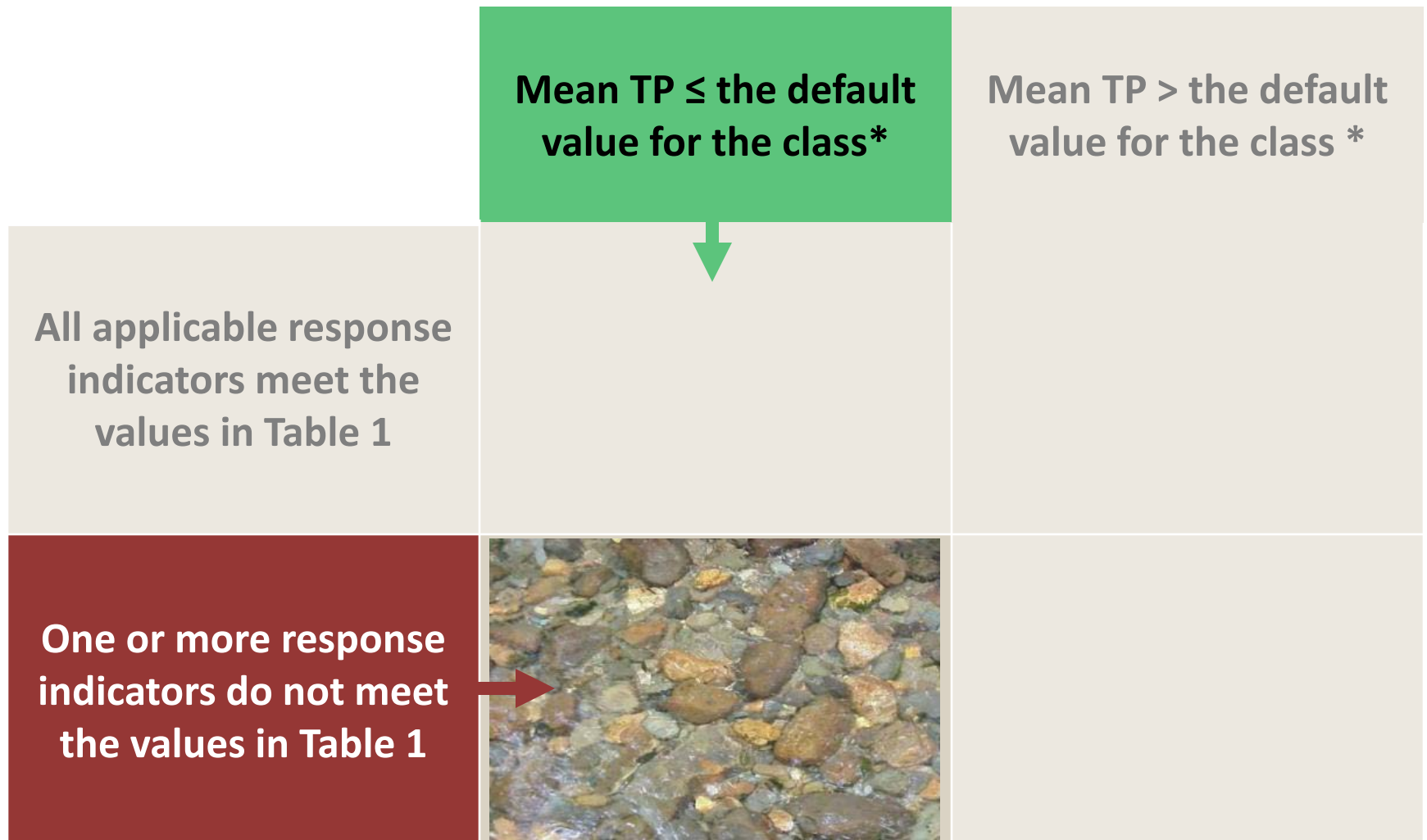
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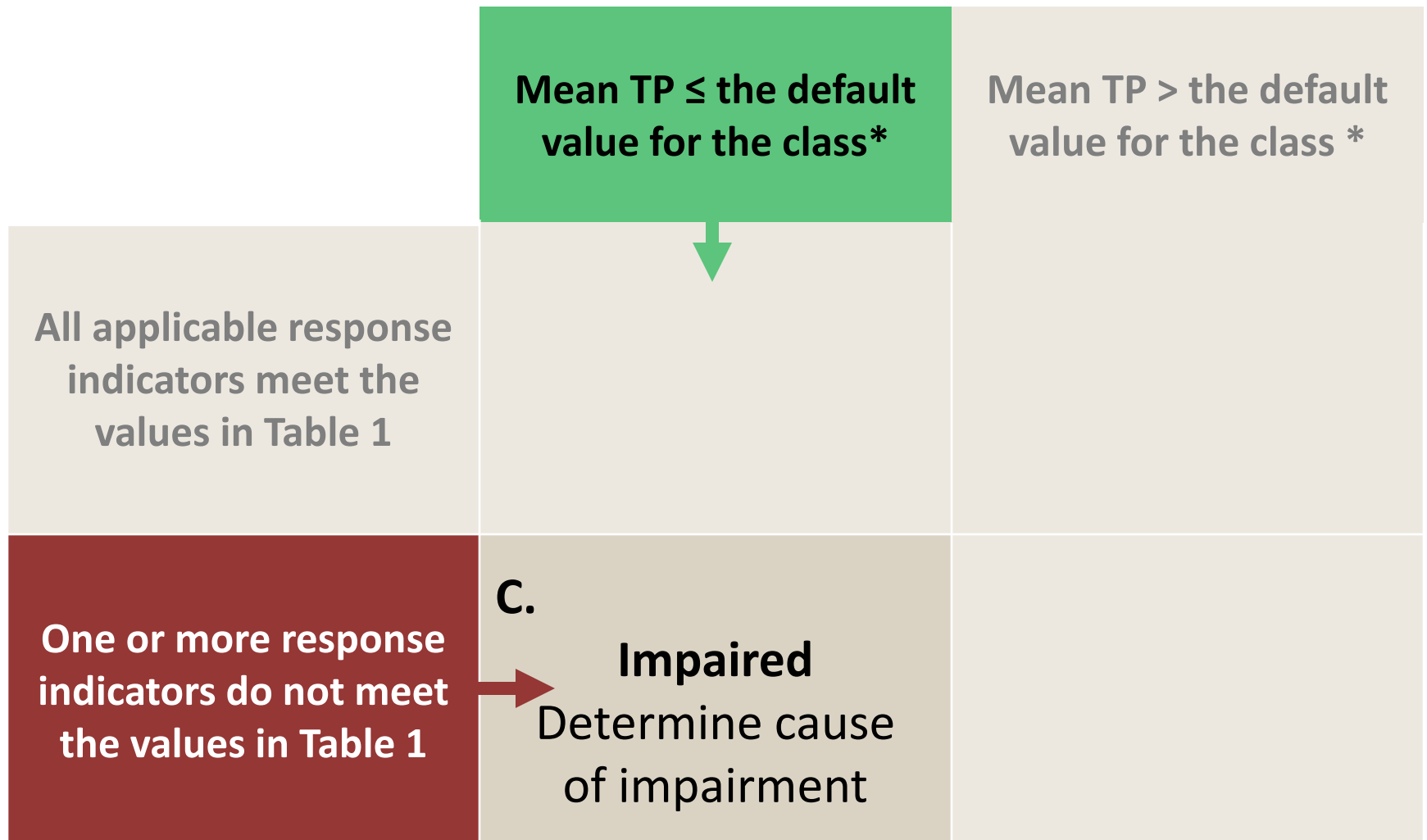
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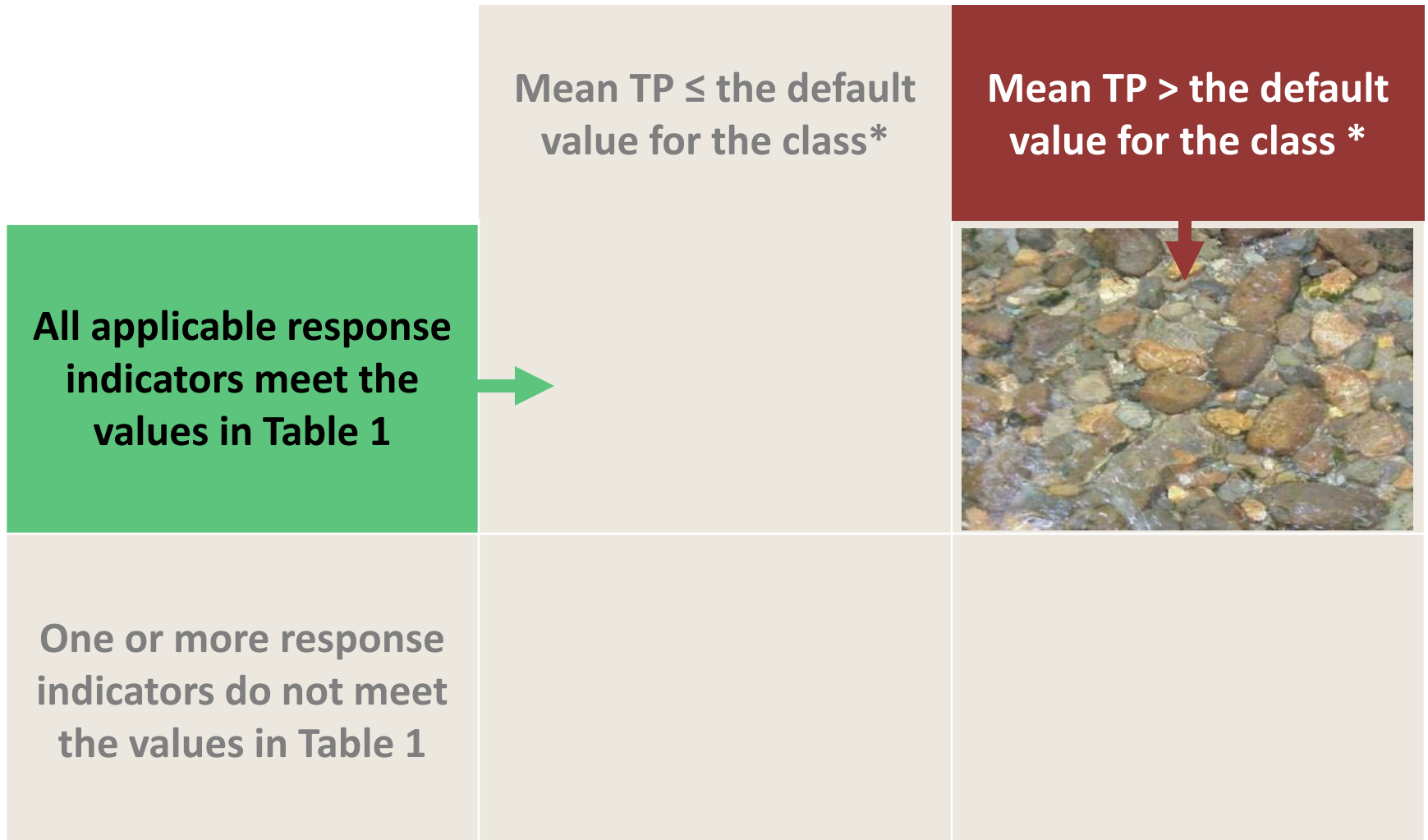
Section 5(C)(3): Determine Cause of Impairment

- Weight-of-evidence approach to determine cause of impairment

Cause of impairment	Nutrient Criteria
TP	Not attained
Another nutrient	Not attained
Non-nutrient cause	Attained (but waterbody may be listed as impaired for another reason)



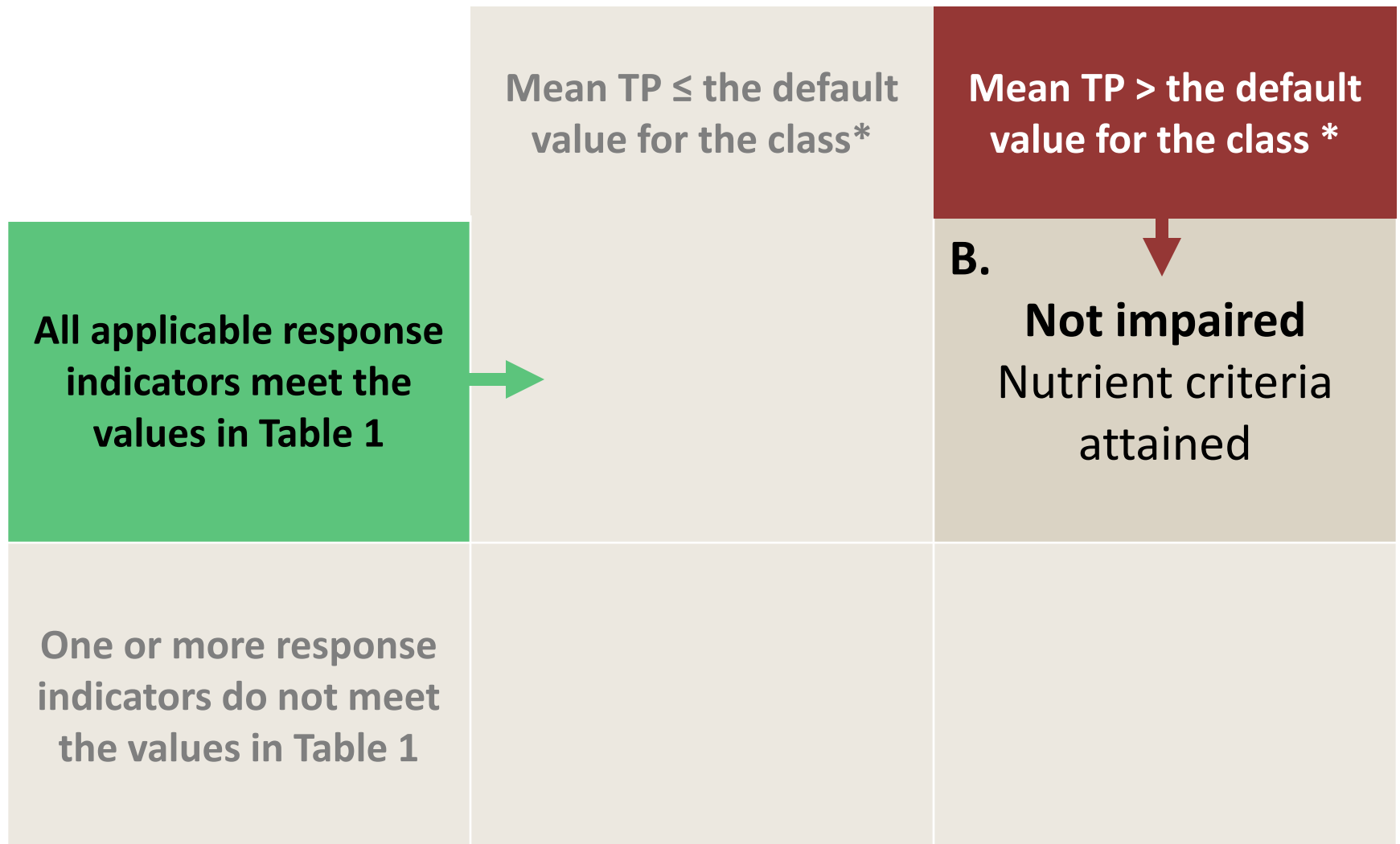
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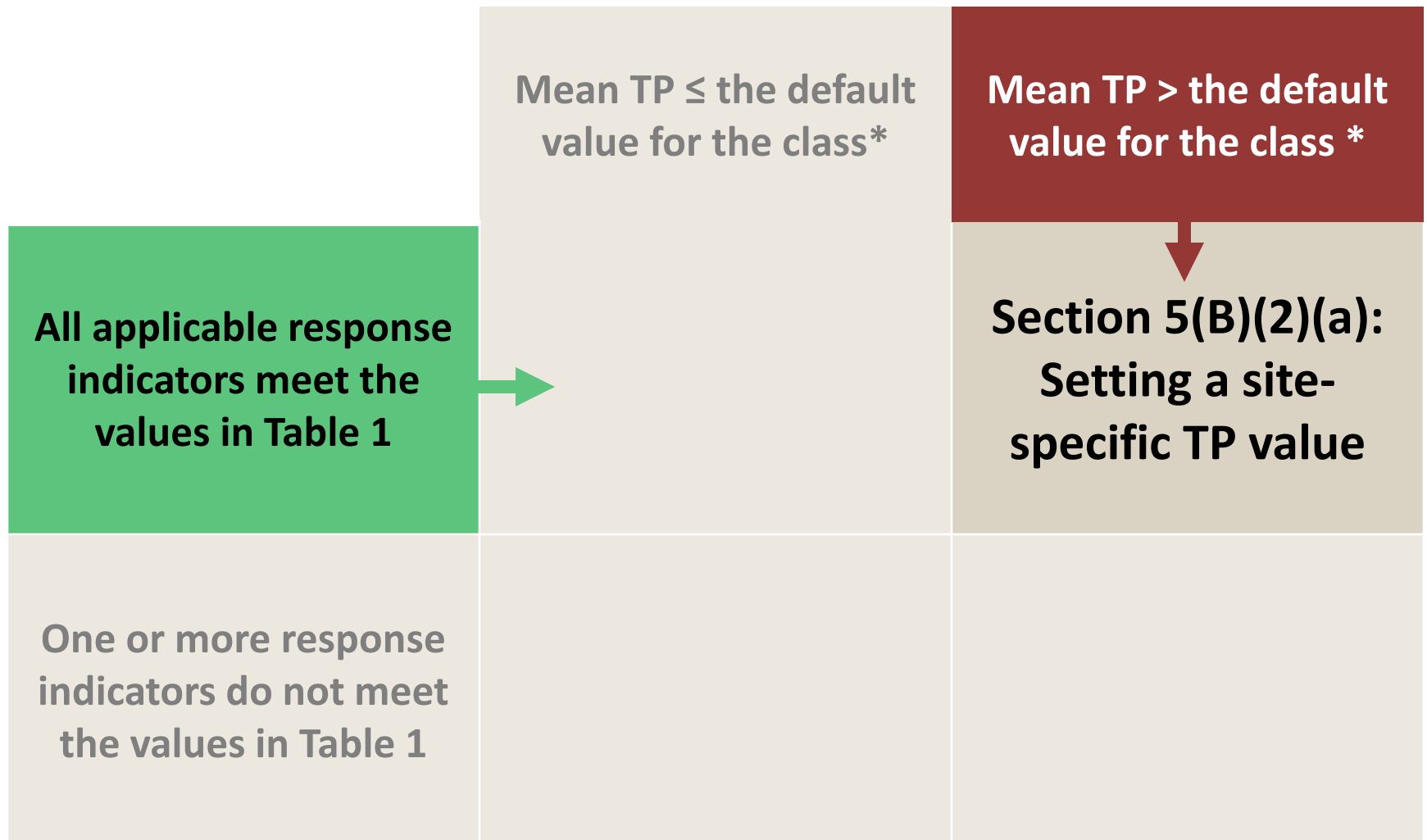
Decision Framework



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Section 5: Decision Framework



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Section 5(B)(2): Site-specific TP Value

- Multi-year study to determine if a site-specific TP value is warranted
- At least 3 years of data including at least 1 year with critical ambient conditions (*e.g.*, low flow, warm temperature)
- If nutrient response indicators are consistently good, then the Department could propose a site-specific TP value that is greater than the default value



Study for a Stream with Rocky Substrate

	June	July	August	September
Water samples (TP, O-PO ₄)	✓	✓	✓	✓
Dissolved oxygen	✓	✓	✓	✓
pH	✓	✓	✓	✓
Sewage fungus	✓	✓	✓	✓
% nuisance algal cover	✓	✓	✓	✓
Aquatic life (biomonitoring)				
macroinvertebrates	--	--	✓	--
algae	--	✓	--	--
chlorophyll <i>a</i> concentration	--	--	--	--
Secchi-disk transparency	--	--	--	--

ESTIMATED COST \$2,000 - \$5,000/year* depending on if a contractor is hired to collect samples

* Assuming one sample per check mark (may need more)



Study for an Impoundment or Deep River

	June	July	August	September
Water samples (TP, O-PO ₄)	✓	✓	✓	✓
Dissolved oxygen	✓	✓	✓	✓
pH	✓	✓	✓	✓
Sewage fungus	✓	✓	✓	✓
% nuisance algal cover	--	--	--	--
Aquatic life (biomonitoring)				
macroinvertebrates	--	--	✓	--
algae	--	--	--	--
chlorophyll <i>a</i> concentration	✓	✓	✓	✓
Secchi-disk transparency	✓	✓	✓	✓

ESTIMATED COST \$1,700 - \$4,800 / year* depending on if a contractor is hired to collect samples*

* Assuming one sample per check mark (may need more)



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	Mean TP \leq the default value for the class*	Mean TP $>$ the default value for the class *
All applicable response indicators meet the values in Table 1	A. Not impaired Nutrient criteria attained	B. Not impaired Nutrient criteria attained
One or more response indicators do not meet the values in Table 1	C. Impaired Determine cause of impairment	D. Impaired Nutrient criteria not attained

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Discharge Permits

- State and federal regulations require permit writers to assess the potential impact of direct discharges of effluent to downstream water quality
 - Maine Pollution Discharge Elimination System (MEPDES)
 - National Pollution Discharge Elimination System (NPDES)
- DEP staff evaluate potential impacts when issuing or renewing discharge licenses



Reasonable Potential (RP) Analysis

- RP determines if there is a reasonable potential of a waterbody failing to attain water quality standards under the following conditions:
 - Critical river flow
 - Maximum flow discharge allowed by the permit
 - Average facility phosphorus concentration
 - Maximum background phosphorus concentration



Nutrient Rule and RP

Chapter 583 Nutrient Criteria	Reasonable Potential Analysis
Does the river attain nutrient criteria at current conditions?	Could there be a problem under worst-case conditions?
Reactive management	Proactive management



RP Analysis



DISCHARGE

Flow ($Q_{\text{discharge}}$)

and

TP concentration ($TP_{\text{discharge}}$)

UPSTREAM

Flow (Q_{upstream})

and

TP concentration (TP_{upstream})

DOWNSTREAM

Flow ($Q_{\text{downstream}}$)

and

TP concentration ($TP_{\text{downstream}}$)



RP Calculations

$$\frac{Q_{\text{discharge}} TP_{\text{discharge}} + Q_{\text{upstream}} TP_{\text{upstream}}}{Q_{\text{discharge}} + Q_{\text{upstream}}} = TP_{\text{downstream}}$$

$Q_{\text{discharge}}$ = Maximum flow of the discharge allowed by permit

$TP_{\text{discharge}}$ = Average TP concentration of the discharge

Q_{upstream} = Background stream flow

TP_{upstream} = Maximum background in-stream TP concentration

$TP_{\text{downstream}}$ = Resultant downstream TP concentration



How will RP change?

Component of RP Analysis	Before 2012	2012 – current	If Chapter 583 was adopted
TP threshold	35 ppb	100 ppb	18 ppb for AA/A 30 ppb for B 40 ppb for C
Critical Flow (cubic feet per second)	7Q10*	7Q10*	August median flow <i>(approximately 3-5 times more water than 7Q10)</i>

*7Q10 is the lowest average flow over a 7-day period that occurs (on average) once every 10 years



Example of RP for Class B River

TP Downstream	TP From rule	Response Indicators	Action
20 ppb	30 ppb	All are OK	Nothing or monitor TP
40 ppb	30 ppb	All are OK	<p>Permit must have an effluent limit for TP</p> <ul style="list-style-type: none"> • Could potentially do a study to determine if a higher site-specific TP value could be adopted and still attain all response indicators
40 ppb	30 ppb	One or more responses are bad or not measured	<p>Permit must have an effluent limit for TP</p> <ul style="list-style-type: none"> • Reduce maximum discharge • Adjust treatment process <ul style="list-style-type: none"> • Add P treatment



What would change with Chapter 583?

	Without Chapter 583	After adopting Chapter 583
WATER QUALITY STANDARDS		
Dissolved oxygen	✓	✓ Same
pH	✓	✓ Same
Aquatic life (biomonitoring)	✓	✓ Same
Sewage fungus	✓	✓ Same
Secchi disk transparency		✓ New
Chlorophyll <i>a</i> concentration		✓ New
% nuisance algal cover		✓ New
REGULATORY REQUIREMENTS		✓ Same framework
* Maine Pollution Discharge Elimination Program (MEPDES)	✓	Individual permits might have new or more stringent nutrient limits if a waterbody does not attain nutrient criteria.
* Municipal Separate Stormwater Systems (MS4) permits		
* Nutrient management plans		
NON-REGULATORY PROGRAMS	✓	✓ Same framework



How many “new listings” could occur?

- Looking at last five years of routine sampling
- Chlorophyll *a*
 - 2 samples
- Percent nuisance algal cover
 - 13 out of 191 samples exceeded the % nuisance algal cover values in Chapter 583
 - 11 of those 13 samples were from streams already listed as impaired or presumed to be impaired for another reason



Nutrient Criteria Will Help the Department Manage Water Quality





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