

PRELIMINARY REPORT
TO THE
208 AREAWIDE PLANNING COMMITTEE
LARIMER-WELD REGIONAL COUNCIL OF GOVERNMENTS
CONCERNING
ALTERNATIVE IMPLEMENTATION STRATEGIES FOR
ACHIEVING WATER QUALITY GOALS

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PRELIMINARY
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ALTERNATIVE IMPLEMENTATION STRATEGIES FOR ACHIEVING WATER QUALITY GOALS

INTRODUCTION

The 208 staff and consultants, after considerable analysis and input from the 208 subcommittees, have developed four alternative management strategies for achieving water quality goals. In this document, the four alternative implementation plans are provided in a general form with associated cost information for each plan. The purpose of this presentation is to provide the 208 Areawide Planning Committee with the opportunity for initial review and discussion of these plans at the committee meeting on August 25, 1977. Each of the alternative plans is considered implementable from a technical standpoint by 208 staff and consultants. The variables include the amount of money required to implement the alternative plans, and the time frame in which the plans might be implemented. Institutional and financial constraints have not yet been considered as part of the plan development, but will be integrated into the planning process in the very near future. Integration of institutional and financial considerations may result in modification of some of the plans. However, it was considered extremely important to provide the 208 APC Committee with the descriptions of the plans at this time and to receive comments on the plans from the committee.

STRATEGY FOR PLAN REVIEW AND
COMMITTEE ADOPTION

The information contained in this report should be considered a first-cut attempt to describe actions and associated costs required to achieve various levels of aquatic conditions in the principal streams of the region. Refinements are anticipated as the process evolves.

A detailed technical report is being compiled as a parallel task to committee review of this preliminary information which will provide detailed information on methods of analysis, assumptions and cost computations on a sub-basin basis. When completed, the alternative technical areawide plans document will be made available to appropriate Federal, state, and local agencies and the general public for review.

Following initial hearing and comment on the alternative plan report by all parties concerned, a draft 208 Technical Areawide Plan will be prepared and submitted for review in a similar fashion.

Concurrently with the development and review of the alternative technical plans and draft 208 technical plan, the institutional and financial options will be developed and presented.

The timing of these events will depend largely upon the extent to which agencies, the 208 Committee, and general public respond to the information provided. However, an absolute deadline of a Draft 208 Plan by February, 1978, must be met.

COMMON FEATURES OF ALL THE PLANS

All the plans recognize the importance of the region's mountain streams as water supply streams, cold water fisheries, and recreational areas. Variations in the plans occur in dealing with the Cache la Poudre River, Big Thompson River, and St. Vrain River in the plains areas of the region. The fundamental question is: What type of fishery and other aquatic life is attained by application of various water resource and water quality management strategies in the plains areas?

QUALITY OF FISHERIES

In order to adequately describe the implications of alternative water management strategies in terms of the quality of aquatic habitat that will result from implementation of those strategies, the level of attainable fisheries are defined as follows:

<u>CLASS</u>	<u>DESCRIPTION</u>
First Class Aquatic Habitat	A first class aquatic habitat is characterized by healthy physical habitat which includes adequate quantity of water to ensure survival during critical periods, and quality of water which does not impair or inhibit development of a wide variety of self-propagating fish species, including appropriate cold or warm water sport fish such as trout, channel catfish, largemouth bass, smallmouth bass, and sauger.

Second Class Aquatic
Habitat

A second class aquatic habitat is defined essentially as a put-and-take fishery in stream reaches of the region where existing quality and quantity of water would allow seasonal creation of an expendable fishery consisting of a wide variety of species as described above. The fishery would not be self-propagating and would have to be restocked each year.

Third Class Aquatic
Habitat

A third class aquatic habitat is defined as having a limited variety of fish species which survive under present water management strategies and water quality. Such species would include carp, suckers, and rough fish.

These classifications will be referred to in subsequent descriptions of alternative plans. As mentioned above, it is assumed under all plans that a first class cold water habitat will be maintained in the mountain areas of the region.

COMMITTEE REVIEW OF ALTERNATIVE PLANS

In subsequent sections the committee is provided with narrative descriptions of four basic alternative plans and the cost of those plans. However, the committee should not feel constrained by the structure of the plans. In addition to critical questions and comments concerning each of the alternative plans, suggestions are welcome which might result in the definition of additional alternatives.

DESCRIPTION OF ALTERNATIVE MANAGEMENT
STRATEGIES FOR THE LARIMER-WELD REGION

PLAN #1

This alternative would enable attainment of a first class aquatic habitat over the entire length of the Cache la Poudre River, the Big Thompson River, and the St. Vrain River from the Weld County Line to its confluence with the South Platte by 1983. Attainment of a first class fishery in the South Platte would require exposure of the gravel substrate underlying existing sediment deposits. Exposure would require initial removal of 4,500,000 cubic yards of sediment within the region, continuous dredging, and upstream controls on natural and man-induced erosion. For these reasons, establishment of a fishery in the South Platte was not considered in the preliminary round of alternative plan development.

Two fundamental requirements of this plan include:

- (1) Design and construction of a physical fish habitat in the Cache la Poudre, Big Thompson, and St. Vrain Rivers;
- (2) Flow augmentation to provide minimum stream flows during the summer months.

Without these two measures, a viable first class habitat cannot be achieved regardless of water quality. In addition, municipal and industrial discharges must be upgraded to produce an effluent which contains no more than 3 mg/l ammonia. These include Fort Collins No. 1, Fort Collins No. 2, Windsor, Kodak, Greeley 1st Avenue, Loveland No. 2, and Great Western at Loveland.

Flow augmentation requirements are 20 cubic feet per second (6,000 acre-feet per year) in the Cache la Poudre River and 15 cubic feet per second (4,500 acre-feet per year) in the Big Thompson River during the months of May through September. No flow augmentation is anticipated for the St. Vrain River.

Operation and maintenance activities will include those normally associated with the operation of advanced municipal and industrial waste treatment plants, fish stocking during initial years to ensure establishment of a first class fishery, and dredging of the Cache la Poudre River, Big Thompson River, and St. Vrain River.

Under this plan, best management practices for irrigated agriculture would be implemented between the completion of the 208 plan and the year 1983. Other non-point source control measures would include construction of flow attenuation basins to reduce suspended solids loadings to the rivers resulting from urban runoff, and development and adoption of city and county ordinances to ensure incorporation of these features in all urban drainage programs.

In order to meet 1983 goals of Public Law 92-500, i.e., fishable, swimmable waters throughout the nation, all of the activities described above would have to be implemented between the time the 208 plan is adopted and 1983. Total capital cost for the region to implement Plan #1 would be on the order of \$105,000,000 (see Table 1).

PLAN #2

This alternative achieves the same goal as Plan #1, i.e., attainment of a first class aquatic habitat over the entire length of the Cache la Poudre River, Big Thompson River, and the St. Vrain River from the Weld County Line to its confluence with the South Platte. However, this alternative is phased over a longer period of time and the goals are not achieved until 1988.

Municipal and industrial wastewater treatment plants would be required to construct and operate advanced waste treatment facilities. However, this would not be completed until 1988. Implementation of feedlot runoff control facilities would proceed in the same manner as Plan #1; however, urban runoff control facilities to reduce suspended solids levels would not be initiated until 1983 and completion of these facilities would not be required until 1993.

Stream engineering, i.e., design and construction of aquatic habitats, would be initiated in 1985 and completed by 1988. Stream stocking and flow augmentation would begin in 1988. Initial dredging of the Cache la Poudre, Big Thompson and St. Vrain would be initiated in 1983 and be completed in 1988.

Full scale implementation of best management practices for irrigated agriculture as water quality control measures would not be initiated until 1983 and would not be completed until 2003. Between the completion of the 208 program in 1978 and 1983, efforts would be focused on continued research and development necessary to test the effectiveness of the more capital intensive BMP's such as canal lining and sprinkler systems. In addition, BMP implementation would

be continued in its present form as funded through SCS and ASCS with emphasis on implementing best management practices that have a positive impact on water quality. During the 1978-83 period, implementation of best management practices would focus on non-capital intensive programs such as irrigation water scheduling, buffer strips, and installation of additional water measuring devices.

The total capital investment required would be the same as required under Plan #1, \$105,000,000, but the annual cost would be lower because implementation would be spread over a longer period of time.

PLAN #3

This plan emphasizes establishment of a second class aquatic habitat, i.e., put-and-take fishery that must be restocked each year, within certain reaches of the Big Thompson River, St. Vrain River, and Cache la Poudre River for a total of 30 miles of put-and-take fishery. However, aquatic habitat would not be modified to allow for self-propagation.

On the Big Thompson River, a put-and-take fishery would be established between the mouth of the Big Thompson Canyon and the intake for the Loudon Ditch, a distance of approximately 2.5 miles. On the St. Vrain River, 15 miles of put-and-take fishery would be established between Last Chance Ditch and the confluence of the St. Vrain with the South Platte. On the Cache la Poudre River, a put-and-take fishery would be established from the City of Greeley municipal intake to Fort Collins Sewage Treatment Plant No. 1. A third class aquatic habitat would exist downstream of the points mentioned above.

As part of this alternative, feedlot control measures would be implemented between now and 1983 as is required under current regulation. Urban runoff control measures would be limited to non-structural measures. There would be no flow augmentation, dredging, or advanced waste treatment for municipalities or industries.

Best management practices for irrigated agriculture would be implemented under present levels of funding with emphasis on those practices which would improve water management and water quality but would not require intensive capital construction. This would include such things as development of buffer strips, and continued development of irrigation scheduling.

PLAN #4

This alternative would result in attainment of a third class aquatic habitat in most streams of the region including the Cache la Poudre below its confluence with the North Fork, and the Big Thompson below the mouth of the canyon. No advanced wastewater treatment would be included and there would be no program of flow augmentation, dredging, stream engineering and construction, or fish stocking.

Urban runoff control measures would be restricted to non-structural measures. Feedlot runoff would be controlled under current regulations by 1983 and development of best management practices for irrigated agriculture would proceed as under Plan #3, i.e., under present levels of funding with emphasis on non-structural measures.

COST OF ALTERNATIVES

The cost of the alternatives described above is presented in Table 1. The costs are displayed in terms of capital cost, operation and maintenance cost, and "equivalent annual cost". The "equivalent annual cost" takes into account variations in the economic effects of staging various components of the alternative plans. The alternative costs are summarized below:

	EQUIVALENT ANNUAL COST	O & M COST	TOTAL CAPITAL
(Thousands of Dollars)			
Plan #1	8,949	2,032	105,489
Plan #2	6,494	1,945	105,489
Plan #3	4,270	1,627	47,274
Plan #4	4,229	1,587	47,206

There is a substantial cost break of approximately \$60,000 million between the first two plans (#1 and #2) and the second two plans (#3 and #4). Plans #1 and #2 require advanced waste treatment for municipalities and industries (\$19.1 million) and flow augmentation (\$17.6 million) which are not included in Plans #3 and #4. In addition, Plans #1 and #2 call for an expenditure of \$35.0 million for Best Management Practices for irrigated agriculture which is not included in Plans #3 and #4.

SEAMAN RESERVOIR

Plans #1, #2, and #3 would require control of sediment discharges from Seaman Reservoir on the North Fork of the

Cache la Poudre River. Control strategies might include: 1) changes in operation of the reservoir; 2) structural modifications to the reservoir; 3) dredging of the reservoir; 4) sediment control programs upstream of Seaman Reservoir in the North Fork drainage; 5) a combination of two or more of the above. No recommended strategy or costs have been developed at this time.

PUBLIC ACCESS

Public access to aquatic habitats in the Cache la Poudre, Big Thompson, and St. Vrain is extremely limited in many areas. Acquisition of public access through purchase of easements or rights-of-way would tend to enhance the benefits of attaining a first class fishery on these streams, but would also increase the cost of these alternatives. COG staff and consultants are developing information on public access to the rivers.

TABLE 1. FEATURES OF ALTERNATIVE IMPLEMENTATION STRATEGIES [a]

ALTERNATE IMPLEMENTATION STRATEGIES FOR ACHIEVING WATER QUALITY GOALS	PROGRAM COMPONENT									TOTAL
	POINT SOURCE CONTROLS		NON-POINT SOURCE CONTROLS			DREDGING [d]		FLOW AUGMENTATION [d]		
	MUNICIPAL & INDUSTRIAL [b]	FEEDLOTS [b]	IRRIGATED AGRICULTURE [b]	URBAN RUNOFF [b]	STREAM FISH STOCKING [c]	STREAM ENGINEERING DESIGN & CONSTRUCTION [b]	INITIAL	THEREAFTER		
Plan #1										
Capital Cost (\$1000)	19,066 [e,f]	300 [g]	67,050	850 [h,i]	167 [j]	220 [k]	118 [l]	118 [m]	17,600 [n]	105,489
Average O&M Cost (\$1000/Yr)	1,754	-	179	-	-	-	62 [o]	37 [p]		2,032
Equivalent Annual Cost (\$1000/Yr)	3,521	22	4,054	64	9	17	47	23	1,192	8,949
Plan #2 [q]										
Capital Cost (\$1000)	19,066 [e]	300	67,050	850 [h,i]	167 [j]	220 [k]	118 [l]	118 [m]	17,600 [n]	105,489
Average O&M Cost (\$1000/Yr)	1,754	-	92	-	-	-	62 [o]	37 [p]		1,945
Equivalent Annual Cost (\$1000/Yr)	3,280	22	2,484	40	6	12	32	12	606	6,494
Plan #3										
Capital Cost (\$1000)	14,856 [r]	300	32,050	[s]	0	68 [u]	0	0	0	47,274
Average O&M Cost (\$1000/Yr)	1,525	-	62	-	40 [j,t]	-	0	0	0	1,627
Equivalent Annual Cost (\$1000/Yr)	2,680	22	1,527	-	35	6	0	0	0	4,270
Plan #4										
Capital Cost (\$1000)	14,856 [r]	300	32,050	[s]	0	0	0	0	0	47,206
Average O&M Cost (\$1000/Yr)	1,525	-	62	-	-	-	0	0	0	1,587
Equivalent Annual Cost (\$1000/Yr)	2,680	22	1,527	-	-	-	0	0	0	4,229

[a] Costs in terms of January, 1977, dollars.

[b] Assumes 7 percent interest, amortized over 20 years.

[c] Assumes 7 percent interest, amortized over 50 years.

[d] Assumes 7 percent interest, amortized over 10 years.

[e] Includes advanced waste treatment at Fort Collins Nos. 1 & 2, Windsor, Kodak, Greeley 1st Avenue, Loveland No. 2, and Great Western Loveland facilities.

[f] Assumes plants requiring advanced waste treatment upgrade from 1978-1982; other facilities are staged according to future need for additional capacity.

[g] Staged over five years.

[h] Staged over ten years.

[i] Control measures for urban runoff will be oriented toward source control, non-structural control options, and structural options incorporated into an overall system of drainage/flood control; suspended solids removal equals 30 percent.

[j] Based on \$110 per surface acre stocked.

[k] Based on one man-year professional design time plus \$500-\$2,000 per river mile for construction; includes cost of fish screens, estimated to be \$1,000 per ditch.

[l] Purchase of mini-dredge.

[m] New mini-dredge to be purchased in 1988.

[n] Assumes unit cost of C-BT water = \$1,000; quota = 60 percent; flow augmentation implemented in Big Thompson and Cache la Poudre Rivers from May through September; 7 percent interest amortized over 50 years.

[o] Includes annual insurance premium of \$3,000; assumes dredge operated continuously during the year; does not include cost of transporting, launching, or retrieving dredge; \$62,000 for first four years to initially expose channel substrate in the Big Thompson & Cache la Poudre Rivers downstream from canyon mouths, and in reach of the St. Vrain River within the two-county area; \$37,000 per year thereafter for channel maintenance.

[p] Assumes mini-dredge operated for seven months out of each year.

[q] All components of 1983 goal strategy delayed five years to allow for additional planning, research and development, and hydrologic analyses.

[r] Secondary treatment.

[s] Control measures for urban runoff will be oriented toward source control and non-structural control options.

[t] Stocking of Cache la Poudre downstream from Greeley municipal intake to Fort Collins No. 1; Big Thompson downstream from canyon mouth to Loudon Ditch; St. Vrain downstream from Last Chance Ditch to confluence with South Platte.

[u] Based on 7 months of professional design time plus \$500-\$2,000 per river mile for construction, includes cost of fish screens, estimated to be \$1,000 per ditch.