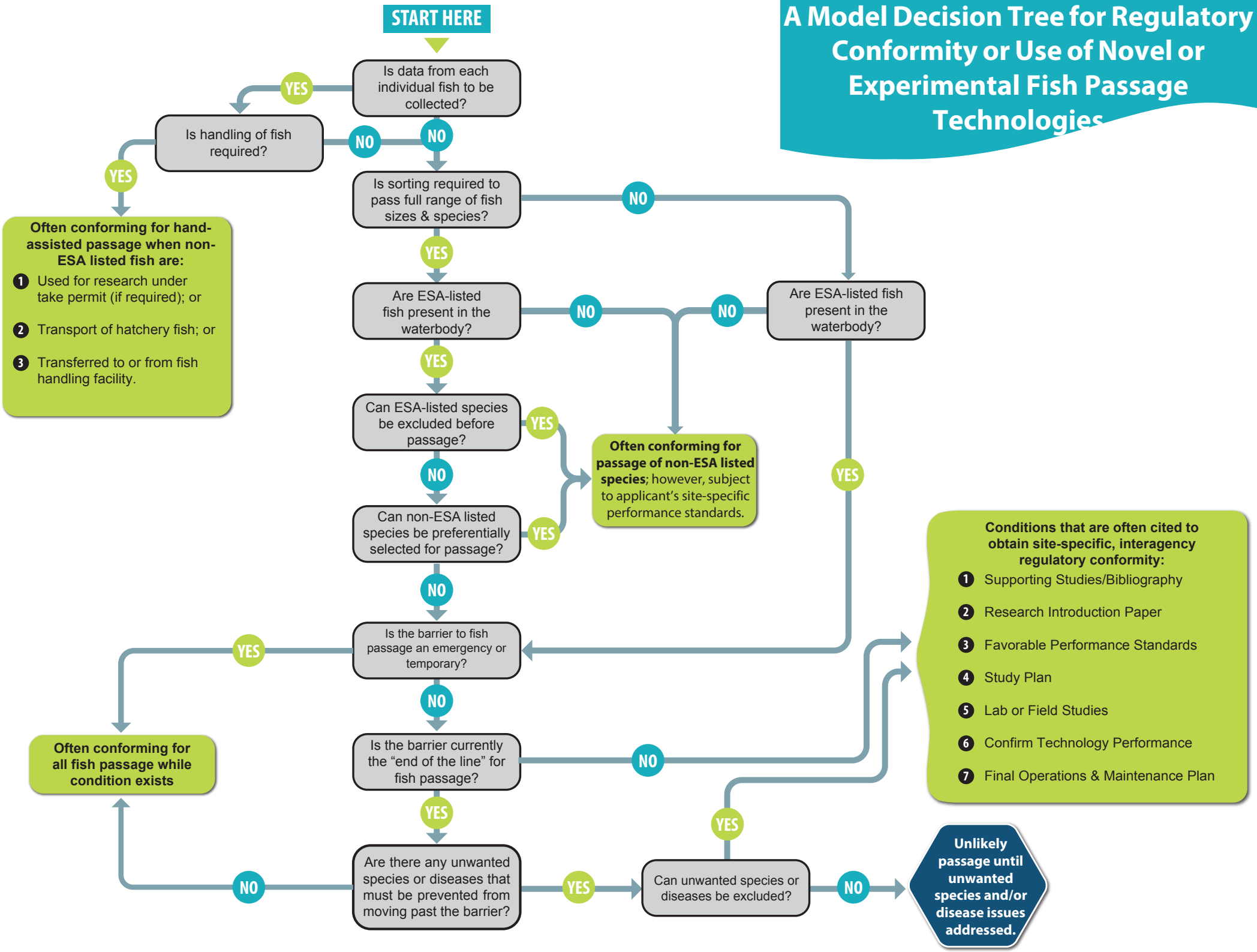
A Model Decision Tree for Regulatory Conformity or Use of Novel or Experimental Fish Passage Technologies



Supporting Documentation for the "Model Decision Tree for Regulatory Conformity or Use of Novel or Experimental Fish Passage Technologies"

Background

The purpose of this Decision Tree is to assist those planning to use or develop new fish passage technologies in understanding the regulatory path so that they can appropriately estimate costs of deploying or developing technologies that conform to fish passage regulatory guidelines. With conventional fish passage structures (e.g., fish ladders) being relatively expensive to build, innovation of equally (or more) effective and less-expensive ways to provide or improve fish passage at new and existing projects. Currently the process for accepting new fish passage technologies varies among agencies and the requirements are inconsistent. Ideally, a single, parsimonious Decision Tree applicable to all agencies' fish passage requirements and site-specific conditions could be used to guide interested parties; however, this is currently not feasible due to ambiguity in the both the requirements that fish passage technologies must meet, as well as subjective uncertainties of the review process. Thus, this Tree is intended as a multi-jurisdictional model to reduce ambiguity and vagueness, and ultimately help to improve fish passage through technological innovation.

Explanations of *Questions* and Decision Points within Tree

Below are explanations and contextual examples corresponding to the labeled components within the Decision Tree. To help with contextual understanding of the Tree, some examples relate to use of the Whooshh Passage Portal (WPP) which is one of several technologies with the potential to improve fish passage and the environmental sustainability of hydropower in line with the Hydropower Vision Roadmap. Additional documentation specific to the WPP can be obtained from Whooshh Innovations.

Does data from individual fish need to be collected?

Is information or data required for an individual fish such that handling or isolating an individual is required? Examples include handling a fish to collect a scale, implanting a transmitter, clipping or tagging a fish.

Is handling of fish required?

Does a fish need to be physically handled to collect data, implant a transmitter, or attach an external tag, etc.?

Decision Point: Often conforming for hand-assisted passage when fish are: 1. Used for research under take permit (if required), or 2. Transport of hatchery fish, or 3. Transferred to or from a fish handling facility.

Fish that require being handled can be sorted manually by the handler and inserted directly into a novel fish passage device, such as a properly-sized . Examples of the need for a novel passage device may include research to evaluate said passage device; transferring fish to a transport or hatchery truck; transferring fish directly to a hatchery; transferring fish to a fish handling facility; or transferring fish back to the river from a source above. For some research applications, a "take" permit, which is an agency-approved document allowing the possibility (within limits) of fish being injured or killed as a byproduct of handling or sampling, may be required to pass fish through a novel fish passage device.

Is sorting required to pass full range of fish sizes & species?

Sorting may be needed to direct certain sizes or species of fish to specific passage devices or routes, or to exclude (e.g., ESA) or include (e.g., non-ESA) specific species from passage, depending on the configuration of the novel fish passage device. A novel fish passage device may not need to sort because it may have inherent characteristics that bias the entry of certain fish species with swimming or behavioral characteristics that are not conducive to entering the novel device. For example, fish ladders (although not-novel) bias against entry of some species due to swimming performance limits. Using the WPP as an example, an approximation of maximum body circumference is needed to determine an appropriate-sized Whooshh Migrator tube for passage. If all fish in the waterbody are acceptable to be directed into a WPP, and all are within an acceptable size range to be passed through a single tube, then sorting is not needed. Multiple Whooshh Migrator tubes are used if the size range of the target fish population exceeds that which can be passed through a single tube.

Are ESA-listed fish present in the waterbody?

Simply, are any ESA-listed species in the waterbody that could enter the novel fish passage device when it is being operated?

Decision Point: Often conforming for passage of non-ESA listed species; however, subject to applicant's site-specific performance standards.

If there are no ESA-listed fish present in a waterbody, a novel fish passage device may be more likely to meet regulatory conformity at a project site. Additionally, all conventional fishways (e.g., fish ladders, trap-and-haul) have performance standards (e.g., passage efficiency, passage time, volitional entry throughout the fish migration period) they are required to meet during operation. Performance standards would similarly be required for novel fish passage devices equal to or better than conventional fishways.

Can ESA-listed species be excluded before passage?

Excluding ESA-listed species so that none are passed through a novel fish passage system reduces regulatory scrutiny. Can these fish be excluded by pre-sorting using conventional means including but not limited to using a specific attraction flow, water depth, timing or seasonality of fish migration period, or the location of entry to a fish passage system, etc.?

Can non-ESA listed species be preferentially selected for passage?

Similarly to exclusion of ESA-listed species, can non-ESA listed species be preferentially selected to enter the novel passage device to avoid impacts to ESA-listed species? Examples may include sorting of non-ESA listed species using traditional techniques such as exclusion bars, weirs, a denil fishway, or a fish trap, etc.?

Is the barrier to fish passage temporary?

Periodically, existing fish passage devices may be unusable due to adverse environmental conditions leading to inefficacy of the passage system, or failure of the passage system itself. Examples include conditions present during an emergency (e.g., rock slide, dam structural failure), dam modifications or construction, maintenance, atypical flow conditions, feasibility or pilot study, legal delay, or while a project is awaiting permanent passage approval.

Is the barrier currently the "end of the line" for fish passage?

Human-created barriers, without a fish passage mechanism, exist that block fish from historically accessible areas that may be important for fish recovery or maintaining access to previously used habitats for spawning, rearing, or thermal refuge habitat. In some cases, fish species have been extirpated upstream or downstream of the barrier and/or the barrier may block both upstream and downstream fish passage. Re-connecting the migration corridor with a novel fish passage system that is safe, less expensive, or easier and faster to deploy than conventional fish passage is useful and may be required to meet fish conservation and restoration objectives of resource managers.

Decision Point: Often conforming for all fish passage while condition exists.

A novel fish passage device would likely receive less scrutiny by regulatory agencies, and may be deemed necessary, if it is used for emergency conditions to provide temporary fish passage, or to provide passage at facilities currently without a method for fish passage. However, it is likely that at least some in-situ testing of the device would need to be performed and approved by the action agencies, beforehand, that demonstrates that the technology is likely to be safe, timely, and effective. Notably, this decision may differ by regional agencies in the United States.

Are there any unwanted species or diseases that must be prevented from moving past the barrier?

In some cases, barriers are used for aquatic management purposes to preclude or slow the migratory spread of unwanted or invasive fish (or non-fish) species. If no unwanted or invasive species are present and the barrier does not have a passage mechanism, regulatory concerns over use of a novel fish passage device are reduced. To note, exclusion of unwanted or invasive species may be similarly important at other junctions of the Decision Tree. Desirable fish species with undesirable traits (e.g., diseases) similarly apply.

Can unwanted species or diseases be excluded?

If unwanted or invasive species are a concern for aquatic resource managers, and they cannot be excluded from passing through or spread due to a novel fish passage device, fish passage will more than likely not be allowed until the invasive species issues are addressed.

Decision Point: No passage until unwanted species and/or disease issue addressed.

See explanation above for "Can unwanted species or diseases be excluded?"

Decision Point: Steps required to obtain site-specific, interagency regulatory conformity:

1. Create Bibliography. Reference earlier research that supports the need to improve conventional technology or design. Other aspects of the Bibliography to support the novel technology application may:
    a. Contain research articles on comparable or related passage technologies;
    b. Demonstrate a level of biologic and engineering understanding particular to the proposed technology and its intended application;
    c. Provide direction, intent, and context of design and studies;
    d. Help support the hypothesis that the novel technology is beneficial; and
    e. Identify limiting factors of the novel design and applications.
2. Submit Research Introduction Paper. Present supporting research on the proposed technology or design using surrogate fish. Elements of the Paper should:
    a. Introduce the novel technology;
    b. Identify existing comparable technologies, or lack thereof;
    c. Detail specific applications under consideration;
    d. Contain schematics of conceptual and anticipated prototype technology;
    e. Provide information on required, or potential, additional technology requirements;
    f. Identify issues that arose or were identified as potential problems in earlier research;

g. Identify areas of research focus;
h. Summarize conceptual/anticipated limiting factors in design;
i. Contain past biological or engineering studies or evaluations performed on the technology; and
j. Contain Bibliography.

3. Establish Performance Standards. Performance standards of the novel technology are identified and justified, in writing, by the regulatory agency (or agencies) that have jurisdiction over the barrier and specific species to be passed. The required standard of performance should not be more than that of a conventional passage system. This process may elucidate additional research studies to address critical uncertainties in technology performance.
4. Document Study Plan, if Needed. If needed to address critical uncertainties in the novel technology, a written study plan is agreed to by the regulatory agencies and applicant (i.e., fish-barrier owner interested in using technology, or technology developer). The plan would identify the best available information from related studies.
5. Perform Lab or Field Studies. It is recommended that the study be performed by an independent, third-party research entity to reduce bias of either the applicant or regulatory agency conducting the study, and to reduce the potential of future scrutiny over research results.
6. Confirm Technology Performance. The study results, as well as supporting information contained in Bibliography or previous studies, are compared against the pre-established performance standards to determine if the technology or design more likely than not will meet or exceed the performance of conventional passage technology for the relevant species.
7. Finalize Operations & Maintenance Plan. The applicant assembles, and regulatory agency approves, a site-specific Operations and Maintenance Plan that includes an emergency backup plan if the novel fish passage systems fails, and contingency plans for other potential occurrences (e.g., non-target species entry, troubleshooting guide, etc.). Relatedly, if the study results demonstrate performance of the novel device 'as good as but not better than' the conventional passage technology, a 'commitment plan' —to be included within the Operations and Maintenance Plan—is advised to mitigate third-party scrutiny. Said commitment plan, for example, might be an agreement to monitor performance and make reports available annually for a minimum of _X_ years (to be agreed with agency), and to apply adaptive management practices to improve performance, if required, so that the median of the data collected since installation over the last 5 years in the monitoring period meets or exceeds the performance standards for the barrier.