Additional factors that could be included in the assessment are shown in red font.

Typical Hatchery Assessment Information

1. Fish Culture
    a. Programs (per Species on station)
        i. History/Purpose/Goals of each program
        ii. Release number/release size of each species/stocks
        iii. Biosecurity and pathology concerns for stocks/species
        iv. Grow-out Phase
            a. Final rearing numbers/densities per Grow-out tank at release (what rearing density metric is being employed—there are many? Also the type of rearing vessel, raceways, circulars—their dimensions, water depth, and rearing volume)
            b. Initial transfer size/numbers into each grow out tanks
            c. Mid-program transfers or splits?
            d. How are fish transferred out of Grow-out tanks?
            e. How are fish transported?
            f. Acclimation/ Direct Release sites for programs (number, size, type, location)
            g. Feed used in grow out phase (not only diet but how often fed and how fed—underwater, at surface, by hand or machine?)
            h. Size by month historical performance of Grow-out phase
            i. Water temperature regime by week for Grow-out phase (should also include O_2 concentrations and a measure of suspended sediments—are the raceways equipped with environmental sensors for oxygen and temperature?)
            j. Typical calendar schedule for Grow-out phase by species/stock
            k. Performance comments/concerns during Grow-out phase
                1. Density limits/concerns
                2. Flow limits/concerns
                3. Exchange rate limits/concerns
                4. Water quality/quantity limits/concerns
                5. Survival rates through Grow-out phase
                6. Other (cleaning schedule)
            l. Additional features in the rearing vessels—presence of:
                1. In-water structure
                2. Underwater feeders
                3. Painted sides and bottoms
                4. Floating covers
                5. Roughened or cobbled bottoms
                6. Natural vegetation (e.g. in earthen ponds)
                7. Other

v. Nursery Phase
   a. Nursery tanks used for each species (again type, size, volume)
      1. Final rearing numbers/densities per Nursery tank before moving to Grow-out tanks
      2. Initial ponding numbers into Nursery tanks
      3. Mid-program transfers or splits?
      4. How are fish transferred out of Nursery tanks
   b. Feed used in Nursery phase
      1. Feed programming by months for Nursery phase (especially the growth program, how ration amount [% body weight fed/day] and feeding frequency changes over time. How often are fish sampled to determine if the growth plan is on track)
   c. Size by month historical performance of Nursery phase
   d. Water temperature regime by week for Nursery phase
   e. Typical calendar schedule for Nursery phase by species/stock
   f. Biosecurity/pathology comments/concerns during Nursery phase
   g. Performance comments/concerns during Nursery phase
      1. Density limits/concerns
      2. Flow limits/concerns
      3. Exchange rate limits/concerns
      4. Water quality/quantity limits/concerns
      5. Survival rates through Nursery phase
      6. Occurrence of precocious development should also be measured for facilities rearing steelhead, and Chinook.

vi. Incubation Phase
   a. Incubator Information (type, configuration, set-up/take-down, clean-up, etc.) (Also does the hatchery have the capacity to incubate eggs from single females each with its own separate water source, e.g., in "isobuckets" until the eyed stage to allow for pathology screenings on parent fish?)
   b. Number of eggs per incubator/tray (or per incubator if using deep troughs, shallow troughs, Kitoi boxes, hatching jars, etc.)
   c. Flow rates per incubator/tray (or per incubation trough. Are eyed eggs provided with a rugose substrate, e.g., folded vexar netting, bio-saddles, bio rings, etc. Is the incubation room kept in darkness or exposed to ambient light? If trays are being used are they single 8-tray units or 16 tray stacks, etc. How are they plumbed, by 8-tray units or a single 16- or greater tray stack? If a head box is used, how is it plumbed; can multiple sources of water be delivered to it? Is a formalin drip system in place?)
   d. Water temperature regime by week for Incubation phase (Types of water sources, e.g., ground water, surface water, is the incubation water chilled or otherwise regulated to control developmental rates? What volume of water is being used *in-toto*)

e. Days to hatch by program (Note that days to hatch isn't as important as T.U. accumulation to ponding and K_D at ponding)
f. Typical calendar schedule for Nursery phase by species/stock
g. Survival green egg to eyed egg
h. Survival eyed egg to ponding
i. Treatments (When do they occur and how do they take place?)
j. How/where are eggs collected (Are eggs collected and incubated at satellite facilities prior to transfer to the hatchery. How does the facility estimate how many green eggs it collects and incubates?)
k. How/where are eggs treated (Does the hatchery have separate areas for spawning, fertilization/disinfection and incubation?)
l. Water quality/quantity concerns/comments
m. Biosecurity/pathology comments/concerns during Incubation phase (including type of alarm systems, type and capacity of the backup generators used in case of power failures for water delivery, how sediment is controlled during the incubation period, particularly during flood events?)

vii. Adult Holding/Spawning Phase

a. Number of adults spawned (Also need to know stock origin and hatchery/wild mix—how is this done? Are DNA and pathology samples taken at spawning? Are other measurements made, e.g., scales for age, weight, length, digital photographs, fecundity estimates, egg size determinations—is there adequate space and equipment to collect this type of information?)
b. Spawning program overview
c. Typical calendar schedule for Adult Holding/Spawning phase by species/stock
d. How/where are adults collected
e. How/where are adults held (Need to know under what conditions the adults are being held and how maturation status is being determined)
f. Water temperature regime by week for Adult Holding/Spawning phase
g. What treatments do adults receive while being held (What type of prophylactics are used on broodstock)
h. Biosecurity/pathology comments/concerns during Adult Holding/Spawning phase
i. Performance comments/concerns during Adult Holding/Spawning phase
    1. Density limits/concerns
    2. Flow limits/concerns
    3. Exchange rate limits/concerns
    4. Water quality/quantity limits/concerns
    5. Survival rates through Nursery phase
    6. Other (How are adults held—males and females mixed together or segregated by sex, how are they sampled, does the facility have an automated crowding gate to force the fish into a portion of the holding pond/raceway? How are ripe and green fish segregated prior to

spawning—are there separate ponds/raceways for ripe and green fish? Are racks used to hold the fish prior to spawning? Is the spawning area protected from direct sunlight and rain? Is space and equipment adequate to perform the biological measurements mentioned above?)

viii. Fish Tagging/Marking

a. Size/program phase for marking of each species/stock
b. Methodology for marking
c. Set-up/Take-down required
d. Water temps/flows/equipment needed (Are power outlets adjacent to rearing locations adequate to accommodate tagging trailers?)
e. Personnel requirements

2. Infrastructure

a. Hatchery water flow (influent through effluent)

i. Discuss and sketch one-line diagram with client if flow-path not already provided

b. Hatchery Water Supply (Provide background on the history of the water supplies, including whether trends exist in volume, chemical composition, etc. Note additionally that with climate change it is really important to keep track of well levels, status of the aquifer, and the effects of floods on water security.)

i. Well Water

1. Annual Temperature Profile (including daily max, min, and mean temperatures)
2. Type of Wells/Construction (Note whether the facility has additional water rights such that additional wells be developed if existing well capacity decreases, and what type of water treatment occurs on well water prior to delivery to the hatchery—degassing towers, etc.)
3. Depth of Wells
4. Pump horsepower and history of pumping each well (Are there back up pumps and generators that the facility can use in case of breakdowns and power failures? How much redundancy is built into the water system?)
5. Well Maintenance schedule
6. Water quality (DO, TDG, water chemistry issues of concern, etc.)
7. Total volume of water available (capacity) and what part of the program is using well water (Typically well water is used during incubation and early rearing and surface water is used during the later parts of the rearing cycle).
8. Water chilling capacity (e.g., 120 gallons/min of delta T 4 degrees C below ambient).

ii. Surface Water

1. Annual Temperature Profile Intake Screening material/equipment
2. How is water transferred from source to aeration or rearing?

i. Gravity
ii. Pumping

3. Water quality (DO, TDG, water chemistry issues of concern, etc.) (Document the capacity, if any, to temper warm rearing waters caused by seasonal high temperatures?)
4. System operation concerns/comments
5. Aeration/Water Conditioning/Water Treatment
    i. Type/Style/Number/Flow Capacity/Dimension/etc.
    ii. Delta Water Conditions across treatment (influent/effluent)
    iii. System operation concerns/comments
6. Hatchery Water Delivery
    i. Head box or pumped
    ii. Pipe Information
    iii. Flows
    iv. System operation concerns/comments (alarms, backup pumping capacity, generators, etc. What is the capacity of the facility to keep operating when power goes out? How will the water supply be affected by floods and sediment importation?)

iii. Hatchery Water Effluent
1. Treatment methods (including pollution abatement ponds and how solid waste material removed from rearing vessels is handled and disposed of)
2. NPDES sampling requirements
    i. Total pounds of fish raised by month/year
3. Total flows/discharge
4. Treatment construction/operation concerns

iv. Hatchery Rearing Containers
1. Incubation
    i. Style/Mfg
    ii. Dimensions/Quantity
    iii. Min/max flow rates per incubator
    iv. Influent/effluent piping methods
    v. Cleaning methods/schedule
    vi. Water treatment at Incubator
    vii. Water quality at Incubator
2. Nursery
    i. Material of Construction
    ii. Dimensions/Quantity
    iii. Rearing water depth
    iv. Min/max flow rates per container
    v. Influent/effluent piping methods
    vi. Cleaning methods/schedule
    vii. Water treatment at container
    viii. Water quality at container
    ix. Additional notes (baffles, screens, split programs, etc.)

x. System operation concerns/comments

3. Grow-out
    i. Material of Construction
    ii. Dimensions/Quantity
    iii. Rearing water depth
    iv. Min/max flow rates per container (including frequency of measurement and equipment or methods employed)
    v. Influent/effluent piping methods
    vi. Cleaning methods/schedule
    vii. Water treatment at container
    viii. Water quality at container
    ix. Additional notes (baffles, screens, split programs, etc.)
    x. System operation concerns/comments
4. Acclimation Site Information
    i. Material of Construction
    ii. Dimensions/Quantity
    iii. Rearing water depth
    iv. Min/max flow rates per container
    v. Influent/effluent piping methods
    vi. Cleaning methods/schedule
    vii. Water treatment at container
    viii. Water quality at container
    ix. Additional notes (baffles, screens, split programs, etc)
    x. System operation concerns/comments

c. Support Buildings
    1. Use (Does the hatchery have a shop with wood and metal fabricating tools?)
    2. General Construction Style
    3. Approximate Size
    4. Condition
    5. Interior spaces
    6. Exterior
    7. Roofing
    8. Type of Heating/Cooling

d. Support Equipment
    1. Pumps
    2. Production water heating equipment
    3. Production water chilling equipment
    4. Emergency generator(s)
    5. Electrical distribution spaces & equipment
    6. Piping distribution & equipment
    7. Vehicles

8. Service Equipment
9. Other

e. Housing
    1. Approximate Size
    2. Condition

f. Fire Protection and Suppression – What plans, options, and equipment are available at the facility to combat wild fires?