Appendix IV
Required and Recommended Data Collection and Reporting

California Hatchery Review Project
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During our review of salmon and steelhead hatchery programs in California, the California HSRG identified in Standard 4.4 a suite of in-hatchery annual monitoring and record keeping responsibilities that are necessary for evaluation of the long-term performance of each of these hatchery programs. Summaries of these collected data, with comparison to established targets (where appropriate), are to be reported and distributed annually for each distinct program, and individual measurements are to be stored in electronic data files. In this Appendix we identify all of the in-hatchery required (Standard 4.4) and recommended data to be collected and reported on an annual basis for each hatchery program. For the monitoring associated with broodstock collection, selection, and spawning, we make frequent reference to the lettered boxes in Figure IV-1 (e.g., Box A, B), a flow chart description of the typical in-hatchery processes and outcomes associated with these operations. Collection and reporting of the data identified below should be done as part of an ongoing Monitoring and Evaluation program (Standard 4.2), and sampling protocols should be discussed in the Hatchery Coordination Team forum (Standard 4.3).

Broodstock Collection
Report the following:
- Date of hatchery ladder/weir/trap initial opening, and schedule of operation thereafter, including closures or days without successful operation.
- Dates and locations of any auxiliary trapping for additional fish.
- Box A, B, C, D, for each fish: collection/initial handling date, size (jack or adult), gender, and origin (natural or hatchery; hatchery- and basin-specific when available).
- Box A, B: age composition as determined by reading scales and/or tags, from a systematic sample of fish from each Box (n≥550 from each, or all fish if the number encountered is fewer than 550) by origin (hatchery and natural). For each fish sampled, report age determination, length, and gender. Describe method used to determine age-structure, and verify accuracy of scale read age determination through comparison with known-age CWT recoveries.
- Box A, B: any tissue or scale samples taken.
- Box A, B: all other fish species encountered and their disposition.
- Box A, B: number of fish examined for marks/tags; number of marks/tags observed; list of decoded CWT/PBT recoveries and all associated biological data collected for those fish (i.e., length, gender); CWT recoveries to RMIS on a timely annual basis. Describe method used to examine fish for marks/tags.

Broodstock Selection
Report the following:
- Detailed description of broodstock selection protocol (initial sorting process).
- Box E, F, G, H, I, J, for each fish: species/run, date, size (jack or adult), gender, and origin (natural or hatchery; hatchery- and basin-specific when available).
- Box G, for each fish: marks/tags applied; exact release location.

Broodstock Spawning
Report the following:
- Detailed description of spawner selection protocol (subsequent sorting process). For example: only females that expelled free flowing eggs demonstrating they were sexually mature were spawned, and fish were randomly mated with respect to length.
- Detailed description of mate partnering protocol (e.g., 1 male to 1 female, or factorial design for conservation-oriented programs), including the number of times individual males were used.
- Detailed description of spawning method (e.g., rip or air spawn, live or dead).
- Box K, L, M, N, O, P, Q, R, for each fish: spawn date, size (jack or adult), gender, and origin (natural or hatchery; hatchery- and basin-specific when available).
- Box K: gender-specific age composition as determined by reading scales and/or tags, from a systematic sample of fish (n≥550, or all fish if the number spawned is fewer than 550). For each fish sampled, report age determination, length, and gender. Describe method used to determine age-structure, and verify accuracy of scale read age determination through comparison with known-age CWT recoveries.
- Box N, for each fish: describe rationale for euthanasia (e.g., excess jacks for program needs).
- Box O, P, for each fish: marks/tags applied, exact release location, and release date.
- Description of method used to dispose of carcasses.
- Calculated effective population size (for conservation-oriented programs).

Egg Fertilization and Collection
Report the following:
- Detailed description of fertilization method and use of extender solutions (e.g., eggs and milt expressed into dry pan then water added).
- Detailed description of post-fertilization egg disinfection protocol.
- For each fish: estimate mean egg size (eggs per ounce from ovary subsample), fecundity (eggs per ounce times total ovary weight), age, and length, in a systematic or representative sample of spawned females (n≥50), by origin (hatchery and natural).
- For each spawning date:
  (1) number of females spawned;
  (2) number of males spawned;
  (3) number of jacks spawned;
  (4) number of green eggs taken;
  (5) average number of eggs per female;
  (6) average number of eggs per ounce;
  (7) average number of eggs retained per female (and describe estimation method).

Incubation
Report the following:
- Detailed description of incubation methods (e.g., trays or jars, flow rates, and loading rates for green and eyed eggs).
- Detailed description of culling/disposal protocol used, including purpose.
- For each spawning date:
  (1) number of eyed eggs retained;
  (2) number of eggs culled/disposed of.
- Survival through the following life stages:
  (1) green egg to eyed egg;

(2) eyed egg to hatched egg;

(3) hatched egg to ponding.

Ponding and Rearing

Report the following:

- Detailed description of ponding/rearing facilities used.
- Detailed description of diet, and feeding regimen.
- For each spawning date:
  (1) number of fish ponded;
  (2) size of fish ponded (fish per pound).
- For each rearing unit, at periodic intervals (no greater than monthly):
  (1) flow index;
  (2) density index;
  (3) from a representative sample of fish:
    (a) Length: mean, standard deviation, and frequency distribution (n≥100);
    (b) Size: mean (fish per pound);
    (c) Condition factor: paired measurements of length, weight (n≥50).
- Estimated survival through the following life stages:
  (1) ponding to marking/tagging;
  (2) marking/tagging to release.

Marking/Tagging

Report the following:

- Detailed description of methods used for marking/tagging fish prior to release, including method of selecting fish that receive marks/tags.
- For each rearing unit, number and percentage of fish marked/tagged by mark/tag-type and date.
- Number of marks/tags lost prior to release by mark/tag-type.

Juveniles Released

Report the following:

- Detailed description of methods used to release fish.
- For each rearing unit, just prior to release, fish length: mean, standard deviation, and frequency distribution (n≥100).
- For each group released:
  (1) date of release;
  (2) number released;
  (3) from a representative sample of fish released: length (mean, standard deviation, and frequency distribution, n≥100);
  (4) marks/tags applied;
  (5) number of marked/tagged fish released;
  (6) location of release;
  (7) water temperature at release site;
  (8) release method, including transport method, transport container water temperature, and acclimatization process (if applicable).
- CWT release information to relevant databases (i.e., RMIS) on a timely annual basis.

Fish Health
Report the following:
- Detailed records of disease monitoring, prevalence and treatments, including:
  (1) five-year adult disease history, including BKD control strategy and efficacy.
  (2) pre-spawn mortality rate of broodstock collected (Box [C+D+J]/[A+B]), by gender and origin (hatchery and natural).
  (3) diagnostic and routine juvenile fish health monitoring, including health status at release.
  (4) efficacy of treatments including drug sensitivity testing of bacterial pathogens and efficacy of antibiotic medicated feed treatments.
  (5) annual status of specific fish pathogen management strategies identified in Fish Health Management Plans or the Hatchery Coordination Team.

Water Supply
Report the following:
- Detailed description of water source.
- Detailed description of water temperature controls.
- Daily mean, minimum, and maximum water temperatures (can be used to determine temperature units).
- Daily river flows from USGS website for location proximate to hatchery.
- Water supply problems.

Maintenance and Equipment
Report the following:
- Major maintenance issues.
- Equipment acquisition.
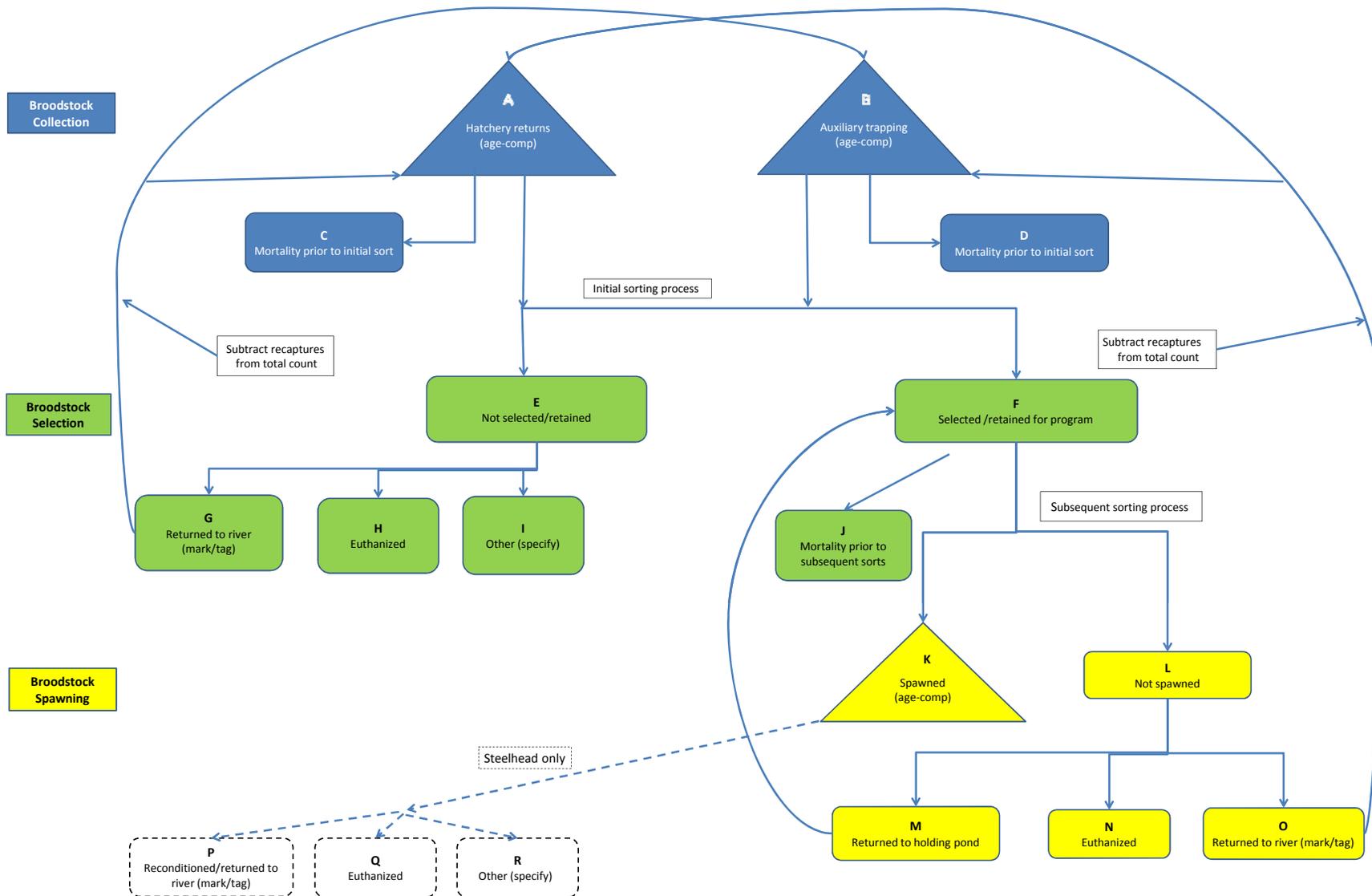- Infrastructure acquisition and/or modification.

Figure IV-1. Generalized flow diagram to track fish from initial trapping through spawning. Required data for Boxes A–R include, for each fish: date, size (jack or adult), gender, and origin (natural or hatchery; hatchery- and basin-specific when available). Triangle-shaped boxes (A, B, K) additionally require age and gender composition. Following the conclusion of program operations, the following relationships hold between the numbers of fish in the various boxes (assuming that recaptures of previously released fish are not included in the Box A and B totals): A+B=C+D+E+F; E=G+H+I; F=J+K+L; L=N+O and for steelhead K=P+Q+R.