

## FY 2012 Trinity River Restoration Program Proposal

{**Note:** important references to Appendix A are *italicized and highlighted*. We encourage readers to print out Appendix A (in color) and examine the tables and figures therein while reading the main text, so that you don't need to flip back and forth}

**A. Title:** Improving AEAM procedures and core assessments to better evaluate (and potentially revise) flow, sediment, channel rehabilitation and watershed actions

**B. Principal Investigators:** ESSA Technologies Ltd staff: David Marmorek [Tel: 604-733-2996 (general), 604-677-9557 (direct), Email: [dmarmorek@essa.com](mailto:dmarmorek@essa.com)], Darcy Pickard ([dpickard@essa.com](mailto:dpickard@essa.com)), Marc Porter ([mporter@essa.com](mailto:mporter@essa.com)). These scientists were intensively involved in IAP work over 2004-2009, and have extensive experience with AEAM elsewhere.

**C. Participants:** TRRP Work Group Leads and Program Scientists in charge of assessments which can potentially provide feedback to flow, sediment and channel rehabilitation actions (see Table 1 in Appendix A). Work group coordinators (Table 2 in Appendix A) should also be involved. We anticipate about 5 days for each of the people who are intensively involved.

**D. Project Dates:** FY2012 (ideally soon enough to help with fy12 flow scheduling decisions in early April)

**E. Scale:** Site, reach and system (depends on each assessment)

**F. Information Type:** Framework and work plan for providing short-term feedback to improve Program management actions by testing key hypotheses and reducing management uncertainties. *Examples of AEAM feedback and decision rules are provided in column 3 of Table 1 in Appendix A.*

**G. Issue Addressed and Background:** The Program is making excellent progress in implementing many of the assessments outlined in the IAP V1.0, and in rigorously following the integrated sampling design that was collaboratively developed during the IAP process. The AEAM cycle (Figure 1 in Appendix A) is a core part of the Program strategy. One challenge common to many large scale restoration programs is having the Evaluation step in this cycle keep pace with the Monitoring step, particularly short term evaluations that are meant to provide rapid feedback to management actions (in the case of the TRRP, annual flow scheduling, sediment, rehab site implementation and watershed actions). The IAP (section 1.4.2, pg. 19-21) outlined procedures for implementing such feedback using a 2-step procedure: 1) evaluation of each ecosystem component relative to quantitative objectives, and an assessment of whether changes to management actions are required (*Figure 2 in Appendix A*); and 2) syntheses across all ecosystem components to determine appropriate management actions, considering various criteria and tradeoffs (*Figure 3 in Appendix A*). While some progress has been made, these procedures have yet to be implemented across all of the assessments of potential utility (*Table 1 in Appendix A*). There's a great opportunity now to have Program scientists collaboratively develop such procedures, rigorously examine what they're learning, make timely reports prior to implementing the next round of management actions, and formalize the process of testing and revising management actions (i.e., documenting, evaluating and synthesizing information to assess whether or not actions are having their intended effects).

The IAP V1.0 recognized that more work was required on this aspect of the program, particularly during the 2010 to 2013 period. Hence this proposal is consistent with the Program evolution envisioned by the IAP. Section 2.4.2 of the IAP presented a **decision tree for converging to core assessments, Figure 4 in Appendix A**. This decision tree is meant to guide both assessments that deal with monitoring progress towards Program goals and objectives (column 1 in Figure 4), as well as assessments which provide AEAM feedback to management actions (**columns 2 and 3 of Figure 3 in Appendix A**). The IAP (page 45) elaborated on the necessary attributes of such AEAM assessments, i.e.:

“To be both a feasible and necessary AEAM feedback to management actions, AEAM assessments must complete the four steps described for Box 1A [i.e. sharpening objectives, clarifying assumptions, determining most cost-effective approaches to achieve required precision, finalizing sampling design and monitoring protocol], and also demonstrate the following attributes:

- a. management targets (similar to the sharpened objectives described under Box 1A);
- b. reliable, cost-effective model linking action to outcome (i.e., if we increase or decrease flow / sediment, we know how outcomes will change);
- c. if...then decision rule regarding unacceptable outcomes that require change in management action (e.g., management objective not achieved in > x% of system after y years), and ability to evaluate this decision rule with an acceptable level of certainty;
- d. ability to aggregate site-specific observations of outcomes to reach or system scale, so that decision rules are based on large scale patterns; and
- e. substantial risk to ecosystem or Program Goal if flow / sediment management actions are not revised when objectives are not achieved (e.g., significant risk of vegetation encroachment, significant risk of thermal impacts on fish growth or survival).

For example, assessment 7H (temperature) has all of these attributes. Assessment 6P (assessing bed mobility) fulfills only some of these attributes (i.e., the TRFE has targets (a) and the IAP/TRFE describes encroachment risks if bar surfaces aren't scoured in wet years / lack of bed mobility (e), but it isn't clear that there's a model (b), a decision rule (c), or a system-scale aggregation approach (d)).”

Finally, Appendix P of the IAP listed three cross-cutting PITAs which relate directly to this issue:

- **CC 1):** Integrated sampling design to support all components, building on work outlined in the IAP and currently being implemented in the IHAP and other monitoring efforts (finalization and fine tuning of individual sampling plans (GRTS or not); assessment overlay, co-location, and nesting; expansion to system-wide target populations; review of pilot study data). Ranked #2 out of 48 PITAs.
- **CC 2):** Cost-precision-decision tradeoffs (including power analyses) for low, medium, high intensity approaches to primary performance measures. Ranked #12
- **CC 3):** Develop AEAM decision rules that reflect revised, more specific objectives, and multi-objective decision rules. Ranked #13.

CC1 and CC2 will be partly addressed in fy11 with sampling design work carried out by Darcy Pickard (contract in process), though the resources in the sampling design Work Order are

insufficient to fully address all sampling design issues in the TRRP. Nevertheless, the sampling design work in fy11 will help to set a foundation for CC3, which relates directly to the AEAM work described in this proposal for fy12.

## H. Scope / Objectives / Deliverables:

**Scope:** Through 1:1 discussions and a 2.5 day workshop, collaboratively and iteratively develop a short *AEAM framework and work plan* for improving AEAM in the Program, building on the IAP, the Flow Evaluation Study, and recent work.

### Objectives:

1. Have a conference call with the Work Group coordinators in Table 2, to review and revise this proposal.
2. Use the sampling design work in fy11 to set a foundation for this fy12 work.
3. Work 1:1 with program scientists to develop a pre-workshop **Straw AEAM Framework**, building bottom-up from each of the assessments in Table 1 (and others suggested by the Work Group coordinators), reviewing the form of AEAM feedback and possible decision rules (*examples in third column of Table 1 in Appendix A*);
4. Conduct a 2.5-day **workshop** to revise the straw framework and develop a work plan.
5. Write up the workshop results in the form a **short report** which describes the revised **AEAM Framework**, provides draft information to inform fy12 management actions, and includes a **Work Plan** with tasks required to improve it, such as:
  - development of specific objectives for each component which can be quantitatively and/or qualitatively evaluated on an annual basis (at site, reach or system scales, depending on the assessment);
  - development of a set of evaluation procedures (e.g., decision trees, statistical tests, quantitative models) applied annually to selected assessments to determine:
    - if the ecosystem component is on track relative to defined objectives (**green**), definitely isn't on track (**red**), or if the evaluation is uncertain (**yellow**) – *see Table 3 in Appendix A*;
    - whether each ecosystem component is responding as predicted to the previous year's (or years') actions;
    - if further revisions to Program management actions may be required (see third column of Table 1 and Figure 2 in Appendix A), and if so,
    - what form of revisions are recommended, and their expected effects.
  - a systematic approach to weighing the outcomes of the above evaluations for all ecosystem components (and other considerations) to make annual decisions on management actions;
  - methods for rapidly producing required evaluations (e.g., routines linked to the Program's IIMS or Partner databases)
  - gaps in data and fundamental understanding required to 'close the loop'
6. Hold a conference call to review the process after the April flow scheduling decisions are completed, and write a short technical memo suggesting improvements for fy13.

**Deliverables and Schedule:** The deliverables are listed in bold under the objectives. Dates

will have to be synchronized with Partner schedules. We suggest that the 1:1 phone conversations and preparation of the straw framework occur in October-November, the workshop in late November, and the report be completed in February 2012, well before April flow scheduling decisions. This AEAM process should be reviewed on a conference call subsequent to these decisions, in perhaps June 2012, and the results of that call summarized in a short technical memo to improve the process for fy13.

## I. Methods:

Our approach will be to implement each of the objectives described above, consistent with the ideas laid out in section 1.4.2 of the IAP. We would first work bottom-up for the set of assessments associated with each ecosystem component (i.e. determine how to make Figure 2 operational). Then we would iteratively revise a straw procedure for synthesizing across components (illustrated in Figure 3). We will draw upon our experience in developing adaptive management plans and tools for other restoration efforts, including the Okanagan River (BC), Platte River (NE), Sacramento River, Dry Creek (CA) and Rio Grande (NM). The project will force scientists to confront the following tough issues and questions:

1. **Objectives and Hypotheses.** What set of *quantitative* objectives and targets should be used for each system component to determine performance at site, reach, and/or system wide scales (via multiple assessments)?<sup>1</sup>
2. **Ecosystem Linkages.** What evaluation methods can bridge across ecosystem components and gain inferences for making decisions on management actions? The IHAP 2010 proposal explicitly recognizes the need for interdisciplinary integration, and proposes various analytical approaches to achieve it (Section C in CDFG, HVT, USFWS, Yurok Tribe (2010)). A strong focus on management decisions will further focus interdisciplinary information needs.
3. **Reliability.** How will we present the level of confidence (both quantitative and qualitative) in conclusions regarding the current status of ecosystem components relative to objectives, and the level of urgency for revising management actions? How will we present differing interpretations of existing information?
4. **Rapid Data Synthesis.** How can data analyses required for April flow scheduling and sediment management decisions be rapidly completed, organized and synthesized for decision making? To what extent can the generation of graphs, tables and other outputs be automated with routines in the TRRP Integrated Information Management System (IIMS) and other data bases?

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<sup>1</sup> Management objectives and targets are listed in both the TRFE and IAP, though many of these objectives need greater specificity (SAB 2009). It may be wise to use a suite of quantitative objectives or targets for each domain, rather than attempting to forge a Program-wide consensus on a single target for each domain. If there are no *specific* objectives or *testable* hypotheses for a given assessment, then there can't be any evaluation and adjustment. Until objectives and/or hypotheses are tightened up, this assessment sits on the back burner and doesn't affect the feedback loop to management actions. If there are multiple objectives for a component this could work into the **red-yellow-green** scale (e.g., red = all agree this is bad; green = all agree this is good; yellow = some would consider this a level of concern)

Ultimately, the information required for annual management decisions could be synthesized into a form like **Table 3 in Appendix A**, which would be a reference point for Program discussions around subsequent changes in management actions. This summary table (backed up by associated appendices) would also help to document the rationale used for Program decisions. At some point, the Program may find it helpful to move towards a more formal decision analysis of the costs and benefits of reducing critical uncertainties in management actions (e.g. Alexander et al. 2006), but a first important step is synthesizing evidence into a qualitative decision framework.

**J. Consultations:** This project does not involve local communities, but will involve all of the major Partners in the Program who are actively doing work on the river.

**K. Partnerships and Capacity Building:** This project will help to build the capacity of all the major Partners in the Program in how to do AEAM, including sharpening objectives and decision rules, completing rapid evaluations of individual ecosystem components, and efficiently synthesizing across disciplines to make timely revisions in management actions .

**L. Draft Budget:** The budget in Tables L1 and L2 is based on the tasks outlined above in section H of this proposal. It includes the cost of travel, accommodation and per diems for two ESSA staff to attend the workshop, but not for other participants, or facility rental. We have not included an out-year budget for work in fy13, though we think it likely that another round of improvements to the AEAM framework will be required.

Table L1. Budget for FY2012 Proposal: *AEAM Framework and Work Plan*

Budget Category	Task 1. Prepare straw AEAM Framework	Task 2. AEAM Workshop	Task 3. Report	Task 4. Follow-up conf call after flow scheduling	Task 5. Project Management	Category Total
<b>ESSA Technologies Ltd.</b>						
Fees <sup>1</sup>	24,664	13,324	12,371	2,843	5,231	\$58,433
Benefits						\$0
Lodging and Per Diem		830				\$830
Transportation/Travel		1,900				\$1,900
Equipment/Supplies	250	125	125			\$500
Misc. Expenses						\$0
Contracts						\$0
Subtotal (direct expenses)	24,914	16,179	12,496	2,843	5,231	\$61,663
Indirect <sup>2</sup>	2,466	1,332	1,237	284	523	\$5,320
Subtotal Total (direct+indirect)	27,380	17,511	13,733	3,127	5,754	\$67,506
In-kind (subtracted from above subtotal)						\$0
Grand Total	\$27,380	\$17,511	\$13,733	\$3,127	\$5,754	\$67,506

<sup>1</sup> Fees include ESSA salary, benefits and overhead

<sup>2</sup> Indirect costs are 10% markup on ESSA fees (not expenses) by CH2MHill or NSR for use of their IDIQ.

Table L2. Labor Cost Breakout Per Organization or Task for FY2012 Proposal: *AEAM Framework and Work Plan*

<b>Job / Position</b>	<b>Rate</b>	<b>Unit</b>	<b>Quantity</b>	<b>Total</b>
Project Manager, Senior Systems Ecologist	\$1,440.00	Day	16	\$23,040
Senior Systems Ecologist	\$840.00	Day	12.5	\$10,500
Senior Statistician	\$982.50	Day	21	\$20,141
Senior Systems Analyst (IIMS)	\$1,267.50	Day	1.5	\$1,901
Applications Specialist	\$712.50	Day	4	\$2,850
				\$0
Total Salary (per organization or task)	-	-	-	\$58,433

## M. References:

Alexander, C.A.D., C.N. Peters, D.R. Marmorek and P. Higgins. 2006. A decision analysis of flow management experiments for Columbia River mountain whitefish management. *Can. J. Fish. Aquat. Sci.* 63: 1142-1156.

CDFG, HVT, USFWS, Yurok Tribe 2010. Interdisciplinary Habitat Assessment Plan of the Upper Trinity River. Work Plan FY2010. 43 pp..

SAB (2008). Review Comments on: Trinity River Restoration Program Integrated Assessment Plan Version 0.98 – September 29, 2008. By Science Advisory Board: Edmund Andrews, Josh Korman, JoAnna Lessard, Mike Merigliano, Clair Stalnaker. November 13, 2008. 21 pp.

Trinity River Restoration Program, ESSA Technologies Ltd. 2009. Integrated Assessment Plan, Version 1.0 – Sept. 2009. Draft report prepared for the Trinity River Restoration Program, Weaverville, CA. 286 pp.  
[http://trrp.net/documents/IAP/IAP%201.0\\_Sept22\\_09.pdf](http://trrp.net/documents/IAP/IAP%201.0_Sept22_09.pdf)

United States Fish and Wildlife Service (USFWS) and Hoopa Valley Tribe (HVT). 1999. Trinity River Flow Evaluation Study - Final Report. A report to the Secretary, US Department of the Interior, Washington, D.C.

## Appendix A. Tables and Figures

**Table 1.** Examples of assessments which could provide AEAM feedback to management actions (drawn from the FY2012 Solicitation Package), and possible forms of such feedback. This is **not** a comprehensive list of all relevant assessments. We used Appendix H of the IAP V1.0 to select assessments whose *primary benefit* included revision of specific actions, rather than being focused solely on tracking progress towards overall Program goals.

FY12 No.	Description of assessment	Examples of possible AEAM feedback to Program management actions	IDT ranking	Point of Contact
<b>Fish Work Group</b>				
12F1	Map & quantify the extent (area) of available fry/juvenile rearing habitat throughout the mainstem	If suitable rearing habitat insufficient outside of rehab site areas, potentially adjust flow and sediment actions.	1	Goodman
12F2	Map & quantify the extent (area) of available fry/juvenile rearing habitat at rehab sites	If suitable rearing habitat insufficient at rehab sites, adjust management actions (e.g., add cover, other features).	2	Goodman
12F10	Pre-smolt/smolt size, condition & disease incidence at outmigration (fish in hand)	If natural pre-smolts are not growing well or are in poor condition, re-examine flow, sediment and rehab actions. If hatchery smolts are in poor condition, recommend re-examining hatchery operations (outside Program control).	13	Pinnix
12F12	Map & quantify the extent (area) of available adult spawning habitat at rehab sites & throughout the mainstem	If spawning habitat not available at rehab sites, adjust rehab site designs (e.g., adding gravel, side channels). If habitat available but not being utilized, probe reasons why.	18	Goodman
12F14	Monitor fry density & abundance at rehab sites	If some constructed fry habitats not being utilized, tweak rehab site designs to mimic attributes of areas that are utilized.	22	Pinnix
12RW6	Monitor abundance/density and composition (richness/diversity) of riparian bird species during breeding, post-breeding and migration periods at rehab sites	If vegetation and/or bird communities not re-establishing well after rehab site construction, adjust site designs and construction methods.	29	Clarke
12F7	Monitor water temperatures at existing Trinity River temperature stations (supplemented where necessary) to model achievement of species-specific Water Year & seasonal temperature targets for rearing juveniles, outmigrating smolts & spawning adults	If unusually warm year, adjust flow releases to ensure that temperature targets are met. If assessment 12F10 suggests poor growth of fry and pre-smolts, or poor condition, possibly re-evaluate temperature targets.	Not ranked	Zedonis/Wittler



FY12 No.	Description of assessment	Examples of <i>possible</i> AEAM feedback to Program management actions	IDT ranking	Point of Contact
<b>Physical work group</b>				
12P1	Quantify changes in channel width/geometry and geomorphic features within the wetted channel (including sinuosity, radius of curvature, thalweg crossings, controls, length of edge (banklength), etc.)	If channel is not evolving towards most desired characteristics (established from studies of channel attributes in areas well utilized by juvenile salmon), adjust rehab site designs, flow and / or sediment.	10	Krause/Davis
12P3	Implementation monitoring and analysis	If Program actions are concerning landowners or stakeholders (e.g., flooding, erosion, impacts on fish holding pools), then conduct special studies to investigate effects of Program actions.	16	Gaeuman
12P4	Monitor bed mobility and scour thresholds	If bedload is not showing appropriate levels of mobility and scour relative to objectives (too low or too high), then consider changes to flows, sediment augmentation and/or channel rehab sites.	17	McBain
12P5	Sediment Supercharge Experiment	Evaluate ability of different levels of sediment augmentation and moderate-high flows to create complex habitat / bars (e.g. <i>build and carve</i> approach).	19	Krause
12P6	Monitor bedload transport rates, compute coarse sediment loads, and evaluate coarse sediment rating curves that are expected to change over time in response to management actions.	If sediment transport not meeting targets, adjust sediment augmentation volume, grain size distribution and location of additions, as well as possibly changes to flow schedules	20	Krause
12P7	Assess design performance of specific design features (alcoves, side channels, lowered floodplains, etc)	Are design features providing suitable habitat at a range of flows? If not, are design changes required?	30	McBain
12P8	Monitor variability in bed elevations	If annual / multi-year bed-level fluctuations are insufficient, consider changes to flow schedules and/or sediment augmentation.	40	Krause/Davis
12P9	Quantifying Channel Complexity	Quantifying channel complexity is a necessary step to evaluating whether or not the Program is meeting the IAP Level 1 objective of creating and maintaining a spatially complex channel morphology.	41	Krause
<b>Wildlife / Riparian work group.</b>				
12RW2	Map and quantify changes in riparian floodplain vegetation (e.g., species, age-class, initiation success, structural attributes) at GRTS sites, including near-channel vegetation	If riparian vegetation is not meeting objectives (either on upper or lower floodplain) consider changes to flow, sediment, channel rehab and/or vegetation management actions.	11	Bair
12RW7	Monitor the abundance/density of multiple FYLF lifestages, and reproductive output and/or reproductive success (recruitment) at rehab sites	If survival or reproduction insufficient at rehab sites, consider adjusting site design or flow timing.	34	Bettaso
12RW8	Model how streamflow actions will affect the bank location of initiating seedlings	Similar to 12RW2 above	35	Bair
<b>Temperature work group</b>				



<b>FY12 No.</b>	<b>Description of assessment</b>	<b>Examples of <i>possible</i> AEAM feedback to Program management actions</b>	<b>IDT ranking</b>	<b>Point of Contact</b>
12T2 & 12T3	Annual Operations Process (Reservoir forecasting (DWR & CVO); Reservoir modeling (CVO & TRRP); River modeling (TRRP & USFWS); River temperature tracking). Temperature Model Support.	Consider changes to flow releases to meet flow and temperature targets, based on current and forecast conditions.	Not ranked	Zedonis / Wittler

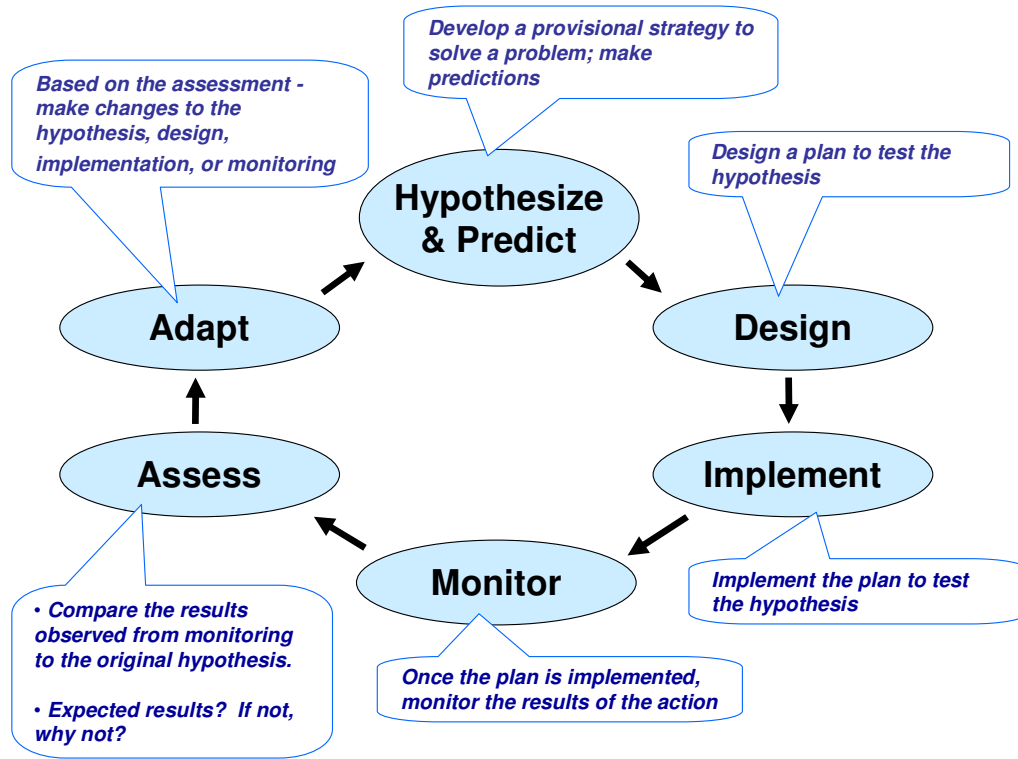
**Table 2.** Work Group coordinators. These scientists would participate in the proposed project, together with points of contact listed in Table 1 for each assessment, and other lead scientists closely involved in these assessments (as well as others added to this list).

<b>Work Group</b>	<b>Coordinator</b>
Fish	Joe Polos, USFWS
Physical	Andrea Hilton, HVT
Wildlife / Riparian	Samantha Chilcote, USFS
Temperature	Rod Wittler, USBR
Flow Scheduling	Andreas Krause, USBR
Interdisciplinary Team	Ernie Clarke, USFWS
Data Team	Eric Peterson, USBR
Watershed Team	Dave Gaeuman, USBR
Design Team	DJ Bandrowski, USBR

**Table 3.** Example format for integrating the results of assessments that have implications for changes in management actions. **Entries are hypothetical.**

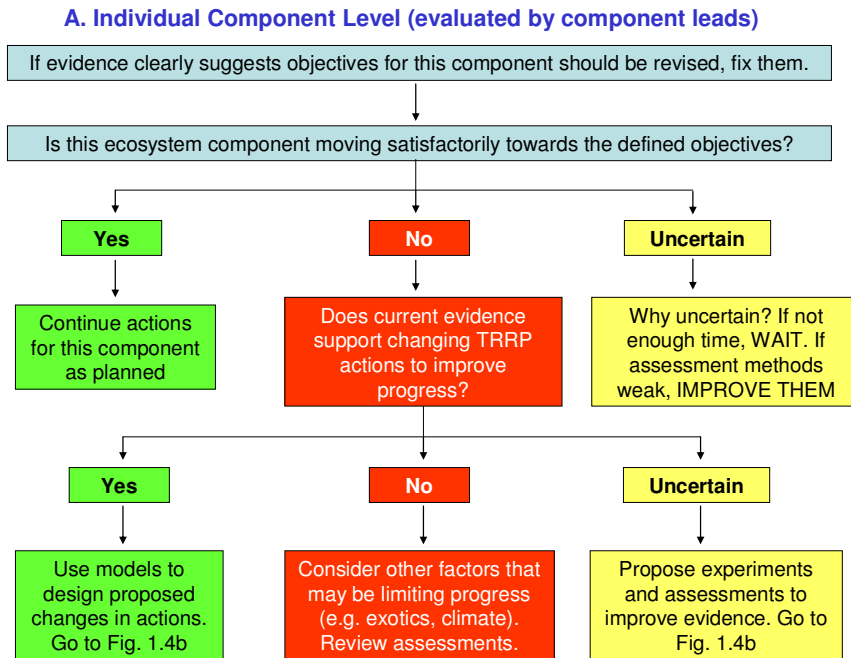
Topic / Questions	Ecosystem Component						
	Fish	Physical	Riparian	Wildlife	Temperature	Watershed	Design Team
Quantitative Objectives & Scale (site, reach, system)*							
Is ecosystem component moving well towards objectives?*	- habitat OK - smolt size below objectives	- sediment transport OK - channel complexity poor	- serious riparian encroachment in Reaches X, Y	- riparian and aquatic birds, turtles OK; frog reproduction poor	- meeting temperature targets	- fine sediment control meeting objectives	- rehab sites X, Y, Z are OK - rehab sites A, B not used by fry
Does evidence suggest changing flow, sediment, channel rehab or watershed actions? Is component responding to actions as expected?	Uncertain – need to assess food and temperature effects on growth	Yes – need more variability in flow to create bar complexity	Yes – need stronger flow to remove seedlings from gravel bars	Uncertain – frog reproduction may be unrelated to actions	No – are able to meet current temperature targets	No – current actions working well	Yes- change designs at sites A and B
What evidence?* How strong is evidence [1 (guess) to 5 (very strong empirical evidence)]?	See Section F 4	See Section P 3	See Section R 3	See Section W 3	See Section T 5	See Section W 3	See Section D 4
<b>Recommended changes in management actions (flow, sediment, channel rehab)</b>	n.a.	Do <i>build and carve</i> flow	Need higher velocities in reaches X and Y	n.a.	n.a.	n.a.	Add more LWD cover
Expected responses to these changes	n.a.	More channel complexity	Less seedling establishment	n.a.	n.a.	n.a.	Better fry utilization
Are proposed actions consistent with overall TRRP strategy?	n.a.	Yes – but change ROD flows	Yes – but change ROD flows	n.a.	n.a.	n.a.	Yes
Are proposed actions consistent with grand experimental design (i.e. won't confound long term evaluations)?	n.a.	Yes, but fewer replicates of ROD wet water yr flows	Yes, but fewer replicates of ROD wet water yr flows	n.a.	n.a.	n.a.	Yes
Do proposed actions support other components' objectives (i.e. don't undermine them)?	n.a.	Need to check if frogs may be affected	Need to check if frogs may be affected	n.a.	n.a.	n.a.	Yes
Do proposed actions address factors most limiting fish production in short term (1-2 yrs)?	n.a.	No – more important over longer term	No – more important over longer term	n.a.	n.a.	n.a.	Yes
Do proposed actions address factors most limiting fish production in long term (10 yrs)?	n.a.	Yes	Yes	n.a.	n.a.	n.a.	Yes, if features are maintained with LWD supply

\* Reference appendices with short summaries (1-5 pages) containing necessary backup.

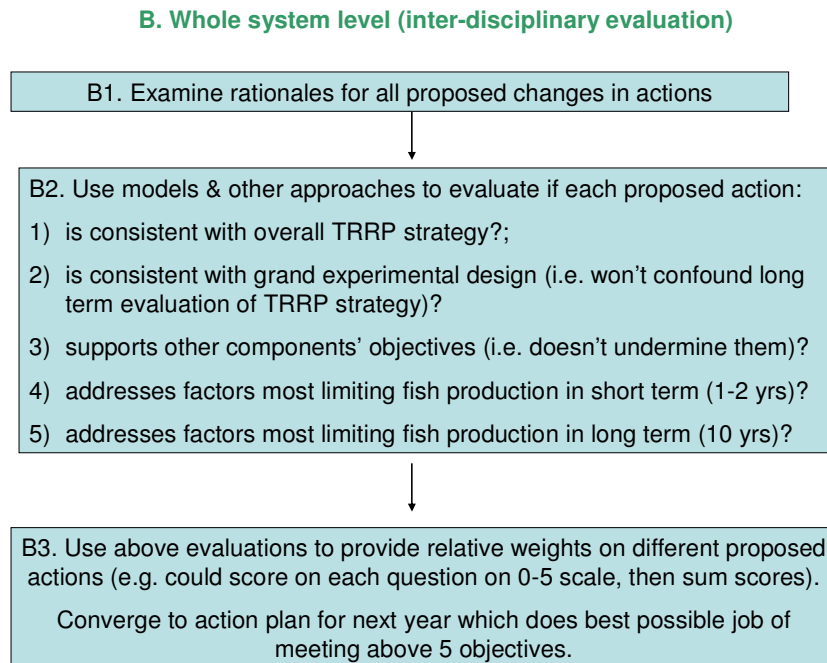


**Figure 1**

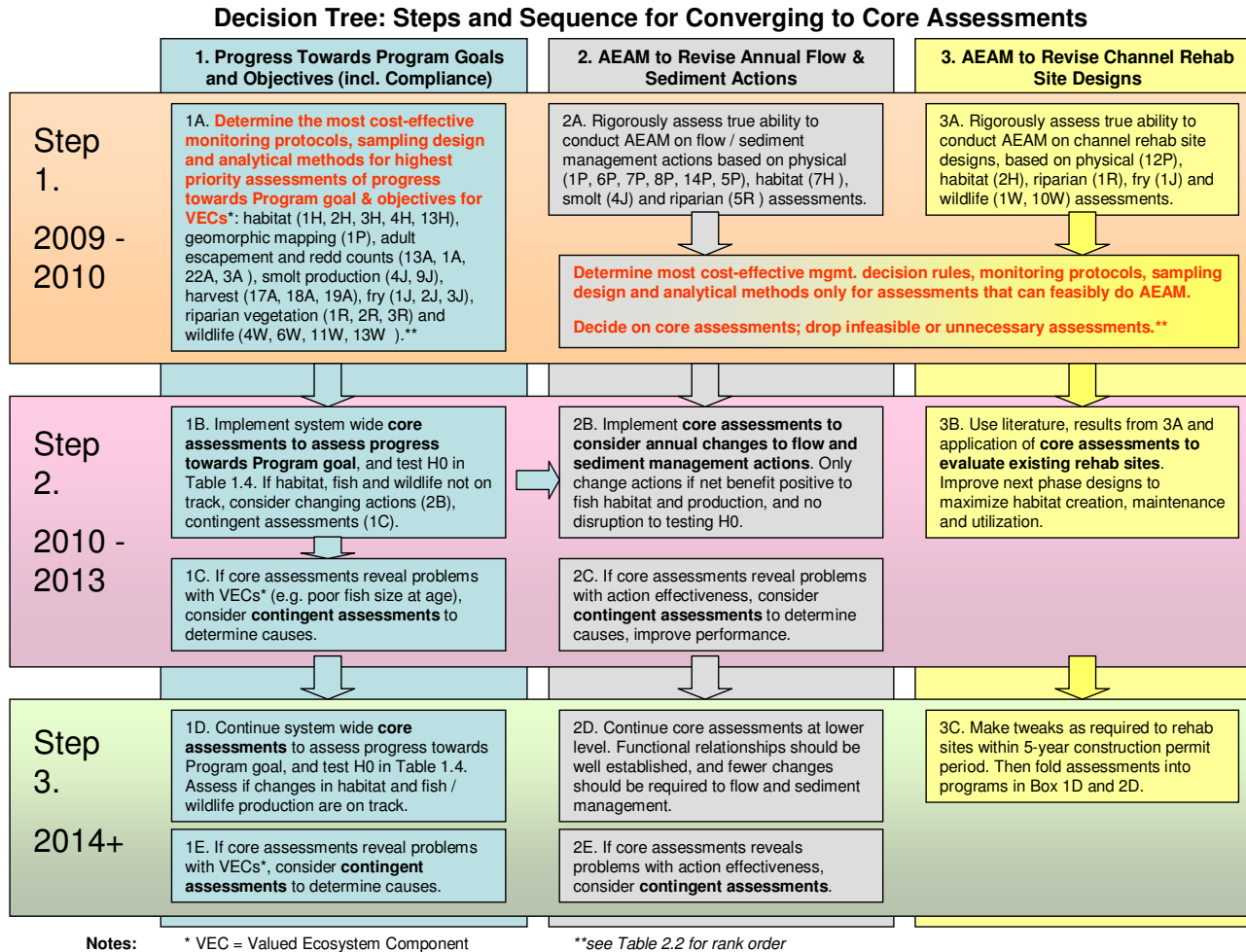
The process of Adaptive Environmental Assessment and Management (AEAM). Source: Figure 1.2 in IAP V1.0.



**Figure 2.** Annual AEAM decisions: assessments for individual components. Source: IAP V1.0, Figure 1.4a



**Figure 3.** Annual AEAM decisions: whole system assessments across all components, considering tradeoffs. Source: IAP V1.0, Figure 1.4b



**Figure 4.** Decision tree for continuing the prioritization of assessments in future years of the Program. Each of the boxes shown in this figure is described in more detail in Table 2.3. Columns 1, 2 and 3 are assumed to be of equal importance in the short term (next 5 years). In the longer term however, column 1 will become more important, since: a) it contains the fundamental metrics of Program performance; b) rehab sites will be completed (column 3); and c) appropriate flow and sediment actions and functional relationships for different water years should be well established (column 2). Most assessments tend to fall into either columns 1, 2 or 3, but there are a few (e.g., habitat assessments, smolt outmigration) which serve more than one function. There are significant budget tradeoffs which need to be resolved (e.g., doing only a few core assessments very reliably vs. doing many assessments with less certain results; maintaining consistent management actions from year to year and focusing on column 1 assessments (progress towards Program Goals) vs. more year to year adjustment in management actions based on column 2 adaptive management assessments). Source: Figure 2.4 in IAP V1.0