The Strategic Plan

For The Restoration Of

Shad and Alewives

To The Kennebec River Above Augusta

Prepared By:

Thomas S. Squiers, Jr.
Malcolm Smith
Department of Marine Resources
May, 1985
Revised August, 1986

The Strategic Plan

For The Restoration Of

Shad and Alewives

To The Kennebec River Above Augusta

The goal of the Kennebec River Anadromous Fish Restoration Plan is:

> "To restore the alewife and shad resources to their historical range in the Kennebec River System."

The following objectives addressing this goal have been developed. They are:

I. To achieve an annual production of 6.0 million alewives above Augusta.

II. To achieve an annual production of 725,000 shad above Augusta.

These objectives are based on the projected potential of the Kennebec River from the Augusta dam to the lower dam in Madison including the Sebasticook River, Sandy River, Seven Mile Stream, and Wesserunsett Stream. A more detailed analysis by river segment or tributary can be found in Tables 1 and 2.

The strategy developed to meet these objectives involve restoration planned in two phases.
They are:

1. Phase I- (January 1, 1986 through December 31, 1998)

   Require upstream and downstream fish passage facilities at the Edwards Dam (FERC #2389). The upstream fish passage facilities need to be capable of allowing the collection/sorting/transportation of fish in addition to allowing passage. Restoration of alewives will be initiated to selected lakes and ponds in the Seven Mile Stream, Sebasticook River, and Wesserunsett Stream drainages. During Phase I, restoration of alewives will be accomplished by trap and truck. In the event that a fish passage/sorting/transportation facility is not completed by May, 1986 at the Edwards Dam, alewives will be transported from out-of-basin.

   Restoration of shad will be initiated to the river segment between the Edwards Dam and the Lockwood Dam. This will be accomplished by requesting a passage facility at the Edwards Dam which will allow the sorting and passage of shad. In the event that a fish passage and sorting facility is not functional by May, 1986, an effort will be made to capture shad in the lower Kennebec River estuary and transport them to the river segment above the Edwards Dam. In addition, shad will be transported from out-of-basin, if available.

   Trucking of shad from the Edwards Dam to upriver segments will be initiated five years prior to passage being provided to that segment.

2. Phase II

Starting in 1999, fish passage will be required at all mainstem dams on the Kennebec River up to the Abenaki Dam (FERC #2364) in Madison, on the mainstem dams on the Sebasticook River up to the confluence of the east and west branches, and at the Madison Electric Works Dam on the Sandy River. Passage will be required at one year intervals proceeding upstream with the exceptions that passage will be required concurrently at the Lockwood Dam (FERC #2574), Winslow Dam (FERC #2322), Fort Halifax Dam (FERC #2552), and the proposed Benton Falls Project (FERC #5073). The required fish passage in these dams is mainly for the benefit of American shad and Atlantic salmon.

The feasibility of truck stocking alewives as a substitute for fish passage facilities will be evaluated during Phase I. It may be decided to continue the truck stocking of alewives during Phase II.

The introduction of alewives into the following lakes during Phase II is dependent on the outcome of a joint study by the Maine Department of Marine Resources and the Maine Department of Inland Fisheries and Wildlife: Great Moose Lake, Spectacle Pond, China Lake, Big Indian Pond, Little Indian Pond, Wassokeag Lake, Clearwater Pond, and Norcross Pond. This study is for the purpose of assessing the interactions of alewives with smelts and salmonids. Based upon the results of these studies, a cooperative decision will be made regarding future alewife introductions into the above listed waters.

Table 1: Potential Alewife Production in the Kennebec River above Augusta.

Ponded Area	Surface Acreage	Total Fish[1] Production (235/Acre)	Allowable[2] Harvest (200/Acre)	Spawning[3] Escapement (35/Acre)
Seven Mile Stream				
Webber Pond	1252	294,220	250,400	43,820
Spectacle Pond	139	32,665	27,800	4,865
Three Mile Pond	1077	253,095	215,400	37,695
Three Cornered Pond	195	45,825	39,000	6,825
TOTAL	2663	625,805	532,600	93,205
Sebasticook River				
Douglas Pond	525	123,375	105,000	18,375
China Lake	3922	921,670	784,400	137,270
Pattee Pond	712	167,320	142,400	24,920
Lovejoy Pond	324	76,140	64,800	11,340
Unity Pond	2528	594,080	505,600	88,480
Pleasant Lake	768	180,480	153,600	26,880
Great Moose Lake	3584	842,240	716,800	125,440
Big Indian Pond	990	232,650	198,000	34,650
Little Indian Pond	143	33,605	28,600	5,005
Sebasticook Lake	4288	1,007,680	857,600	150,080
Wassookeag Lake	1062	249,570	212,400	37,170
Plymouth Pond	480	112,800	96,000	16,800
TOTAL	19,326	4,541,610	3,865,200	676,410
Wesserunsett Stream				
Hayden Lake	1446	339,810	289,200	50,610
Sandy River				
Norcross Pond	122	28,670	24,400	4,270
Clearwater Pond	751	176,485	150,200	26,285
North Pond	170	39,950	34,000	5,950
Parker Pond	128	30,080	25,600	4,480
TOTAL	1171	275,185	234,200	40,985
Grand Total[4]	24,606	5,782,410	4,921,200	861,210

[1]Based on an annual commercial yield of 100 pounds per surface acre and an escapement rate of 15%. Average weight of .5 pound/fish

[2]Assumes 100% fish passage efficiency (upstream and downstream)

[3]The escapement rate of 35 adult alewives per acre refers to the escapement needed into the pond or lake. Higher rates would be needed downriver depending on the number of dams and fish passage efficiency.

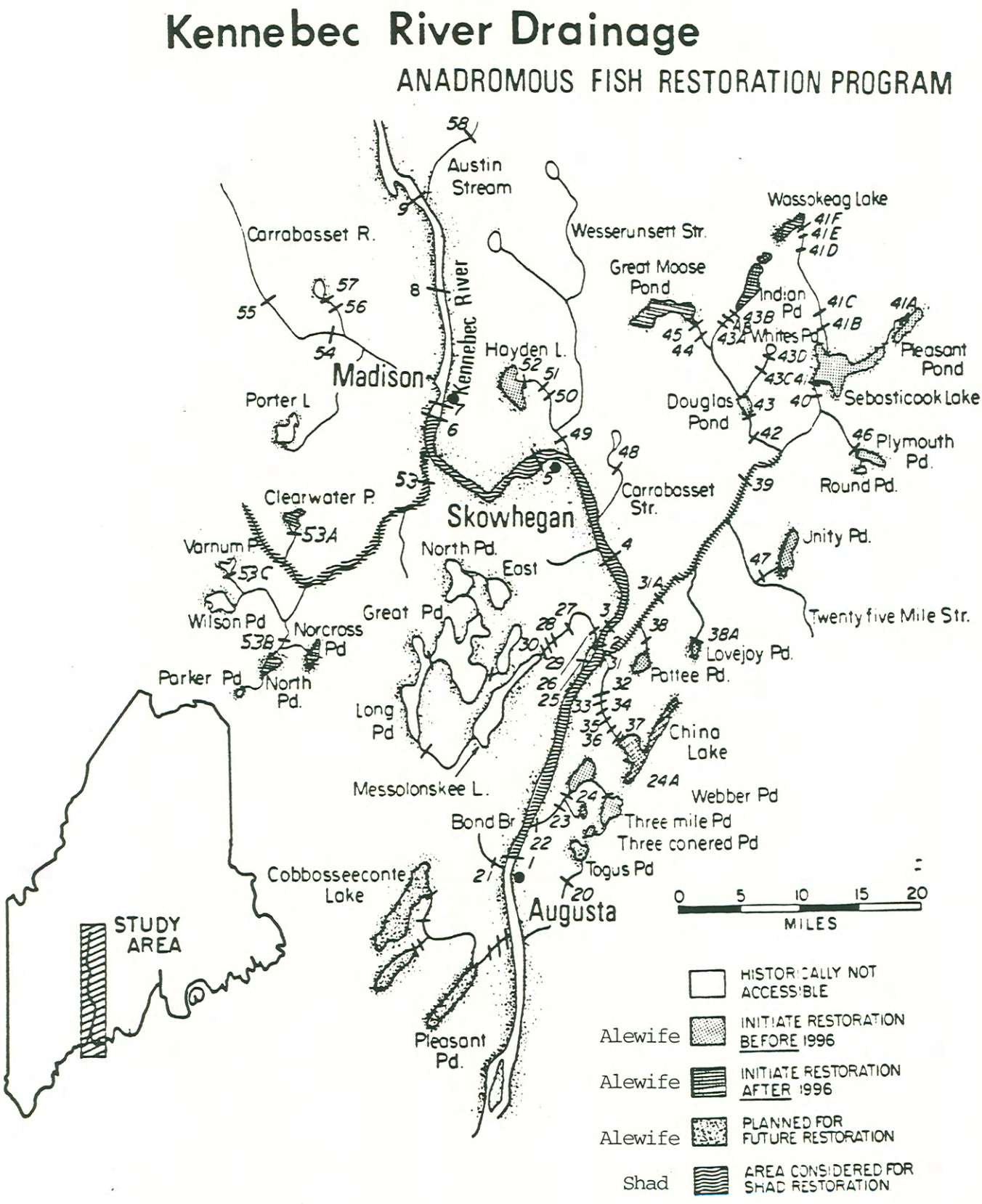
[4]Assumes there will be 100% survival of downstream migrating juvenile alewives. A 10% mortality at each hydroelectric facility (with downstream passage) would reduce the potential total production from 5,683,641 alewives to 4,047,800

Table 2: Potential shad production in the Kennebec River based on water surface acreage (2.3 shad/100 sq. yds.)

River Segment	Surface Acreage ($yd.^2$)	Potential Shad Production[1]
Mainstem Augusta Dam to Milstar Dam, Waterville	6,872,800	158,074
Sebasticook River Halifax Dam to Confluence of East and West Branches	6,757,080	155,413
Mainstem Kennebec River Scott Paper Company Dam, Waterville to Shawmut Dam, Fairfield	2,531,361	58,221
Mainstem Kennebec River Shawmut Dam, Fairfield to Central Maine Power Dam, Skowhegan	6,125,167	140,879
Mainstem Kennebec River Skowhegan Dam to Madison	4,961,583	114,116
Sandy River Mouth to Route #4, Bridge in Farrington	4,262,250	98,032
TOTAL:	31,510,241	724,735

[1]Assumes that there will be 100% survival of downstream migrating juvenile shad. A 10% mortality at each hydroelectric facility (with downstream passage) would reduce the total production from 724,735 to 519,759.

FIGURE 1: Location of dams and lake systems for the section of the Kennebec River considered for alewife and shad restoration. For a description of the dams see Appendix 2 and 3.



Appendix 1: Fish Passage Requirements for Dams on the Mainstem of Kennebec River and Major Tributaries.

Dam	Miles Above Tidewater	Gross Static Head	PASSAGE REQUIREMENTS Shad[1]	Alewife[2]
		Kennebec River - Mainstem		
1. Edwards Dam Augusta	0	17	385,216	1,547,879
2. Milstar Dam Waterville	18	21	228,471	164,640
3. T & A Mills Dam Scott Paper Co. Waterville	20	23	205,625	148,175
4. Shawmut Dam CMP Fairfield	26	24	176,514	133,358
5. Weston Dam CMP Skowhegan	38	35	106,074	50,600
		Sebasticook River		
31 Fort Halifax Dam CMP Winslow	18	30	77,707	1,135,711
39a Benton Falls Dam Benton Falls	26	31	57,531	767,267
39 Burnham Hydro Burnham	40	33	22,224	599,567
		Sandy River		
53 Madison Electric Norridgewock	52	17	41,825	45,539

[1]Shad passage requirements are based on a 50% escapement rate and a 90% fish passage efficiency at each fishway. The 10% loss was allocated to spawning requirements of the impoundment below the fishway.

[2]Alewife passage requirements are based on an escapement rate of 35 adult alewives per acre of spawning habitat. A 90% fish passage efficiency was assumed at each fishway.

Appendix 2: Obstructions on the Kennebec River from Augusta to Moosehead Lake.

Dam Number	Project Name	Gross Head	Location	Owner	License Expiration Date	Generating Capacity (kw)
1	Edward (FERC #2389)	17	Augusta	Augusta Dev. Corporation	12/31/1993	3,500
2	Lockwood (FERC #2574)	21	Wtvl/Winslow	Milstar Manufacturing Corp.	04/30/2004	6,550
3	Winslow (FERC #2611)	21	Wtvl/Winslow	Scott Paper	12/31/1993	3,730
4	Shawmut (FERC #2322)	23	Fairfield	Central Maine Power Co.	01/31/2021	8,650
5	Weston (FERC #2325)	35	Skowhegan	Central Maine Power Co.	12/31/1993	12,000
6	Abenaki (FERC #2364)	43	Madison	Madison Paper Industries	04/30/2004	5,400
7	Anson (FERC #2365)	21	Madison	Madison Paper Industries	12/31/1993	6,000
8	Williams (FERC #2335)	48	Solon/Embden	Central Maine Power Co.	12/31/1987	13,000
9	Wyman (FERC #2329)	142	Moscow	Central Maine Power Co.	12/31/1993	72,000
10	Harris (FERC #2142)	159	T1 R6	Central Maine Power Co.	12/31/2001	76,000
11	Moosehead Lake (FERC #2671)	9.5	Big Squaw/Taunton	Kennebec Water Power	12/31/1993	Storage
12	West Outlet Moosehead Lake	6.5	T1 R1	Kennebec Water Power		Storage

Dam Number	Location	Owner	Head	Condition
22	Seven Mile Stream Vassalboro	NA	3'	Breached
23	Seven Mile Stream Vassalboro	NA	11'	Breached
24	Webber Pond Outlet	Vassalboro	7'	Good
24a	Three Mile Lake Outlet	NA Sebasticook River	3'	Breached
31	Fort Halifax (FERC #2552) Sebasticook River Winslow	Central Maine Power	22.5'	1,500 kw License expires 12/31/93
32	China Lake Outlet Vassalboro	Ladd Paper Co.	9'	Fair
33	China Lake Outlet Vassalboro	American Woolen Co.	16'	
34	China Lake Outlet Vassalboro	H. Brewer	15'	
35	China Lake Outlet Vassalboro	NA	4'	
36	China Lake Outlet Vassalboro	Masse & Son	13'	
37	China Lake Outlet Vassalboro	Town of Vassalboro	7'	
38	Pattee Pond Brook Winslow	NA		Breached
38a	Lovejoy Pond Outlet Albion	Clarence Chalmers	15'	Good
39	Sebasticook River Burnham	Burnham Hydro Electric (Keddy)	27'	
39a	Sebasticook River Benton Falls	Everett E. Whitman	31'	Licensed; construc- tion was not ini- tiated as of 3/25/85
40	East Branch Sebasticook River Newport	Guilford Industries	13'	Preliminary permit
41	Sebasticook Lake Newport	Town of Newport	8'	Good

Dam Number	Location	Owner	Head	Condition
41a	Pleasant Lake Outlet Stetson	NA	5'	Poor
41b	East Branch Sebasticook River Corinna	Eastern Woolen Mills	14'	Good
41c	East Branch Sebasticook River Corinna	Eastern Woolen Mills	14'	Good
41d	East Branch Sebasticook River Corinna	Eastern Woolen Mills	14'	Good
41e	East Branch Sebasticook River Corinna	Eastern Woolen Mills	12'	Good
41f	Wassookeag Lake Dexter	Amos Abbott Co.	8.8'	Good
42	Pioneer Dam (FERC #8736) West Branch Sebasticook River Pittsfield	Chris Anthony	10'	300 kw License Exempted
43	Waverly Ave (FERC #4293) Sebasticook River Pittsfield	Chris Anthony	15'	700kw License Exempted
43a	Indian Stream St. Albans	Harold Bishop	8-10'	Fair
43ab	Indian Stream St. Albans		6-8'	Fair
43b	Big Indian Pond Outlet St. Albans	Town of St. Albans	9'	Good
43c	Madawaska Pond Palmyra	Inland Fisheries & Wildlife	4'	Good
43d	Whites Pond Palmyra	NA	3-4'	Poor
44	West Branch Sebasticook River Hartland	Irving Tanning Co.	8'	Fair
45	Great Moose Pond Hartland	Town of Hartland	17'	Fair
46	Plymouth Pond Plymouth	Plymouth	9'	Good

Dam Number	Location	Owner	Head	Condition
47	Unity Pond Unity		3'	Not Present
49	Malbons Mills, main stem Wesserunsett Stream Skowhegan	NA	15'	Poor, log crib; breached still impassable at most water levels
50	Lower West Branch Wesserunsett Stream	NA	5-7'	Dam approx. 2' in head & fall 5' in head; falls passable.
51	Lower West Branch Wesserunsett Stream	NA	8-10'	Fair
52	Hayden Lake Outlet	Town of Madison	6'	Good
53	Sandy River Norridgewock	Madison Electric Works	17'	Good
53a	Clearwater Pond Industry	NA	3-4'	Good
53b	Little Norridgewock Stream, Chesterville	IF&W	6-8'	Good