Updated Escapement Estimate Type Classification Guidance

NuSEDS Escapement Estimates Toolkit Working Group[1]

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Overview

This report documents the updated NuSEDS escapement estimate Type (1–6) classification guidance and the property-first decision key used to assign types consistently.

Introduction

NuSEDS (National Salmon Escapement Database) stores salmon spawner survey records, spawner abundance estimates, and linkages between them for Pacific Region salmon populations (Fisheries and Oceans Canada 2016). NuSEDS estimate Types 1–6 are intended to communicate the interpretability of annual escapement estimates for downstream uses such as stock assessment and status evaluation. However, the current table-only guidance is often applied inconsistently and does not explicitly encode common, operational complications that strongly influence interpretation (e.g., incomplete run coverage, breaches/bypass at counting sites, variable visibility, and incomplete documentation).

This report documents an updated, Hyatt-aligned guidance implementation intended for biologists and analysts who upload escapement data to New SEDS/NuSEDS and require a consistent, transparent basis for assigning Types 1–6.

Hyatt (1997) intent and foundation

Hyatt (1997) developed a draft, hierarchical escapement classification key intended to be “unambiguous, easy to apply and reliable” for both field personnel and informed data users (Hyatt 1997). Hyatt framed classification around three linked dimensions: (i) properties of the survey and analytical methods used, (ii) statistical properties of the estimates (units of expression, accuracy, and precision), and (iii) the level of documentation supporting the estimate.

The NuSEDS estimate type table is derived from this foundation, but the table-only representation can be read as a method lookup. This creates ambiguity about how to incorporate timing, partial coverage/uptime, breaches/bypass, infilling, combined-method workflows, and uncertainty evidence.

Estimate type summary (Types 1–6)

Table 1: High-level summary of estimate Types 1–6 for orientation. Types summarize interpretability given method properties, uncertainty evidence, and documentation; they do not guarantee unbiasedness.

Label	Units	Interpretation
Census / near-census (high resolution)	Absolute abundance	A direct count (or near-census) with high confidence that missed fish are negligible or well constrained.
Absolute abundance estimate (qualified)	Absolute abundance (often with uncertainty)	A standardized estimation method producing absolute abundance with qualified accuracy and, where available, quantified precision.
Relative abundance index (high resolution)	Relative units (index, within-series)	A consistent, high-effort index that supports within-series comparisons; absolute abundance and uncertainty may not be fully quantified.

Label	Units	Interpretation
Relative abundance index (medium resolution)	Relative units (index, within-series)	A lower-effort index where comparability is more sensitive to timing, visibility, and coverage.
Relative abundance / estimate (low evidence)	Relative units (uncertain)	A numeric estimate where method information, documentation, or key qualifiers are insufficient to support stronger interpretation.
Presence / not detected	+ / -	A non-numeric record indicating adults present or not detected with reliable species identification.

Why an update is needed

In operational datasets, the same nominal estimate Type can be assigned to methodologically different estimates, and the table-only guidance does not encode several recurring, decision-relevant qualifiers. Key drivers of interpretation include:

- **Modern method coverage**: hydroacoustic imaging sonar approaches (e.g., DIDSON/ARIS pipelines) are increasingly used for escapement estimation but are not always clearly represented in table-only guidance, encouraging ad hoc interpretation (Holmes et al. 2005).
- **Incomplete coverage and breaches/bypass**: device outages, partial run-window coverage, and breach/bypass events can materially affect interpretability unless the magnitude and correction method are documented (See et al. 2021).
- **Timing, visibility, and effort standardization**: for survey-based indices, timing relative to run timing, observer efficiency, and visibility conditions often govern comparability and potential bias (Jones et al. 1998; Korman et al. 2002; Holt and Cox 2008).
- **Combined-method workflows**: multi-component estimates (e.g., sonar combined with tributary visual apportionment; fences supplemented during breach periods) require explicit component recording to avoid concealing a weaker component (Parsons and Skalski 2010).
- **Downstream filtering sensitivity**: estimate Types are used as data-quality filters in Wild Salmon Policy (WSP) rapid status workflows; inconsistent assignment can create discontinuities near threshold cutoffs (Holt et al. 2009).

How this guidance should be used when uploading to New SEDS/NuSEDS

This update is intended to support consistent type assignment during data entry and review by making key qualifiers explicit.
In practice:

- **Record methods explicitly** (enumeration and estimation). If methods are unknown, the guidance assigns a conservative Type 5 and records a method-unknown qualifier.
- **Record key qualifiers that affect interpretation** (e.g., run-window coverage, device uptime, breach/bypass context, timing/visibility constraints, infilling/interpolation method).
- **Provide documentation evidence** sufficient for independent interpretation

(e.g., field logs, methods/QA notes). Where evidence is missing, the guidance applies conservative downgrades.

- **Report quantitative uncertainty when available** (e.g., CV or SE) to support qualified precision for Type 2 where appropriate (e.g., AUC and mark–recapture uncertainty reporting) (English et al. 1992; Schwarz et al. 1993; Hilborn et al. 1999; Parken et al. 2003).

What this report provides

This report documents an updated, Hyatt-aligned guidance implementation that:

- Preserves Hyatt's Types 1–6 while making eligibility rules explicit.
- Separates **enumeration methods** (field data collection) from **estimation methods** (analysis and modelling).
- Uses a property-first decision sequence (data format gate; method-known gate; method-family checks; final documentation and uncertainty checks).
- Records qualifier codes for common downgrade causes (e.g., breaches/bypass, coverage/uptime, timing/visibility, documentation).
- Identifies recommended metadata additions for New SEDS/NuSEDS and notes that these additions are implemented in supporting software (see Methods).

Scope

This report documents classification logic, evidence expectations, and recommended metadata. It does not re-estimate escapement, evaluate biological status, or replace program-specific expert judgement.

Methods

Design principles (Hyatt-aligned)

Hyatt (1997) intended estimate-type assignment to reflect (i) method properties, (ii) statistical properties, and (iii) documentation (Hyatt 1997). The updated guidance encodes these dimensions explicitly as decision gates, method-family checks, and final evidence requirements.

Table 2: Mapping of Hyatt (1997) intent to the updated, property-first guidance implementation.

Hyatt (1997) dimension	How the updated guidance encodes it
Method properties (survey + analysis)	Method families + property checks (coverage, effort, timing, visibility, cross-section coverage)
Statistical properties (units, accuracy, precision)	Type eligibility by method family and a final precision/accuracy gate (supports CV/SE where available)
Documentation	Documentation qualifier + final documentation enforcement

Decision key design

The classification follows a property-first sequence:

1. **Data format gate**: non-numeric presence/not-detected is classified as Type 6.
2. **Method known gate**: if survey and analytical methods are not identified, the estimate is provisionally Type 5 and flagged as method-unknown.

3. **Method family selection**: a primary method family scopes the applicable questions.
4. **Method-family checks**: coverage, effort, visibility, timing, and related criteria drive conservative downgrades.
5. **Final checks**: documentation and uncertainty evidence are evaluated; where evidence is missing, conservative downgrades apply.

This structure is intended to reduce subjective table interpretation by turning common qualifiers into explicit questions and recorded qualifier codes.

Software availability (implementation of the guidance)

The guidance is implemented in the **SMN Escapement Estimates Toolkit** (R Shiny application) (NuSEDS Escapement Estimates Toolkit Working Group 2026). The toolkit executes one canonical decision key and produces (i) a final estimate Type (1–6) and (ii) explicit qualifier codes explaining conservative downgrades.
In this report, the software is treated as a companion implementation rather than a primary publication artifact. To avoid over-emphasizing engineering details for the intended audience, the implementation is referenced only at a high level.

Handling common operational complications

The updated guidance treats several recurring complications as explicit qualifiers rather than implicit judgement calls.

Breaches/bypass and infilling

Breach/bypass events at counting sites, and periods of missing observation due to outages or missed visits, can materially affect interpretability unless the magnitude and correction method are documented. The updated guidance treats bypass/breach risk and incomplete coverage as explicit downgrade triggers and records whether defensible infilling/interpolation was required (Holmes et al. 2005; Vélez-Espino et al. 2010; See et al. 2021).

Survey timing relative to run timing

For survey-based indices, visit count alone is not sufficient: surveys must bracket the period when fish are present, and visibility constraints and observer effects can govern bias and comparability (Hill 1997; Jones et al. 1998; Korman et al. 2002; Holt and Cox 2008). The updated guidance includes timing and visibility checks within method families where these factors are primary drivers of interpretability.

Combined-method estimates

Combined-method workflows (e.g., system-wide sonar with tributary visual apportionment, or fences supplemented during breach periods) should be recorded as explicit components. The updated guidance applies a conservative rule: where multiple components contribute to the final estimate, the assigned Type should not exceed that implied by the weakest component unless a documented integration method supports a higher classification (Parsons and Skalski 2010).

Calibration and historical revisions

Where historical values have been recalibrated or revised, the updated guidance treats calibration as an analysis layer that should be captured in metadata (calibration source, diagnostics, and revision history) rather than as a new estimate Type. This supports interpretation of time-series values by downstream users.

Quantitative uncertainty (CV/SE)

Hyatt (1997) distinguished higher-quality absolute-abundance estimates in part by qualified precision (variance evidence) (Hyatt 1997). Where available, reporting quantitative uncertainty (e.g., CV or SE) improves interpretability for downstream use. For example, AUC and peak-count approaches have established approaches for incorporating uncertainty and evaluating sensitivity to survey timing and frequency (English et al. 1992; Hill 1997; Hilborn et al. 1999; Parken et al. 2003; Millar et al. 2012). The updated guidance includes a final precision/accuracy check and recommends capturing quantitative uncertainty when available.

Recommended metadata elements for New SEDS/NuSEDS

The updated guidance can be expressed using existing NuSEDS fields in many cases, but several high-value metadata elements are needed to make estimate Types interpretable and reproducible for downstream users.
Note: The field names below are illustrative. The key point is that these elements are (i) recorded by the guidance as explicit qualifier codes and (ii) recommended for storage in New SEDS/NuSEDS so that Type assignment is transparent to data users.

Table 3: Recommended metadata elements for New SEDS/NuSEDS uploads to support transparent Type 1–6 assignment and interpretation.

Metadata element	Why it matters for interpretation	Typical qualifier code(s)	Priority for upload
Enumeration method (field)	Scopes which property checks apply.	METHOD_UNKNOWN (if missing)	Required
Estimation method (analysis)	Distinguishes analysis pathways (e.g., mark–recapture, AUC, modelling).	METHOD_UNKNOWN (if missing)	Required
Primary method family (FS/V/A/S/T/R/P/M)	Controls eligibility rules and the set of required qualifiers.	METHOD_UNKNOWN (if missing)	Required
Run-window coverage evidence	Explains conservative downgrades due to missed start/end of run.	RUN_COVERAGE	Recommended
Device/site uptime evidence	Explains conservative downgrades due to outages/unobserved intervals.	UPTIME	Recommended
Breach/bypass context	Explains conservative downgrades where missed fish are plausible.	BREACH_BYPASS	Recommended
Infilling/ interpolation method	Distinguishes defensible correction from undocumented gap-filling.	INFILL_METHOD	Recommended
Survey timing relative to run timing	A core driver of bias and comparability for survey indices.	TIMING	Recommended
Visibility/	Affects detectability and	VISIBILITY /	Recom

Metadata element	Why it matters for interpretation	Typical qualifier code(s)	Priority for upload
conditions	comparability (especially for visual methods).	ENV_COND	mende d
Documentation evidence	Determines whether a downstream user can independently interpret the estimate.	DOC	Requir ed
Quantitative uncertainty (CV/SE)	Supports qualified precision for Type 2 and more transparent uncertainty.	PRECISION_A CCURACY	Recom mende d
Combined-method components	Prevents concealment of a weaker component within an overall estimate.	(varies; conservative component rule)	Recom mende d
Calibration source + diagnostics	Supports interpretation of recalibrated time series.	(varies)	Recom mende d
Revision history (what changed/when)	Supports transparency when historical values have been revised.	(varies)	Recom mende d

NuSEDS data dictionary alignment

The NuSEDS data dictionary defines the database fields used to store enumeration methods, estimation methods, estimate classification (Types 1–6), and supporting metadata (e.g., inspections/effort and timing fields) (Fisheries and Oceans Canada 2025). The updated guidance is designed to be expressible using existing NuSEDS fields where possible, and to clearly identify gaps where additional metadata would improve interpretation and reproducibility.

Table 4: NuSEDS fields relevant to estimate-type classification and how they relate to the updated guidance (see the NuSEDS data dictionary in docs/context/).

Field Name	Field Definition	Role in updated guidance
ESTIMATE_CLASSIFICATION	This categorizes estimates based on their levels of accuracy and precision (Type-1 are the most accurate, Type-6 the least accurate). There…	Stores Type 1–6 estimate classification (includes some legacy non-Type labels)
ENUMERATION_METHODS	The enumeration method used to observe fish. The first method listed is the primary method. Values are: Bank Walk, Based on Angling Catch, …	Primary field method (enumeration) used to scope method-family checks
ESTIMATE_METH	There are several standard methods to chose from. Cumulative CPUE - Created for Stikine Sockeye Fixed Site Census -	Primary analysis method (estimation) and special cases (combined,

Field Name	Field Definition	Role in updated guidance
OD	Combining one or more r…	calibrated, unknown)
ADULT_PRESENCE	Values are present if adults were observed, none observed if no adults were observed during the stream inspections, not inspected if adults…	Supports presence/not-detected pathways (Type 6 context)
JACK_PRESENCE	Values are present if jacks were observed, none observed if no jacks were observed during the stream inspections, not inspected if jacks we…	Supports presence/not-detected pathways (Type 6 context)
NO_INSPECTIONS_USED	This is the number of stream inspection logs that are linked to the SEN or were used in the analysis. E.g. 10 stream inspections and a fixe…	Supports effort/visit thresholds (VISITS and related downgrades)
START_DTT	This is the time stream inspections began e.g. 2000-10-15 means that the first inspection for this season's estimate started on October 15 …	Supports timing/coverage interpretation (inspection start date)
RUN_TYPE	Run_Type indicates the run timing for different runs within the same season. In some cases, the runs may be well documented enough to label…	Supports timing context when multiple runs occur in a season
INDEX_YN	This indicates whether the estimates are for a portion of the population. This is usually due by purposely limiting enumeration to a portio…	Flags index (partial coverage) estimates (relative-abundance context)
ACCURACY	This is the ability of a measurement to match the actual value of the quantity being measured. Some historical estimates that were imported…	Legacy qualitative field; not a substitute for quantified uncertainty metadata
PRECISION	This is the ability of a measurement to be consistently reproduced, or put another way, the number of significant digits to which a value h…	Legacy qualitative field; not a substitute for quantified uncertainty metadata
RELIABILITY	This field was added for the inclusion of historical data from an external source. It is the level of reliability that the person placed in…	Legacy/import field (historical); not consistently present
ESTIMATE_STAGE	Preliminary SENs are the first drafts of summary estimate documents. Source data may be incomplete and their accuracy has not been verified…	QA/workflow stage (preliminary/near final/final); not a type determinant

Method families

Table 5: Method families encoded in the property-first guidance and the best attainable Type before conservative downgrades.

Code	Method family	Best attainable type
FS	Fixed site census (manual or electronic)	1
V	Visual ground or snorkel count	2
A	Aerial survey count	3
S	Hydroacoustic sonar count (modelled)	2
T	Trap model (non-spanning)	2
R	Redd survey	2
P	Electrofishing CPUE index	3
M	Mark-recapture program	2

Results

This section summarizes the primary outputs of the updated, property-first estimate Type (1–6) guidance: a transparent decision sequence, explicit qualifier (downgrade) codes, and practical evidence expectations that can be used during New SEDS/NuSEDS data entry and review.

A companion software implementation executes one canonical decision key and returns both (i) a final estimate Type and (ii) explicit qualifier codes explaining any conservative downgrades (NuSEDS Escapement Estimates Toolkit Working Group 2026). In this report, the implementation details are intentionally minimized.

Key overview

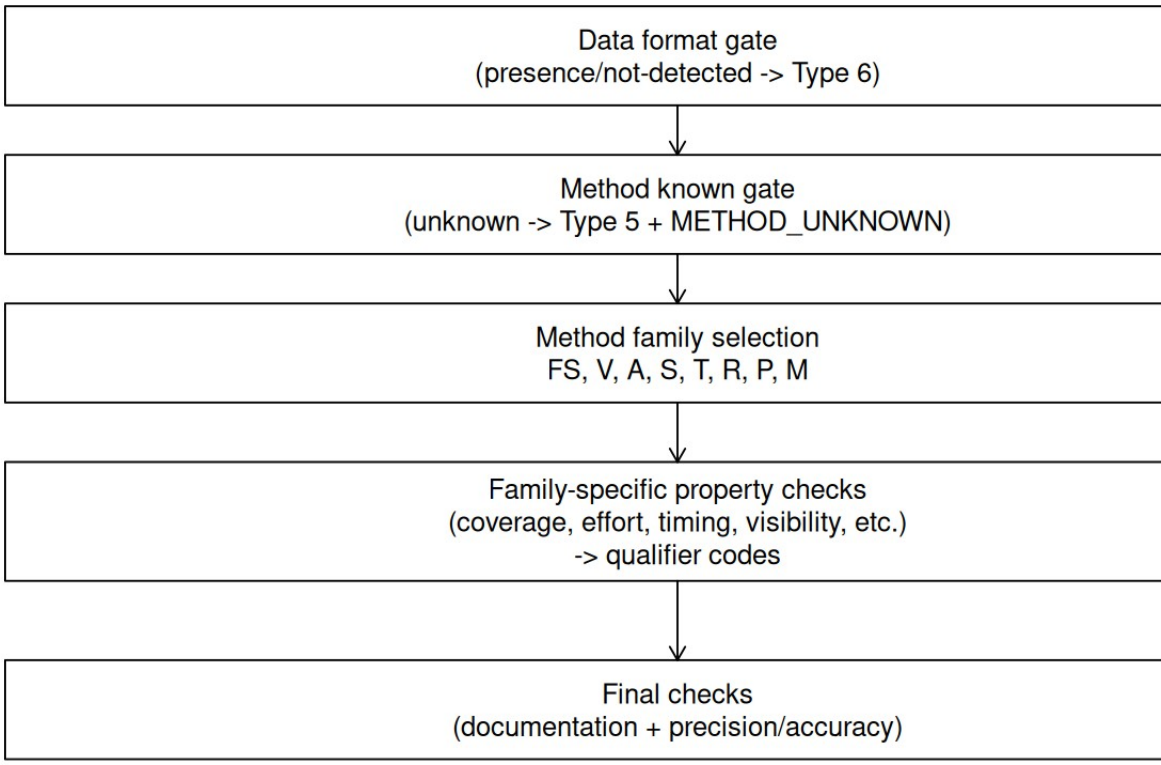

Figure 1. Overview of the property-first gates and method-family checks in the updated guidance.

What is updated relative to the table-only guidance

Table 6: Summary of the main updates relative to the current table-only estimate-type guidance.

Gap in the current table-only guidance	Update in this guidance
Methods not explicitly represented (e.g., hydroacoustic sonar)	Explicit method-family coverage and definitions, with conservative eligibility rules aligned to Hyatt (1997)
Ambiguous handling of breaches/bypass, coverage gaps, and infilling	Explicit qualifier codes (e.g., BREACH_BYPASS, RUN_COVERAGE, UPTIME, INFILL_METHOD) plus final documentation enforcement
Timing relative to expected run timing not made explicit	Timing and visibility checks within method families where these factors control comparability
Combined-method estimates treated as a single opaque category	Conservative approach for combined-method workflows: record components and do not conceal the weakest component

Gap in the current table-only guidance	Update in this guidance
Calibration/historical revisions not communicated to data users	Recommend calibration metadata and revision history as part of the record (rather than inventing new public Types)
Precision/accuracy criteria hard to apply without uncertainty metadata	Final precision/accuracy check plus recommendation to capture quantitative uncertainty (CV/SE) when available
Documentation expectations not enforceable as part of a repeatable workflow	A single, published guidance implementation that produces explicit reasons for conservative classification

Minimum evidence expectations by Type

The guidance is intended to help data providers record enough information that estimate Types can be interpreted consistently by downstream users. Table Error: Reference source not found summarizes practical minimum evidence expectations and common conservative qualifiers.

Table 7: Practical minimum evidence expectations and common conservative qualifier codes by estimate Type.

Candidate Type	Minimum evidence for interpretation	Common qualifiers when evidence is missing
Type 1 (census/ near-census)	Method explicitly identified; evidence that missed fish are negligible or well constrained (e.g., full coverage/uptime, bypass/breach context handled); documentation sufficient for independent review.	RUN_COVERAGE, UPTIME, BREACH_BYPASS, DOC
Type 2 (absolute abundance estimate)	Method explicitly identified; estimation pathway documented; quantitative uncertainty (CV/SE) recorded when available; documentation sufficient for independent review.	PRECISION_ACCURACY, DOC, METHOD_UNKNOWN
Type 3 (high-resolution index)	Method explicitly identified; survey effort and reach/coverage recorded; timing brackets the run window or is otherwise justified; visibility constraints documented.	VISITS, TIMING, VISIBILITY, REACH_COVERAGE, DOC
Type 4 (medium-resolution index)	Method explicitly identified; at least minimal effort/coverage recorded; timing/visibility constraints explicitly recorded (Type 4 is sensitive to these qualifiers).	VISITS, TIMING, VISIBILITY, DOC
Type 5 (low evidence / method	Method unknown or documentation insufficient for stronger inference; record method-unknown and other qualifiers so downstream users can interpret conservatively.	METHOD_UNKNOWN, DOC

Candidate Type	Minimum evidence for interpretation	Common qualifiers when evidence is missing
unknown)		
Type 6 (presence/not-detected)	Non-numeric record (+/–); species identification credible; record observation basis and date context.	(context-dependent)

Illustrative outcomes (hypothetical examples)

The scenarios below are hypothetical examples intended to illustrate representative outcomes from the key.

Table 8: Hypothetical illustrative classification outcomes from the property-first guidance.

Scenario	Key conditions	Outcome
Fixed site, constrained opening	Full coverage, QA review, documentation	Type 1 (no qualifiers)
Fixed site with bypass risk	Bypass not monitored or breach severity unknown	Type 2 + BREACH_BYPASS
Hydroacoustic sonar, fully documented	Classification documented, within spec, uptime sufficient, documentation present	Type 2 (no qualifiers)
Hydroacoustic sonar, partial coverage	Partial cross-section coverage or outages	Type 3 + XSEC_COVERAGE and/or UPTIME
Visual ground/snorkel, high-effort program	>=5 visits, reach coverage adequate, timing brackets peak	Type 2 (AUC pathway) or Type 3 (index pathway)
Visual ground/snorkel, sparse visits	1–2 visits or visits miss the run window	Type 4 + VISITS and/or TIMING
Presence or not-detected	Non-numeric data format	Type 6

Discussion

Intended use (New SEDS/NuSEDS data entry and review)

The updated guidance is intended to support consistent estimate-type assignment during data entry and review by:

- Making method and evidence expectations explicit (rather than implicit in a table-only lookup).
- Recording conservative qualifier codes that explain why a candidate Type cannot be supported.
- Improving interpretability for downstream users by separating enumeration

(field) methods from estimation (analysis) methods.

Estimate Types are not a binary “usable/unusable” label. Lower Types may still be informative for specific purposes (e.g., presence/absence, qualitative local context, or within-program indices), but are not interchangeable with census-like or fully qualified absolute-abundance estimates.

Implications for downstream assessments

Estimate Types are commonly used as screening filters in downstream workflows (including WSP rapid status assessments) where method properties and evidence quality affect interpretation (Fisheries and Oceans Canada 2005; Holt et al. 2009). When Type assignment is inconsistent, threshold-based decisions can become sensitive to classification noise, particularly near cutoffs (e.g., around the Type 4 boundary). More broadly, measurement error in spawner abundance can distort stock–recruit inference and downstream decisions, reinforcing the need to record uncertainty and detectability-related metadata where available (Walters and Ludwig 1981).

By producing explicit qualifier codes (e.g., missing method identification, timing/coverage gaps, insufficient documentation), the updated guidance makes the reasons for conservative classification transparent and enables targeted improvements in metadata capture.

Recommended metadata additions (schema) and implementation status

A central finding of this update is that the current Type table alone cannot communicate the information required for consistent interpretation of real-world escapement estimates. Several recurring qualifiers are better represented as explicit metadata elements rather than as new public estimate Types.

This report therefore recommends (and the companion implementation supports) additional metadata elements for New SEDS/NuSEDS uploads, including:

- Run-window coverage evidence (missed start/end of run).
- Device/site uptime and unobserved intervals.
- Breach/bypass context and severity.
- Infilling/interpolation method and justification.
- Timing relative to run timing (and visibility/conditions where relevant).
- Combined-method components and an integration method summary.
- Calibration source and diagnostics for calibrated time series.
- Revision history (what changed and when).
- Quantitative uncertainty when available (e.g., CV or SE).

These elements are summarized in Methods (Table Error: Reference source not found). In the companion toolkit implementation, these elements are reflected in the returned qualifier codes so that Type assignment is transparent to data users (NuSEDS Escapement Estimates Toolkit Working Group 2026).

Practical implementation monitoring (lightweight)

A full empirical validation program is outside current resourcing. However, New SEDS/NuSEDS stakeholders can still track practical indicators of data completeness and interpretability that are directly tied to the guidance.

Suggested monitoring metrics include:

- Proportion of estimates with **METHOD_UNKNOWN**.
- Proportion of estimates downgraded for **DOC** (insufficient documentation

evidence).

- Frequency of specific qualifiers (e.g., RUN_COVERAGE, UPTIME, BREACH_BYPASS, TIMING, VISIBILITY) by program or time period.
- Distribution of Types (1–6) over time within programs, to detect abrupt changes driven by metadata practices rather than biology.

These metrics support targeted improvements (e.g., documenting breach severity more consistently) without requiring a resource-intensive validation study.

Limitations

This guidance summarizes interpretability given recorded methods and evidence. It does not correct biased inputs, replace program expertise, or guarantee biological accuracy. The most common practical limitation is incomplete metadata: when critical qualifiers are not recorded, the guidance applies conservative classification (often Type 5) to avoid overstating interpretability.

Governance and change control

Because estimate Types are used as screening tools and can influence downstream inference, any changes to method families, thresholds, or qualifier rules should be versioned and reviewed. Changes should be accompanied by an updated worked example set and regression/path tests in the companion implementation so that behavior changes are deliberate and transparent.

Next steps

- Finalize a minimal, public-facing metadata schema for New SEDS/NuSEDS that supports the guidance (including quantitative uncertainty fields where available).
- Maintain a small set of worked examples (anonymized as needed) to demonstrate expected behavior on representative cases.
- Use implementation monitoring metrics (above) to prioritize metadata capture improvements that most strongly affect interpretability.

Appendix

Appendix A: Downgrade criteria codes

Table 9: Downgrade criteria codes used by the classification key.

Code	Description
RUN_COVERAGE	Run window coverage gaps (missed start or end of run).
VISITS	Too few site visits for the claimed precision tier.
BREACH_BYPASS	Bypass or breach risk at a counting site.
UPTIME	Device outages or unobserved intervals.
REVIEW_QA	Insufficient review of automated events.
VISIBILITY	Poor visibility or lighting limits detection.
REACH_COVERAGE	Intended reaches or segments not surveyed.
TIMING	Visits not aligned with migration peak or plateau.
EFF_STD	Inconsistent effort standardization.

Code	Description
XSEC_COVERAGE	Partial cross-section coverage.
CLASSIFICATION	Species or target classification error.
TRAP_EFF	Unmeasured or uncertain trap efficiency.
DETECTABILITY	Redd or carcass detectability bias.
DEVICE_CONFIG	Device settings not documented or unstable.
ENV_COND	Environmental conditions bias detection.
MR_ASSUMP	Mark-recapture assumption violations.
INFILL_METHOD	Interpolation or infilling not documented.
DOC	Documentation or evidence missing.
PRECISION_ACCURACY	Precision or accuracy weaker than candidate Type.
METHOD_UNKNOWN	Survey or analysis method not identified.

Appendix B: Glossary

Table 10: Glossary of key terms used in the updated estimate-type guidance.

Term	Definition
Estimate type	A categorical data-quality class (Types 1-6) intended to summarize reliability and interpretability of an escapement estimate.
Enumeration method	The field observation approach used to collect escapement information (e.g., fixed-site counts, visual surveys, sonar detections).
Estimation method	The analytical procedure used to convert field observations into an annual estimate (e.g., mark-recapture, AUC, modelling, expansions).
AUC (area under the curve)	A method that integrates repeated counts over time to estimate total passage or spawner abundance, typically requiring assumptions about residence time and detectability.
Method family	A grouped survey/estimation class used to scope which property checks apply in the decision key (FS, V, A, S, T, R, P, M).
Relative abundance	A time-series property indicating values are comparable within the same program/method over time, but may not represent a complete census of true abundance.
WSP (Wild Salmon Policy)	A Canadian policy framework that includes rapid status assessments using benchmarks and decision-tree logic applied to salmon Conservation Units.
Breach/ bypass	Fish bypassing a counting site, or a breach/failure of the counting installation, resulting in missed fish unless corrected.
Infilling/ interpolation	A documented method used to estimate unobserved portions of a run due to missed visits or device outages.
Calibration	A procedure that adjusts or infers estimates using a relationship to a higher-quality series or method, potentially changing historical values.

Term	Definition
Downgrade flag	A recorded code explaining why an estimate cannot attain a higher-quality type (e.g., VISITS, TIMING, DOC).
CV (coefficient of variation)	A standardized uncertainty metric defined as the standard deviation divided by the mean (often reported as a percentage).
SE (standard error)	A measure of uncertainty in an estimated quantity; commonly the standard deviation of an estimator under repeated sampling.

Appendix C: NuSEDS data dictionary crosswalk

This appendix documents how the updated guidance relates to NuSEDS fields and controlled vocabularies (see docs/context/Data_Dictionary_NuSEDS_EN.csv).

C.1 Enumeration method values (ENUMERATION_METHODS)

Table 11: Suggested mapping from NuSEDS enumeration method values to the updated key method families (FS, V, A, S, T, R, P, M).

NuSEDS ENUMERATION_METHODS value	Suggested method family	Notes
Bank Walk	V	
Based on Angling Catch	P	Catch-based index; treat as a CPUE-style index unless more detail is provided.
Biologist/ Working Group	unknown	Not a method; treat as method-unknown unless a specific field/analysis method is documented elsewhere.
Boat	V	
Broodstock Removal	FS	
Dead Pitch	V	Carcass-based visual surveys; often paired with peak/cumulative dead estimation methods.
Electronic Counters	FS	
Electroshocking	P	
Enumeration by Hatchery	FS	
Fence	FS	
Fixed Wing Aircraft	A	
Float	V	
Helicopter	A	
Hydroacoustic Station	S	

NuSEDS ENUMERATION_METHODS value	Suggested method family	Notes
Other	unknown	Treat as method-unknown unless a specific field/analysis method is documented elsewhere.
Peak Live and Dead Count	V	Value is analysis-like; prefer capturing peak/cumulative variants under ESTIMATE_METHOD.
Redd Counts	R	
Snorkel	V	
Spot Checks	V	
Stream Walk	V	
Strip Counts	V	
Tag Recovery	M	
Trap	T	If trap is non-spanning or efficiency-corrected, use T; fully constraining traps may behave more like fixed-site counting.
Walk	V	

C.2 Estimate method values (ESTIMATE_METHOD)

Table 12: Suggested interpretation of NuSEDS estimate method values under the updated guidance. Where 'depends' appears, additional method metadata are required to apply the key cleanly.

NuSEDS ESTIMATE_METHOD value	Guidance interpretation	Suggested method family	Notes
Cumulative CPUE	CPUE index	P	
Fixed Site Census	Enumeration device/mode (often stored as estimate method)	FS	
Cumulative New	NA	NA	
Peak Live + Dead	Visual-series estimation (AUC/peak variants and expansions)	V	
Area Under the Curve	Visual-series estimation (AUC/peak variants and expansions)	V	

NuSEDS ESTIMATE_METHOD value	Guidance interpretation	Suggested method family	Notes
Mark & Recapture: Jolly-Seber	Mark-recapture estimation	M	
Addition/ Subtraction	Math/expansion operations (depends on base method)	depends	
Multiplication/ Division	Math/expansion operations (depends on base method)	depends	
Mark & Recapture: Peterse n	Mark-recapture estimation	M	
Redd Count	Redd-based estimation (often requires spawners-per-redd conversion)	R	
Peak Live + Cumulative Dead	Visual-series estimation (AUC/peak variants and expansions)	V	
Lake Expansion	Math/expansion operations (depends on base method)	depends	
Insufficient Information	Method unknown/administrative label	unknown	
Peak Live * Expansion	Visual-series estimation (AUC/peak variants and expansions)	V	
Unknown Estimate Method	Method unknown/administrative label	unknown	

NuSEDS ESTIMATE_METHOD value	Guidance interpretation	Suggested method family	Notes
Not Applicable	Method unknown/administrative label	unknown	
Expert Opinion	Method unknown/administrative label	unknown	
Mark & Recapture: Bayesian	Mark-recapture estimation	M	
Other Estimate Method	Method unknown/administrative label	unknown	
Sonar-DIDSON	Hydroacoustic modelling pipeline	S	
Calibrated Time Series	Calibrated time series (requires calibration source + diagnostics)	depends	For interpretability, record calibration source years, diagnostics, and revision history.
Resistivity Counter	Enumeration device/mode (often stored as estimate method)	FS	Enumerated as a device/mode; ensure bypass/coverage/QA metadata are captured to support Type 1/2 eligibility.
Sonar-ARIS	Hydroacoustic modelling pipeline	S	
Mark & Recapture: Open Model	Mark-recapture estimation	M	
Combined Methods	Combined-method workflow (requires explicit component listing)	depends	Decompose into components (e.g., sonar + visual apportionment; fence + visual during breach) and apply conservative classification.
Video Counter	Enumeration device/mode (often stored as estimate method)	FS	Enumerated as a device/mode; ensure QA review rate and uptime/coverage metadata are captured.
(Peak Live+Cum Dead)*	Visual-series estimation (AUC/peak variants	V	

NuSEDS ESTIMATE_METHOD value	Guidance interpretation	Suggested method family	Notes
Expansion	and expansions)		

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