

restored to full tidal flushing and, therefore, full ecological function. Table 6-1 shows the estimated habitat unit benefits for each site.

Fish Passage

Site Screening

DMF conducted a survey in 2001 and 2002 to collect information on the present state of fish passage in Massachusetts coastal streams and rivers and help guide future restoration efforts. Statewide, the survey covered 215 coastal streams; 493 lakes, ponds, or reservoirs; and 380 obstructions to migratory fish passage. It also included discussions with regional biologists, harbor masters, and local herring and shellfish wardens. The survey identified 93 existing fish passage structures and approximately 43 active river herring runs in Barnstable County, and it demonstrated that Massachusetts has a large investment in fish passage along the coastal rivers and streams. DMF recommended numerous projects that should be undertaken over the next several years. These projects included the maintenance, repair, and re-design of failing or inefficient existing fishways and the construction of new fishways to provide access to additional spawning grounds (DMF 2004).

The 93 fish passage sites were ranked by DMF using 12 criteria that assessed relative ecological, economic, and social importance as well as the practicality of providing or improving fish passage on Cape Cod. A description of the criteria used to rank the sites and an explanation of the values given for each criterion are shown in Table 6-2. Positive values represent benefits to the overall stream system, and negative values represent impairments. The ranges of values as well as the values themselves were developed by the DMF anadromous fish biologists. The values given for all the criteria were summed to determine a total score for each project site. Sites that ranked high but were given the value “0” for the need criterion were eliminated. The highest ranking 24 remaining sites were selected as priority sites for fish passage restoration. Table B-2 in Appendix B summarizes the evaluation DMF used to rank the original 93 fish passage sites, with the top 24 sites identified by shading. DMF is using the evaluation procedure it developed for this Project to evaluate the remaining statewide fish passage obstructions identified by DMF.

Figure 6-2 shows the location of the 24 fish passage projects, and Table 6-3 describes the conceptual treatment system proposed for each site.

Conceptual Design and Cost Development

NRCS visited each fish passage site to collect information on site conditions and to estimate construction cost for each project. NRCS surveyed the river/stream systems from mouth to headwaters and created a site specific label for each site. At each site, general physical characteristics of the water bodies (spawning areas) and data of specific importance to anadromous fish were noted. All obstructions and fishway characteristics were recorded on a field data sheet and photographed.

Site-specific details were documented for the first impassable obstruction and its impoundment area to assist in the evaluation of future alterations or fish passage possibilities. On some streams, information was gathered on additional impassable obstructions as well. River obstruction type, estimated total and future potential anadromous fish populations, and observed construction issues were recorded. When a fishway was present, the type of design, and needed repairs were recorded along with a brief description of the state of fish passage and the potential for further improvements.

Table 6-2
Criteria used to determine priority fish passage obstruction remediation projects

Criterion	Description of criterion	Description of value	Value
Obstruction number	Stream obstructions (dams, culverts), even if provided with fish passage facilities, can prevent river herring from reaching spawning grounds. The number of obstructions on a stream presents a negative factor in determining potential for development in a system.	Constant	-3 per obstruction
Acreage	Potential population size is loosely related to the amount of habitat available in a system. The total acreage available is important in determining the systems priority for fishway work.	1-5 acres	0
		6-20 acres	3
		21-50 acres	6
		51-100 acres	9
		100 + acres	12
Existing populations ^{1/}	Most river systems on Cape Cod that have significant habitat currently have populations of river herring. DMF emphasizes that future work should be on preserving existing populations rather than creating new ones. This criterion is important in developing priorities.	Low Population	0
		High Population	15
Stream flow ^{1/}	Some streams within Cape Cod have chronically low stream flows during fall juvenile migration periods, resulting in occasional loss or partial loss of a year class. The priority for development was reduced for these streams depending on the severity of the problem.	No Stream Flow	-10
		Good Stream Flow	0
Public access ^{1/}	Some streams are more accessible to the public for recreation than others. Accessible systems were increased in ratings.	Not Accessible	0
		Accessible	5
Water quality issues ^{1/}	If water quality was considered sufficiently poor to affect productivity of river herring populations, negative values were assigned to the system.	Poor	-5
		Good	0
Conflicting water usage ^{1/}	Demand on water for agricultural purposes (cranberry bogs) and occasionally public water supplies can have a deleterious effect on river herring populations. Where this situation exists, negative values were given.	Agricultural Demand	-5
		No Agricultural Demand	0

Table 6-2 (cont.)
Criteria used to determine priority fish passage obstruction remediation projects

Criterion	Description of criterion	Description of value	Value
Construction difficulty ^{1/}	In some situations, the construction of passage facilities is technically difficult or overly expensive. The rating was reduced accordingly.	Difficult	-5
		Not Difficult	0
Environmental benefits ^{1/}	The provision of fish passage at some locations would provide benefits to other anadromous species, such as American shad and smelt. Additional value was given to these systems.	No Benefit	0
		Benefit	3
Community support ^{1/}	If a town, city, environmental organization, community group, etc. has expressed support for the project, extra value was given to the system.	No Support	0
		Support	3
Need	Some fish passage structures are currently adequate while others have varying needs of replacement or repair. Where passage was obstructed, restricted, or deteriorating, higher values were given.	None (passage unimpeded)	0
		Preventive (deteriorating)	5
		Necessary (restricted passage)	10
		Critical (obstructed passage)	15

^{1/}For this criterion, a range of values was given in evaluating the site; only the low and high values are depicted on the table.