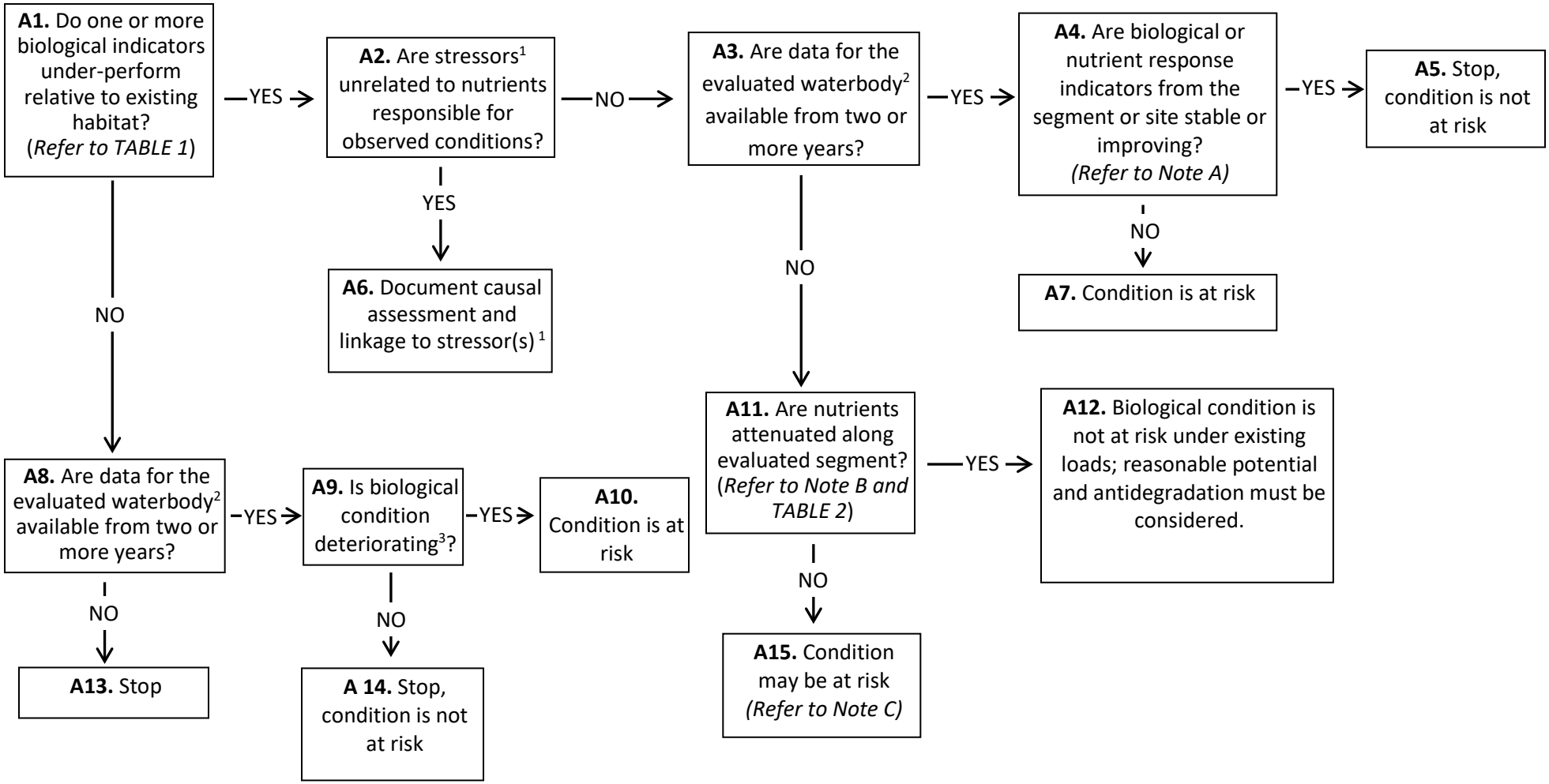
3745-2-04 Appendix A SNAP status verification flow charts and tables.

Flow chart A. Decision tree for determining when biologically attaining condition status is at risk by nutrients.

For application when biological criteria are attaining, but one or both nutrient response indicators (dissolved oxygen (DO) range or chlorophyll) are elevated.



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[1] Stressors include pollutants and physical conditions.

[2] The geographic scope or length of evaluated stream segments are defined in approved study plans or QAPPs.

[3] For a given location, a decrease of five or more index of biotic integrity or invertebrate community index points, or 0.6 or more modified index of well-being points between sampling years represents a significant change. Trends for waterbodies are formally evaluated in Biological and Water Quality Technical Support Documents.

Flow chart A (continued) – additional notes:

Note A. This can be determined by comparing older data to current data using: (1) Table 1 in the SNAP Appendix or (2) footnote 3 in the Flow chart A or (3) allied response indicators (24-hour DO range, chlorophyll).

Note B. Attenuation of nutrients in an evaluated segment is demonstrated by nutrient concentrations measured at two or more successive sites downstream from a defined source decreasing through uptake, sequestration, or dilution such that concentrations fall to either background levels or levels where risk of eutrophication to downstream waters is minimal (see Table 2). Where there are no historic data on which to base trends, attenuation of nutrients within the segment implies assimilation within what the waterbody can handle under existing conditions, and that stress from the nutrient load is spatially transient (i.e., localized to the immediate segment).

Note C. If attenuation appears ambiguous or cannot be determined because of an insufficient number of downstream sampling points between the source in question and the next downstream receiving water or the next downstream major source contributor, additional sampling is needed to determine condition status.

Table 1. Equations used as guidance to help determine whether biological indicators are underperforming relative to existing habitat.

To assist in determining whether a given biological indicator is underperforming expectations relative to measured habitat quality, the following equations can be used as an approximation. The equations are based on quantile regression at the 25th percentile. For results of the comparison near or below the 25th percentile, the QHEI matrix should be examined. The reference sites sampled from 2003 to the present were used for deriving the WWH equations. Sites with existing EWH designations were used for the EWH equations.

Class / Ecoregion		Equations & Inputs	
		Fish IBI = b0 + b1*QHEI	
		b0	b1
HELP		11.3	0.37
All others	WWH	16.4	0.37
	EWH	37.5	0.12
		Macroinvertebrates EPT= b0 + b1*QHEI	
		b0	b1
All Ecoregions	WWH	-4	0.25
	EWH	3.97	0.17
All Ecoregions		Fish MIwb= b0 + b1*QHEI	
		b0	b1
Wading	WWH	5.125	0.046
	EWH	7.381	0.025
Boating	WWH	6.011	0.044
	EWH	7.730	0.025

EPT = Ephemeroptera, Plecoptera, and Trichoptera, EWH = exceptional warmwater habitat, HELP = Huron/Erie lake plain ecoregion, IBI = index of biotic integrity, MIwb = modified index of well-being, QHEI = qualitative habitat evaluation index, WWH = warmwater habitat. For more information on these terms, see rule 3745-1-07 of the Administrative Code, and "Biological Criteria for the Protection of Aquatic Life: Volume III. Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities" available online here: https://epa.ohio.gov/divisions-and-offices/surface-water/reports-data/biological-criteria-for-the-protection-of-aquatic-life

Table 2. Concentrations of total phosphorus (TP) and dissolved inorganic nitrogen (DIN) arrayed by narrative levels of ecological risk.

Table 2 presents narrative descriptions of various levels of ecological condition and potential risk, arrayed with ranges of nutrient concentrations commonly observed at the respective ecological condition levels. The risk table is based on data collected from 1999 through 2023. This information may be a useful reference for nutrient assessment using Charts A or C. **Chart A**: Attenuation from a defined source may be inferred by nutrient concentrations measured at successive stations within an evaluated segment, decreasing from a higher risk level to a lower risk level. **Chart C**: Table 2 may be used as a general reference in assessing impairment risk. Actual risks and the potential benefits of abatement are site-specific determinations.

		←*DECREASING RISK*				
	TP Conc. (mg/l)	**DIN Concentration** (mg/l)				
		<0.44	0.44 < 1.10	1.10 < 3.60	3.60 < 6.70	≥6.70
DECREASING RISK→	<0.040	background levels typical of least disturbed conditions (Blue[1])	levels typical of developed lands; little or no risk to beneficial uses (Blue)	levels typical of modestly enriched condition; low risk to beneficial use if allied responses are within normal ranges; high phosphorus uptake (Blue)	levels typical of enriched condition in phosphorus limited systems; moderate risk to beneficial use if allied responses are elevated; high phosphorus uptake (Green[2])	characteristic of tile-drained lands; otherwise atypical condition with moderate risk to beneficial use if allied responses are elevated; high phosphorus uptake (Gray[5])
	0.040-<0.080	levels typical of developed lands; little or no risk to beneficial uses (Green)	levels typical of developed lands; little or no risk to beneficial uses if allied responses are normal (Green)	levels typical of working landscapes; low risk to beneficial use if allied responses are within normal ranges (Blue)	levels typical of enriched condition in phosphorus limited systems; moderate risk to beneficial use if allied responses are elevated; high phosphorus uptake (Red[4])	characteristic of tile-drained lands; moderate risk to beneficial use if allied responses are elevated (Red)
	0.080-<0.131	levels typical of modestly enriched condition with high nitrogen uptake; low risk to beneficial use if allied responses are within normal ranges (Red)	levels typical of working landscapes; low risk to beneficial use if allied responses are within normal ranges (Red)	levels typical of streams with a significant effluent fraction; low risk to beneficial use if allied responses are within normal ranges; pre-uptake condition (Yellow[3])	characteristic of tile-drained lands; moderate risk to beneficial use if allied responses are elevated; increased risk with poor habitat – OR – large rivers with significant effluent fraction (Red)	characteristic of tile-drained lands; moderate risk to beneficial use if allied responses are elevated (Red)
	0.131-<0.400	levels typical of enriched condition with high nitrogen uptake; elevated risk to beneficial use (Red)	levels typical of enriched condition with high nitrogen uptake; elevated risk to beneficial use (Red)	levels typical of streams with a significant effluent fraction; moderate risk to beneficial use if allied responses are within normal ranges; pre-uptake condition (Yellow)	enriched condition; generally high risk to beneficial uses; often co-occurring with multiple stressors; increased risk with poor habitat (Red)	enriched condition; generally high risk to beneficial uses; often co-occurring with multiple stressors (Red)
	≥0.400	high nitrogen uptake; atypical condition (Red)	high nitrogen uptake; atypical condition (Red)	typical of effluent dominated rivers; high risk (Red)	enriched condition; high risk to beneficial uses (Red)	enriched condition; high risk to beneficial uses; often co-occurring with multiple stressors (Red)

"allied responses" = allied response indicators (24-hour DO range, chlorophyll)

Table 2 (continued) – additional notes:

[1] Blue indicates both fish and macroinvertebrates have a better than even chance of meeting or exceeding expectations after accounting for habitat quality.
[2] Green indicates one indicator has a better than even chance of exceeding expectations after accounting for habitat quality, and one indicator has slightly less than even chance.
[3] Yellow indicates that both indicators have an approximately even chance of meeting expectations based on habitat quality.
[4] Red indicates both indicators have a less than even chance of meeting or exceeding expectations after accounting for habitat quality.
[5] Gray indicates an extreme condition one is likely only to encounter in an ag ditch receiving tile drainage.

Note A: The 5-day biochemical oxygen demand (BOD5) and total Kjeldahl nitrogen (TKN) parameters play a role in the nutrient-to-organic enrichment continuum. These parameters can indicate organic enrichment, a condition dominated by decomposition of carbon-rich material, which differs from nutrient enrichment. BOD5 and TKN can also indicate nutrient enrichment, especially when Table 2 shows elevated risk and/or sestonic chlorophyll is high. BOD5 concentrations 2.5 to <6 mg/L are elevated; ≥6.0 mg/L are very elevated. TKN 0.7 to <1.0 mg/L are elevated; ≥1.0 mg/L are very elevated.

Table 2A. Proportion of sites within a Table 2 cell with an IBI score or number of EPT taxa at or exceeding expectations based on habitat quality, based on data collected from 1999 through 2023.

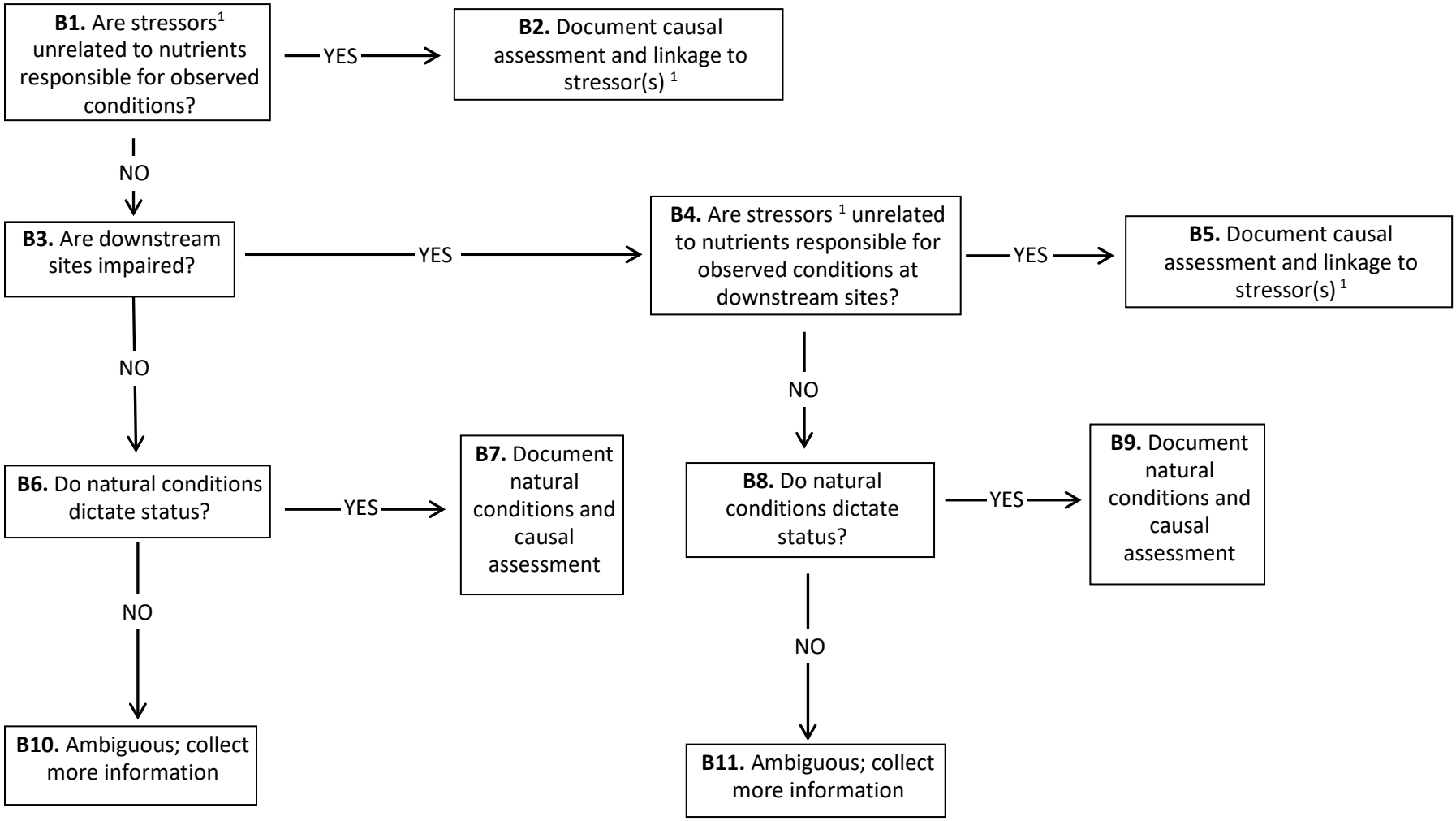
	DIN concentration (mg/l)				
TP conc (mg/l)	<0.44	0.44 < 1.10	1.10 < 3.60	3.60 < 6.70	≥6.70
<0.040	0.66 / 0.57	0.63 / 0.53	0.68 / 0.68	0.5 / 0.62	0.33 / 0.56
0.040 - <0.080	0.53 / 0.39	0.53 / 0.47	0.6 / 0.59	0.48 / 0.4	0.33 / 0.22
0.080 - <0.131	0.48 / 0.37	0.45 / 0.47	0.49 / 0.5	0.28 / 0.36	0.25 / 0.2
0.131 - <0.400	0.43 / 0.27	0.4 / 0.33	0.5 / 0.5	0.38 / 0.34	0.14 / 0.06
>0.400	0.2 / 0	0.28 / 0.15	0.39 / 0.15	0.44 / 0.25	0.36 / 0.23

Table 2B. Percent of total water chemistry observations within Table 2 cells, based on data collected from 1999 through 2023.

	DIN concentration (mg/l)				
TP conc (mg/l)	<0.44	0.44 < 1.10	1.10 < 3.60	3.60 < 6.70	≥6.70
<0.040	22.2	7.5	4.2	0.6	0.2
0.040 - <0.080	7.6	7.9	6.0	0.8	0.1
0.080 - <0.131	3.6	6.6	6.7	1.1	0.2
0.131 - <0.400	3.1	4.9	9.9	1.9	0.5
>0.400	0.3	0.5	1.7	0.9	0.9

Flow chart B. Decision tree for determining biological impairment caused by stressors other than nutrients.

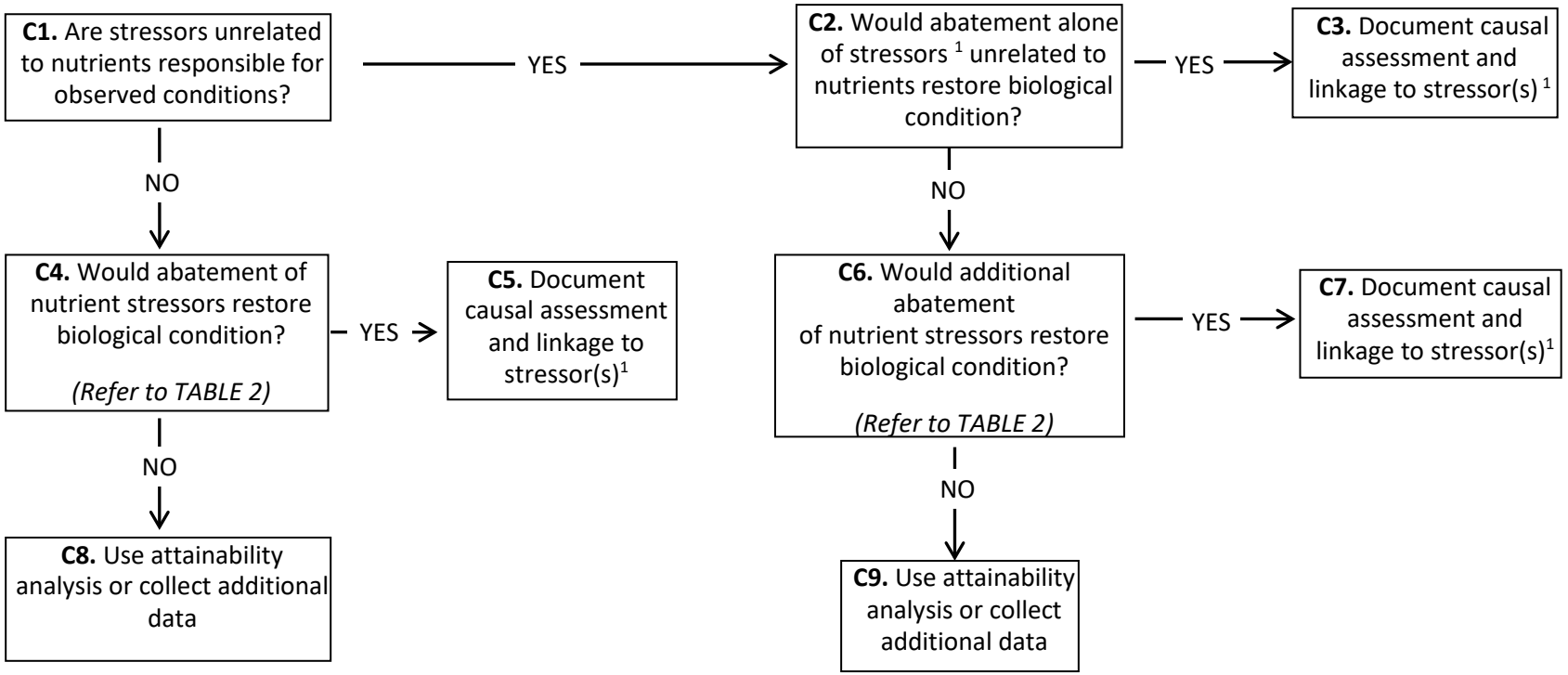
For application when one or more biological criteria are non-attaining, but no nutrient response indicators (dissolved oxygen (DO) range or chlorophyll) are elevated.



[1] Stressors include pollutants and physical conditions.

Flow chart C. Decision tree for confirming biological impairment caused by nutrients.

For application when one or more biological criteria are non-attaining, and either nutrient response indicator (dissolved oxygen (DO) range or chlorophyll) is elevated.



[1] Stressors include pollutants and physical conditions.