5.0 CONCEPTUAL MODELS OF RESTORATION PROCESSES

In this chapter, conceptual models of restoration projects are presented based on concepts of how the ecosystem is believed to function, how it has been altered or degraded, and how various actions might improve conditions. The conceptual models presented in Chapter 4 depicting the lifecycles of the species of priority management concern, and the stressors affecting these species, suggest the direction of potential restoration actions. Restoration processes which specifically target these stressors are identified for potential management interventions.

Ultimately, conceptual models for project implementation, complete with hypotheses, monitoring plans, experimental design and adaptive management plans, will be developed for selected projects. Until projects are proposed and defined in detail, the implementation models cannot be defined on a project-specific basis. Consequently, conceptual models have been developed for categories of potential restoration actions, including those associated with:

- water temperature
- floodplain habitat
- instream habitat
- flow
- shaded riverine aquatic habitat
- coarse sediment supply

The example conceptual models of restoration processes are presented on **Figure 5-1** through **Figure 5-6**. Stressors that were identified in Chapter 4, are set forth and a restoration process is established based on this stressor. An example restoration project is then described which would work towards the identified restoration processes. The conceptual model then shows how project success would be measured by the monitoring plan. Both the project objective (e.g., did the project increase the diversity and abundance of SRA habitat) and the desired outcome (e.g., did the increase in quality of SRA habitat facilitate population increases for the targeted fish species) would be measured. Features of the experimental plan are provided. Testable hypotheses and null hypotheses are identified for each example project. Adaptive management is incorporated into project implementation.

Ecological and biological monitoring will be an essential component of project implementation. Features of the experimental design are identified on the example conceptual models. The variables that need to be measured in order to document the status and trends of fish populations, and more generalized system indicators that can provide the basis for assessing progress in meeting the desired outcomes presented in Chapter 2, also will be described in the experimental design.

Hypotheses are formulated for each component of the conceptual models. These hypotheses attempt to define the linkages/relationships between potential interventions and the ecosystem response (i.e., flow and water temperature or flow and channel habitat). The hypotheses underlying the projects will be tested through comprehensive monitoring.

Conceptual models of restoration processes for the river-wide ecological and biological monitoring and evaluation plan (Monitoring Plan, described in Chapter 7) will be developed as each element of the Monitoring Plan is defined.

Figure 5-1. Conceptual model and hypotheses for example temperature project

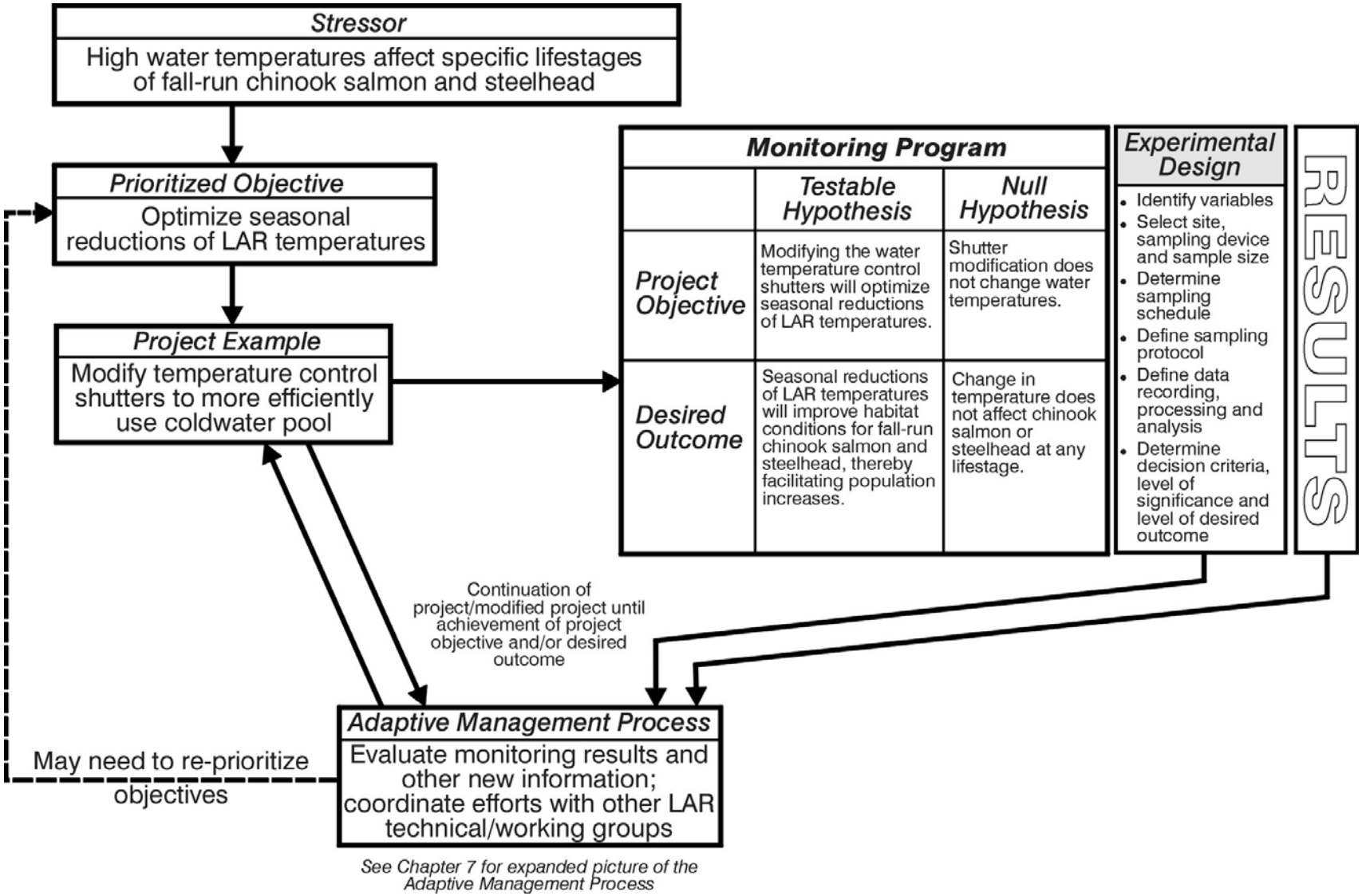


Figure 5-2. Conceptual model and hypotheses for example flow project

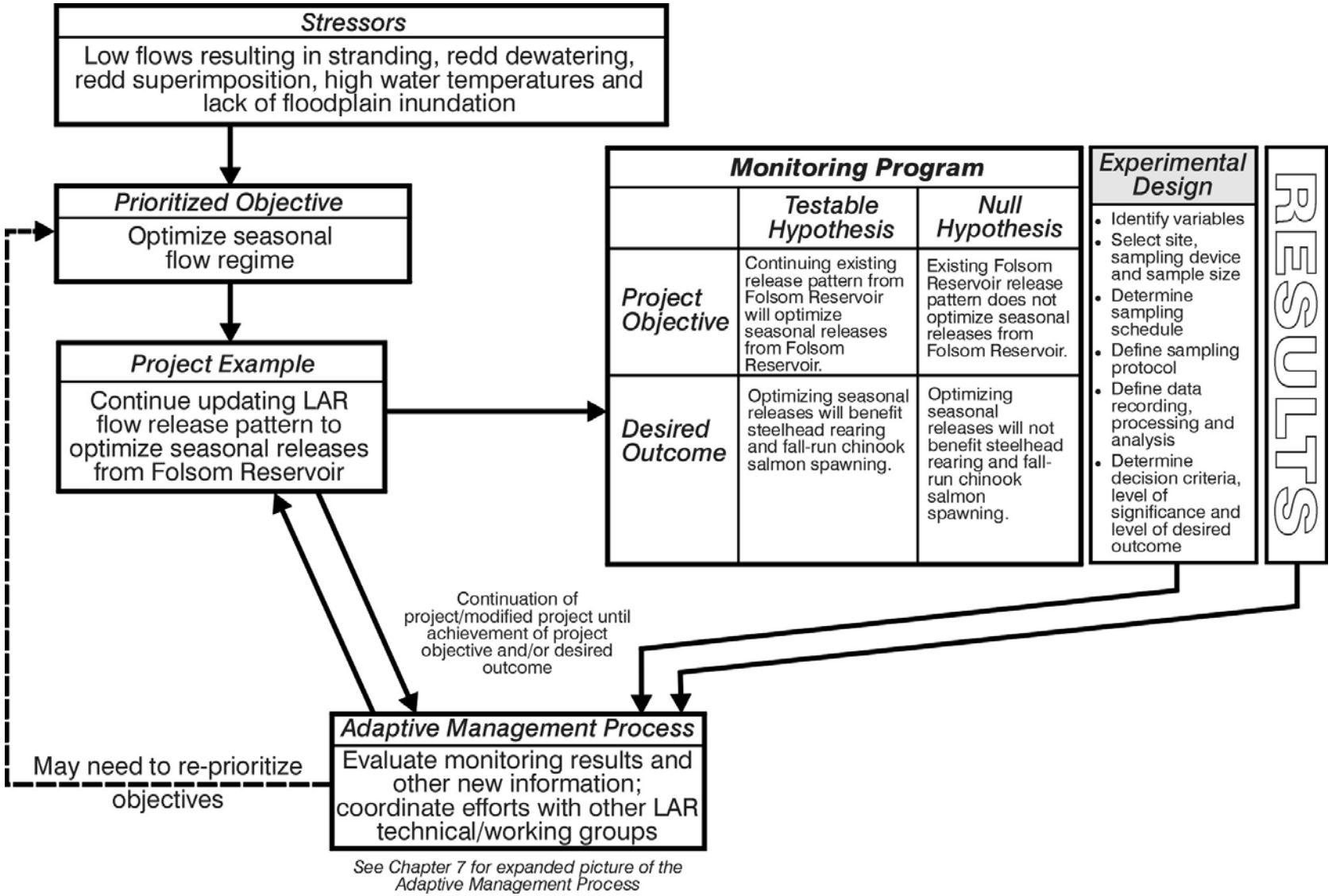


Figure 5-3. Conceptual model and hypotheses for floodplain habitat project

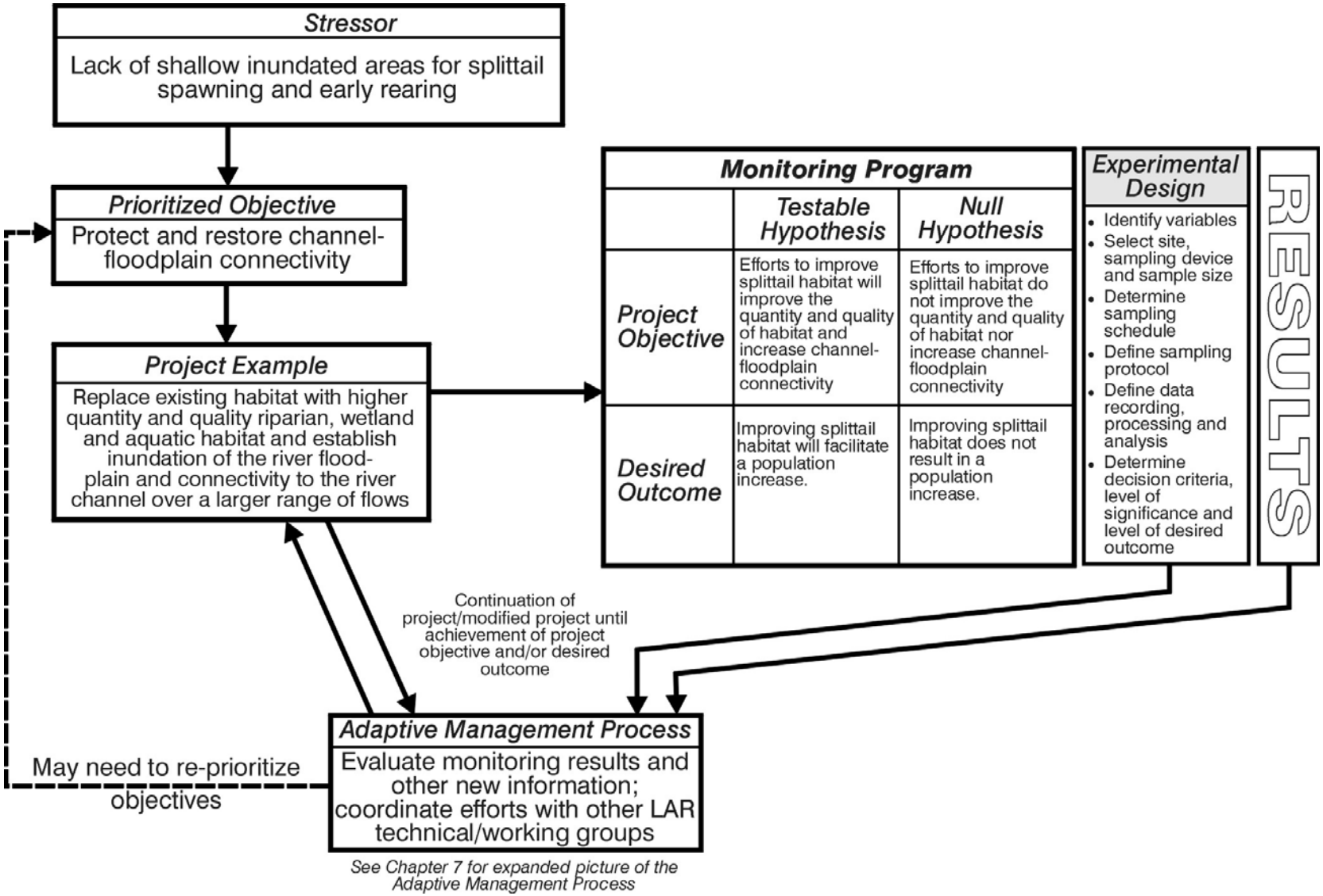


Figure 5-4. Conceptual model and hypotheses for shaded riverine aquatic habitat project

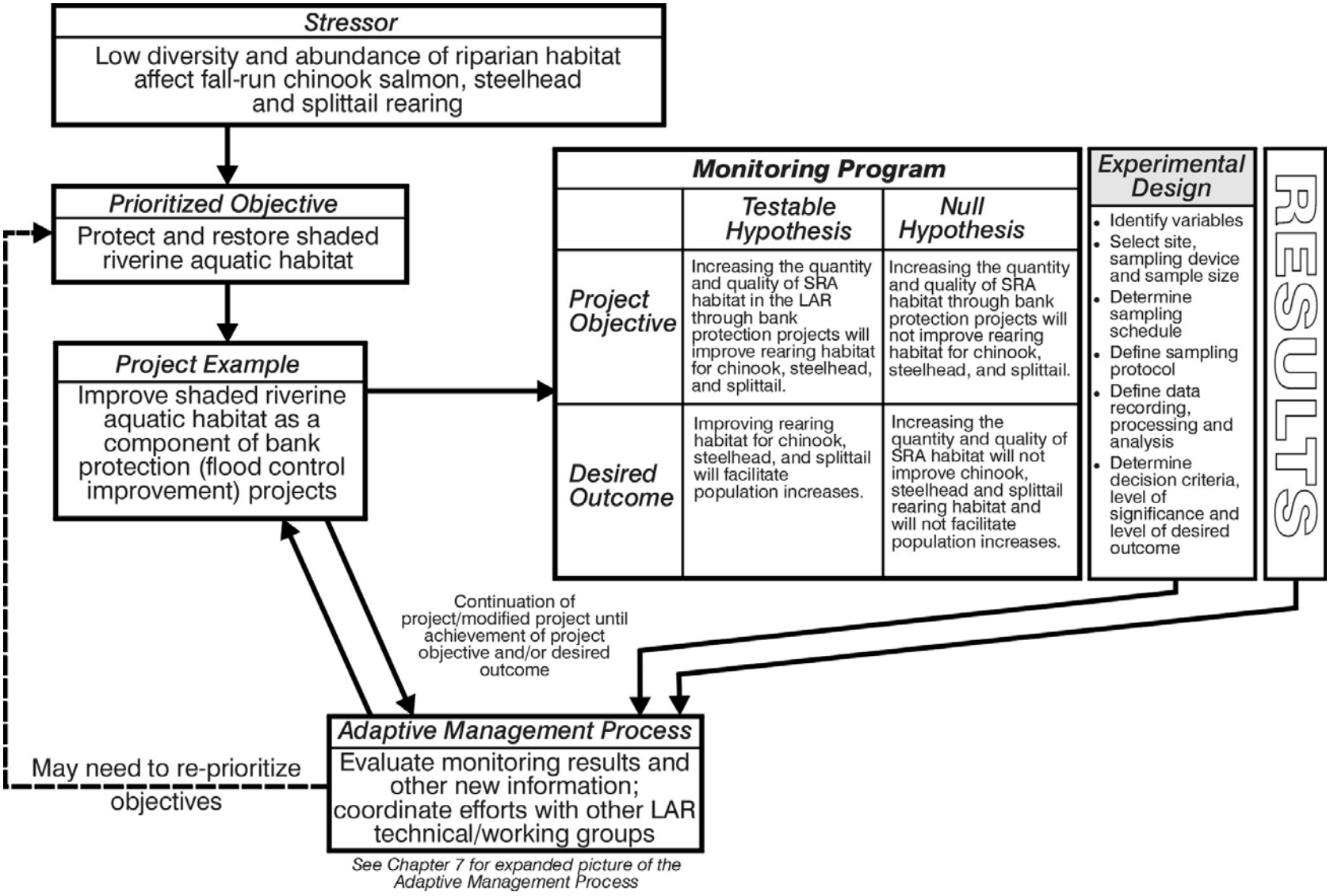


Figure 5-5. Conceptual model and hypotheses for instream habitat project

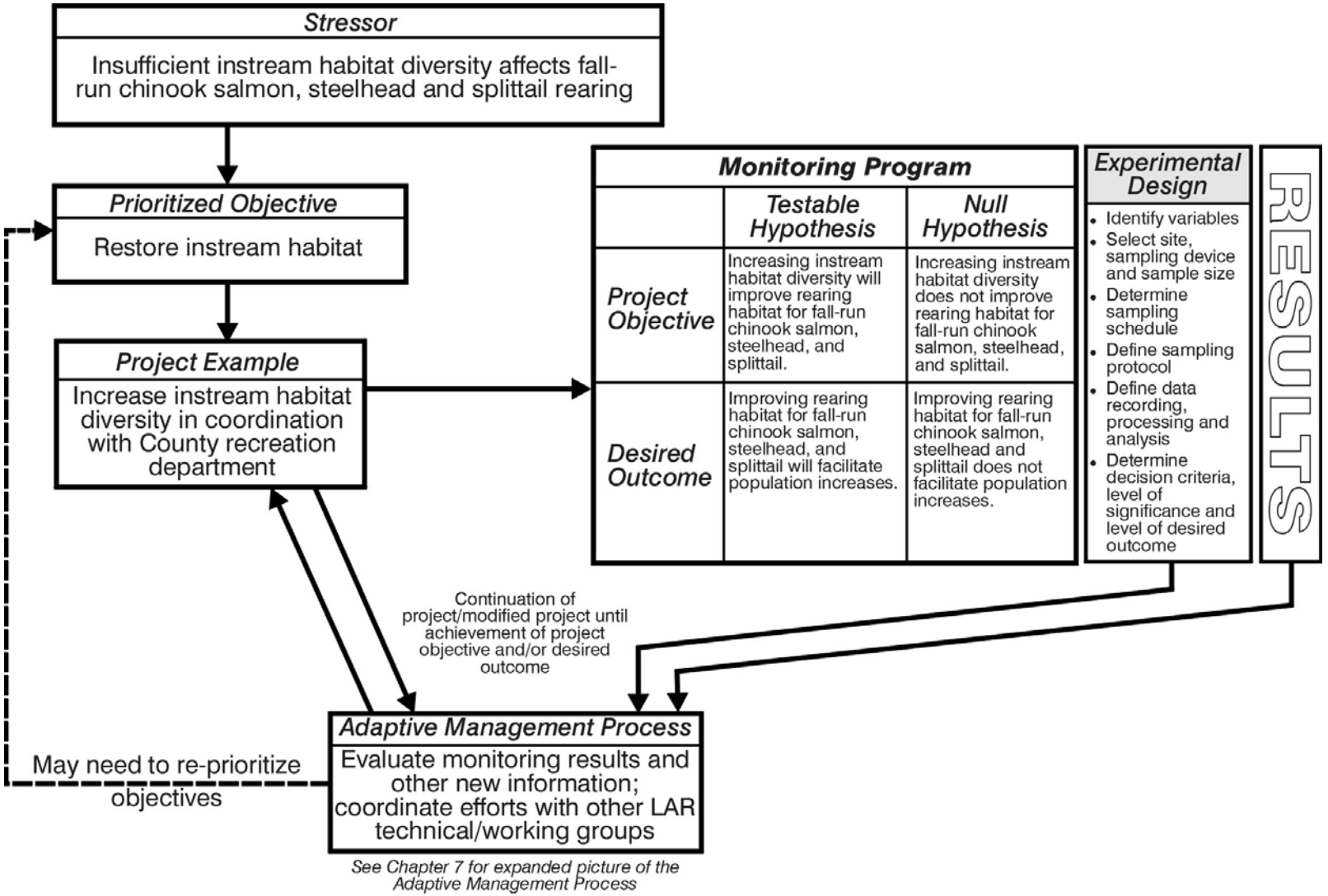
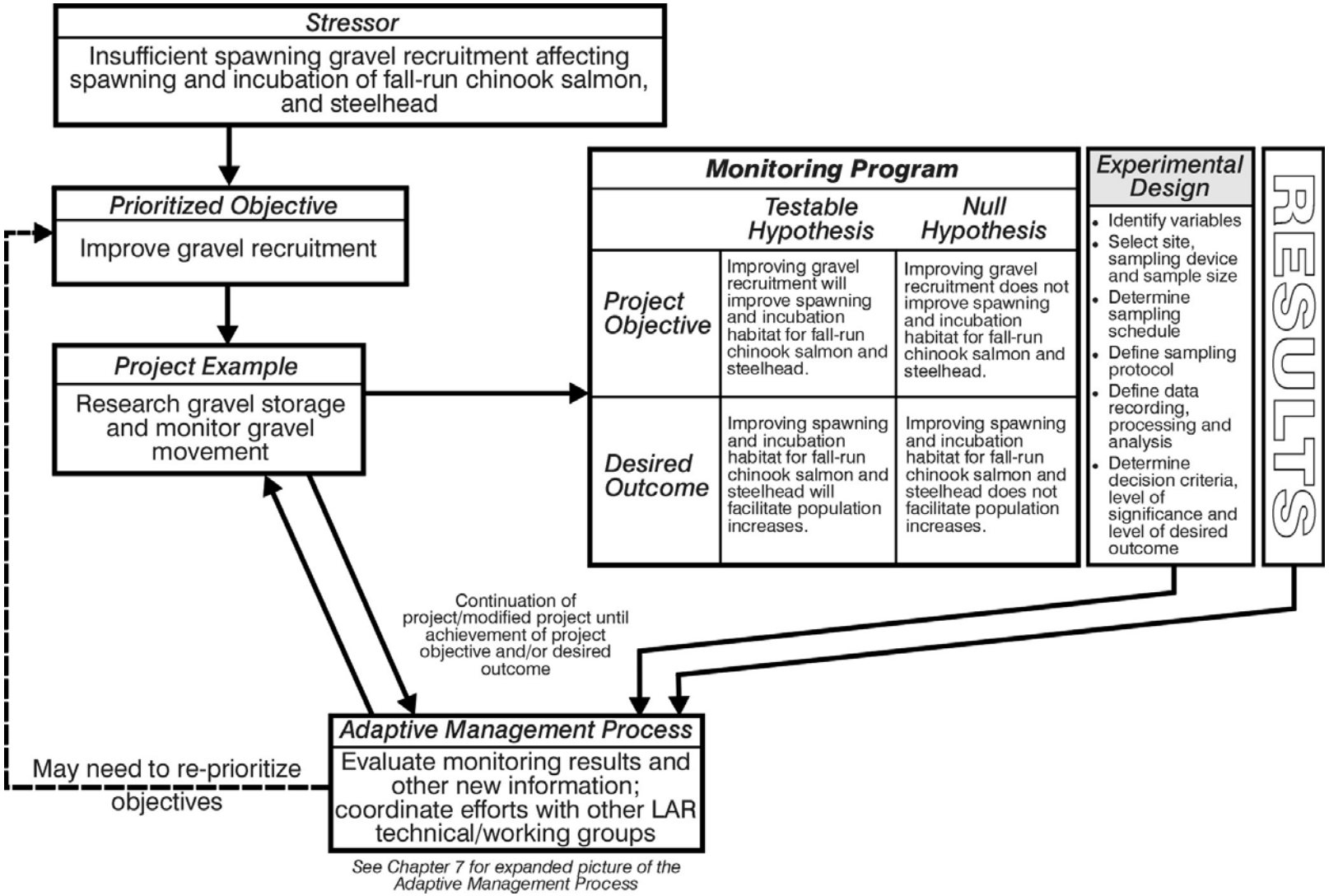


Figure 5-6. Conceptual model and hypotheses for example coarse sediment supply project



Indicators are selected to provide measurable evaluations of important ecological processes, habitats, and species whose status individually and cumulatively provide an assessment of ecological health. Indicators are features or attributes of the ecosystem that are expected to change over time in response to project implementation.

In these models, adaptive management is established as a critical component of each restoration project. Adaptive management relies upon identifying indicators of ecosystem health, comprehensive monitoring of indicators to measure changes over time, testing alternative ways of meeting objectives, and adapting future management actions according to what is learned. The conceptual model depicts how adaptive management would allow the project to evolve, as necessary, based on the monitoring results or, possibly, information external to the project (e.g., recent innovations in bank protection techniques). This new information feeds back into the adaptive management process and supports proposed actions, suggests revisions to actions or restoration processes, and identifies needs for further monitoring and evaluation.