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ALTERNATIVE APPROACHES TO OPERATING AND MAINTAINING
RECREATION AREAS(U) ARMY ENGINEER WATERWAYS EXPERIMENT
STATION VICKSBURG MS ENVIRONMENTAL LAB W H BUMGARDNER

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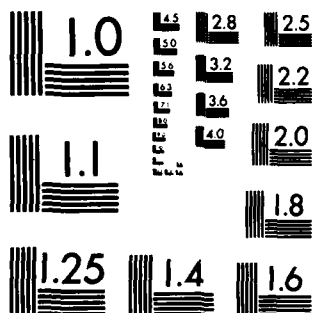
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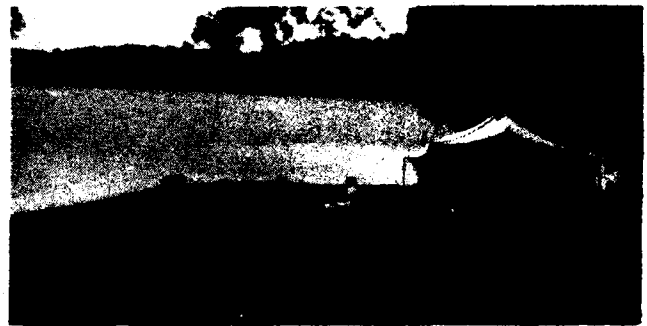
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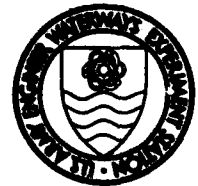


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and (c) development of a methodology for the preparation of O&M performance standards. The internal working document from which this information was extracted is on file at WES.

cont
The existing approaches substudy revealed that O&M activities were being conducted through the use of: (a) in-house Corps resources, (b) contractual arrangements, and (c) a combination of in-house resources and contractual arrangements. Most of the O&M work was being conducted through contractual arrangements. The highest level of satisfaction was with O&M activities conducted in-house, followed by the combined approach. Managers were more dissatisfied with the contract approach than either the in-house or combined approach.

Although the findings were somewhat inconclusive about O&M costs, they suggest that contracting is more often cost efficient than conducting O&M activities with in-house resources, particularly under conditions of high overall project visitation and high levels of overnight use. It was undetermined whether the contract or in-house approach was more cost efficient under conditions of low overall visitation. The availability of local labor had no effect on O&M costs.

In suggesting a methodology for local preparation of O&M performance standards, it was concluded that qualitative indicators as well as the amounts of manpower, time, equipment, and supplies and the associated costs should be delineated for specific work tasks.

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PREFACE

This report presents the findings and the conclusions of three substudies, completed January 3, 1982, which were part of the U.S. Army Engineer Waterways Experiment Station (WES) project, "Cost Efficiency of Methods of Operating and Maintaining Corps Recreation Areas." The first substudy that focused on identifying existing operation and maintenance (O&M) approaches used within the Corps was conducted by the Corps of Engineers Construction Engineering Research Laboratory (CERL) under the supervision of Dr. H. E. Balback. The second substudy on documenting and comparing costs incurred with O&M activities was conducted by Dr. Chrystos D. Siderelis, Department of Recreation Resources Administration, North Carolina State University, Raleigh. The third substudy on developing a methodology for preparation of O&M performance standards was conducted by Dr. Walter H. Bumgardner, Department of Recreation, University of Southern Mississippi, Hattiesburg. Dr. Bumgardner was the principal author of this report under an Intergovernmental Personnel Act agreement with WES.

Mr. Larry Lawrence, Environmental Laboratory (EL), WES, was the principle investigator, and Mr. William J. Hansen, EL, was the Recreation Research Team Leader. Dr. Adolph J. Anderson, EL, was Manager of the Recreation Research Program. The study was supervised by Dr. Conrad J. Kirby, Chief, Environmental Resources Division, EL. Dr. John Harrison was Chief, EL.

COL John L. Cannon, CE, and COL Nelson P. Conover, CE, were Commanders and Directors of WES during this study. Technical Director was Mr. F. R. Brown.

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CONVERSION FACTORS, U. S. CUSTOMARY TO METRIC (SI)
UNITS OF MEASUREMENT

U. S. customary units of measurement used in this report can be converted to metric (SI) units as follows:

<u>Multiply</u>	<u>By</u>	<u>To Obtain</u>
acres	4046.873	square metres
gallons (U. S. liquid)	3.785412	cubic metres
inches	25.4	millimetres

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Operation and maintenance (O&M) activities at Corps projects are conducted through the use of in-house resources, by contract, and through a combination of these two approaches. Much of the O&M work at Corps projects has historically been done with in-house resources. This study reveals that the trend now is toward conducting more O&M activities by contract.

Most operations and maintenance activities were conducted through contractual arrangements

More O&M activities were found to be conducted by the combined in-house/contract approach and the contract approach than through the use of in-house resources. The five activities most frequently contracted were:

- a. Pumping pit toilets.
- b. Trash pickup.
- c. Rest room/bathhouse cleaning.
- d. Campsite/group area cleaning.
- e. Mowing and grounds maintenance.

The five activities most frequently conducted through the combined in-house/contract approach were:

- a. Equipment maintenance.
- b. Road/pavement maintenance.
- c. Law enforcement.

- d. Mowing and grounds maintenance.
- e. Fee collection.

The five activities most frequently conducted through the use of in-house resources were:

- a. Interpretation.
- b. Water supply/treatment facilities O&M.
- c. User surveys.
- d. Routine/preventive maintenance of structures.
- e. Sewage treatment facilities O&M.

Most O&M approaches did not vary with seasonal changes

Although the results were somewhat incomplete relative to variations in O&M approaches with seasonal changes, they indicated that the three approaches were used fairly consistently throughout the seasons. One of the most significant exceptions to this generalization pertained to law enforcement. Most contracts covered only the peak recreation season and required more patrol time on weekends when visitation was higher. A second exception was with campsite/group area cleaning, which was most often done by contract only during the peak user season. Another was with trash pickup, wherein the majority of projects using only contracting had provisions for reduced pickup during off seasons.

More dissatisfaction existed with contracting than with other O&M approaches

The highest level of satisfaction was with O&M activities conducted in-house, followed by the combined approach. Managers were more

dissatisfied with the contract approach than with either the in-house or combined approach.

Manager dissatisfaction varied
among O&M activities

With only two O&M activities, in-house law enforcement and the combined approach to mowing and grounds maintenance, was there more dissatisfaction than satisfaction expressed. The activities conducted in-house with which managers expressed the most dissatisfaction were user surveys, law enforcement, pest control, water supply/treatment facilities O&M, and sewage treatment facilities O&M. The activities conducted by contract evoking the most dissatisfaction were campsite/group area cleaning, rest room/bathhouse cleaning, mowing and grounds maintenance, and trash pickup. Dissatisfaction with the combined approach was most frequently expressed relative to mowing and grounds maintenance, equipment maintenance, and trash pickup.

Few distinct preferences existed
toward any of the O&M approaches

With a few exceptions, there were no distinct preferences expressed toward any of the three O&M approaches. However, the following additional conclusions can be drawn about the pattern of preferences expressed:

- a. The approach which was being used was the one most often preferred.
- b. Preference of approach most often related to the level of satisfaction with the approach being used. The more satisfied or dissatisfied the manager was with the approach being used, the more frequently he preferred or did not prefer the approach.

- c. Dissatisfaction expressed with the contract or combined approaches commonly related to a preference for returning to an in-house approach.

The only O&M activity for which there was a decisive preference was pumping pit toilets by contract. The in-house approach was most strongly preferred for routine/preventive maintenance of structures, water supply/treatment facilities O&M, sewage treatment facilities O&M, and interpretation.

Alternative approaches to law enforcement are a possibility

Management preferences of approaches to law enforcement were, in one respect, similar to the general pattern: only 6 percent or 61 managers contracting for the service suggested there was a better approach. On the other hand, of those using the in-house approach, only 10 (27 percent) preferred that approach, whereas 16 (43 percent) indicated that a better approach was needed. However, there was no consensus of what the approach should be. The mixed preferences suggested that the advantages and disadvantages of alternative approaches to law enforcement need to be more thoroughly identified for project managers.

Improvements in contractor performance are needed

When contracting is used, the Corps cannot supervise the contractor and, therefore, loses some control and management capabilities. Monitoring and inspection of contractor performance becomes highly essential to ensuring compliance with specifications and standards.

In-house personnel were being used
to fill in for poor contractor
performance or nonperformance

Significant problems were being created for project managers by poor contractor performance or nonperformance. Particularly as related to the combined approach, but also with the contract approach, any tendency of making a practice of in-house personnel filling in for poor performance can cause a drain on in-house resources and potentially lead to further noncompliance by contractors.

The importance of good personnel
planning is increasing

Trends toward a lack of in-house personnel, high personnel turnover rates, and the need to maximize the efficient use of existing manpower authorizations emphasize the increasing importance of good personnel planning. Some of the problems associated with these trends, such as dissatisfaction with certain O&M approaches, could foreseeably be decreased with improved personnel forecasting and planning.

Contracting appeared to be the most
cost efficient approach to conducting
O&M activities

Because data collection problems were encountered in the cost documentation substudy, conclusions about O&M costs can be considered only illustrative of the findings rather than final. Comparatively speaking, it has been more cost efficient for the Corps to conduct O&M activities through contractual arrangements than through the use of in-house resources.

Examination of the extent of O&M contractual efficiencies indicated, however, that contracting has probably not resulted in greatly significant savings to the Corps. With two exceptions, there have not been large differences between in-house and contractual costs. Litter pickup and mowing open areas were considerably more costly where conducted by in-house resources than by contract.

Visitation and overnight use levels
had varying impacts on O&M costs

Visitation, when considered singularly, did not reveal conclusive findings about variations in unit costs. However, as visitation and overnight use increased, the mean average unit costs for both in-house and contracted maintenance increased. Nonetheless, contracted costs were still less per unit and more frequently resulted in cost efficiencies.

Mean average unit costs of O&M activities most often increased as overnight use, when considered singularly, increased. The O&M activity unit costs were generally less when conducted by contract. However, contractors commonly incurred higher costs at projects with low overnight use, and lower costs with high overnight use. The opposite appeared to be true for activities conducted in-house.

Labor availability had no effect
on O&M costs

The cost documentation substudy revealed nothing to support the hypothesis that close proximity to available labor pools has an effect on

average unit costs of O&M activities. The findings indicated that competitive bidding made possible by availability of several potential contractors presented no particular advantage over situations where there were fewer potential contractors or smaller labor pools.

O&M performance standards can be prepared with procedural consistency

A methodology has been developed for preparing O&M performance standards that is sufficiently general for Corps-wide application, yet precise enough for planning and evaluating specific work activity at the project level. It would be equally applicable to prescribing the quantity and quality of work to be performed under all three O&M approaches.

The essential items of information that should be contained in individual standards are: tasks identification, qualitative indicators of expected workmanship, unit of work for which the standard pertains, and associated amounts of manpower, time, equipment and supplies, and costs.

Recommendations

Identify optimum conditions for changing O&M approaches

Due to the variety of contract approaches at Corps projects and the variation in preferences expressed by managers for different approaches, further investigation should be undertaken to validate and further identify the trends discovered in this study. Strengths and weaknesses of each contracting approach should be evaluated, including the optimum conditions for changing from one O&M approach to another. The Corps' experience with "umbrella contracts" should be given special attention since it

is a relatively new and unevaluated approach. The optimum groups of O&M activities that should be contracted or retained in-house when using the combined approach should be identified. Verification of the need for retaining certain O&M activities in-house, such as interpretation and preventive maintenance of structures, is needed.

Evaluate alternative approaches to law enforcement

The advantages and disadvantages of alternative approaches to Corps law enforcement programs should be evaluated and more thoroughly identified for project managers.

Evaluate the Corps' tree management program

The Corps should evaluate its existing tree management practices for recreation areas and consider establishing a recreational silviculture program possibly as an adjunct to its existing timber management program.

Improve alternatives for dealing with poor contractor performance or nonperformance

Poor contractor performance or nonperformance needs to be more carefully anticipated, and appropriate specifications should be incorporated in contracts for handling the deficiency.

Contract O&M activities to maximize cost efficiency

All things considered, if the Corps' only goal is to achieve maximum cost efficiencies at individual projects, it seems advisable to contract O&M activities. However, total dollar savings appear to be less certain of an advantage with contracting when considering that, except for litter

pickup and mowing open areas, in-house mean average unit costs are not much higher than contracted costs.

Give priority to projects with high overnight use and visitation when considering contracting

The results of the cost-tracking study indicated that Corps projects with high overnight use and high visitation rates are potentially the best candidates for achieving cost efficiencies through the contracting approach. The results also suggest that umbrella contracts may be most feasible for highly visited projects where the maximum numbers of O&M activities can be placed under contract.

Consider noncost-related variables in selecting O&M approaches

In view of the comparatively limited overall cost advantage to contracting, other factors such as contractor reliability, quality of work, and availability of in-house resources require high consideration when assessing the feasibility of various O&M approaches.

Study comparative cost efficiencies at projects with low visitation

Since the data obtained in the cost-tracking study did not enable a conclusive recommendation on whether the contracting or in-house approach was more cost efficient at projects with low visitation, this topic warrants further investigation.

Adopt a standardized O&M activity cost measurement methodology

Given that this was an initial attempt to document the Corps' O&M

costs on recreation areas, and considering the requirement for data to make future cost comparisons, there is a need to adopt a methodology to continue this type of study. Now that the "cost tracking" method has been tested and evaluated, it is recommended that it be systematically implemented within the Corps.

Adopt a system of integrated maintenance management

Substantial improvements in the Corps' management of O&M activities at recreation areas could be realized through a system that combines the three major elements of this study. Such a system should include a continuous process for developing and prescribing O&M performance standards, documenting current O&M approaches, and examining the relative efficiency and cost-effectiveness of those approaches.

ALTERNATIVE APPROACHES TO OPERATING AND
MAINTAINING RECREATION AREAS

PART I: INTRODUCTION

1. The increased usage of U.S. Army Corps of Engineers lakes has resulted in a need to expand the level and intensity of operation and maintenance (O&M) activities in order to preserve and protect resources while ensuring enjoyable public visits. The increase in visitation and the resulting requirement for improved maintenance have unfortunately come at a time when national policy requires a reduction in Federal expenditures and employees. This has created a difficult problem for Corps managers: specifically, how best to manage environmental resources and fixed facilities, given current and future budgetary and manpower constraints.

2. The problem of having to do more with less has, as would be expected, resulted in greater emphasis being placed on the efficiency and effectiveness with which O&M activities are accomplished. In addition to making better use of in-house resources in accomplishing O&M activities, a potential option for countering the problem is increasing the use of contractual alternatives. Circular No. A-76, released 29 March 1979 by the Office of Management and Budget (OMB), requires the Corps to follow rigid and detailed guidelines when determining whether certain O&M activities should be conducted in-house or contracted to private sources (OMB 1979).

3. Given the diversity of Corps projects in terms of size, location, visitation levels, and functions, making the determination of whether or not to contract becomes a formidable task. This is especially true when considering that there is little information available about what services are most amenable to contracting relative to cost, utilization of manpower, resources, contract administration, and work performance. Information is needed throughout the Corps on what constitutes an effective O&M service contract and minimizes in-house resources required for contract administration and monitoring. Guidelines are needed at the local level for improving the efficiency and effectiveness with which specific O&M tasks are accomplished regardless of which approach or combination of approaches is employed.

4. This document presents a summary of the results of the Corps' Recreation Research Program Work Unit, "Cost Efficiency of Methods of Operating and Maintaining Corps Recreation Areas." It illustrates the progress being made by the Corps toward successfully dealing with: (a) increasing O&M requirements, (b) decreasing resources for accomplishing O&M tasks and, (c) feasibility issues of whether to contract for maintenance or use in-house resources.

5. This report consolidates the findings of three separate but closely related substudies comprising the research project. The substudies are (a) an identification of current approaches used within the Corps for conducting O&M activities, (b) documentation and comparison of costs incurred with O&M activities, and (c) development of a methodology for the preparation of O&M performance standards.

6. Each of the three substudies was designed around specific research objectives. The study on existing O&M approaches had as its objectives:

- a. Identify the O&M activities presently performed by in-house personnel; through contracts, purchase orders, and leases; or through a combination of any of these or other approaches.
- b. Determine whether O&M activities are being performed on a varying or seasonal basis, e.g., by contract personnel during the peak visitation season and by in-house personnel during the off season.
- c. Reveal resource/project managers' opinions on the quality with which O&M activities are being conducted.
- d. Reveal managers' preferences for the way these activities should be performed and/or any alternative approaches that would be advantageous.

The objectives of the O&M cost documentation substudy were to:

- a. Document Corps costs associated with contractual and in-house O&M services.
- b. Compare O&M costs associated with variations in levels of visitation, types of stay, and labor availability.
- c. Suggest which approaches to conducting O&M activities are most cost efficient when performed under various conditions.

7. The objective of the substudy on performance standards was to develop a methodology for Corps usage in preparing O&M performance standards for in-house and contractual work. The methodology was intended for wide application by the Corps in specifying and evaluating the performance of O&M work activities at project levels.

PART II: STUDY PROCEDURES AND DETAILED FINDINGS

8. The procedures used for examining O&M approaches consisted of conducting a telephone survey of 120 Corps project managers. The survey was limited to projects with the most recreation facilities and highest annual visitation rates. The procedure used in the cost documentation substudy employed a "cost tracking" technique in maintaining daily records on resources utilized and O&M work accomplished at 13 Corps projects during two summer seasons. Statistical analyses were used in evaluating the accumulated data. In developing a methodology for preparing O&M performance standards, existing Corps procedures, those used by other agencies, and newly proposed criteria were evaluated and synthesized into a systematic process. Information obtained in the cost documentation study was used in developing the proposed methodology and example standard.

Existing Corps O&M Approaches

Mowing

9. The largest portion of mowing at Corps Projects (48 percent) is done by contract. Approximately 28 percent of the mowing is accomplished through the combined use of in-house and contractual services, and the remainder (24 percent) is done solely through in-house resources. The northerly areas (e.g., New England Division) reportedly accomplished this task entirely with temporary in-house personnel due to the shortness of the growing and recreation seasons.

10. The level of satisfaction with in-house mowing was very high. Twenty-two of twenty-nine managers using this approach indicated satisfaction. The level of satisfaction with contracted mowing was low; twenty out of thirty-five managers surveyed indicated dissatisfaction. Satisfaction and dissatisfaction with the combined in-house and contractual approach were nearly equally divided. There was no clear expression of which of these approaches was preferred.

Rest room/bathhouse cleaning

11. Of the projects surveyed, 70 percent were either totally or partially relying on contractual services for cleaning rest rooms and bathhouses. The remaining 30 percent used in-house personnel for these tasks. Some significant regional differences in approach emerged from the study. The New England Division and South Pacific Division generally used in-house operations totally, while the Southwestern Division generally contracted this activity. The other Divisions generally used combinations of contracting and in-house labor.

12. The quality of contractual services was rated good to very good by fifty-two (62 percent) of the managers and at least adequate by seventy-eight (93 percent). Only six respondents rated contractual services as poor to very poor. At thirty-three (93 percent) of the projects where cleaning was performed in-house, the quality of work was rated as good to superior.

13. Even with the high overall satisfaction with existing approaches, the difficulty of finding enough manpower was identified as a

problem. Advantages cited for in-house performance included lower costs when temporary employees are used during the peak season, more flexibility, and quicker response to problems. Manpower restrictions and the difficulty in finding and keeping personnel has led to this task's being contracted at many projects. One problem with using contractors was ensuring that the contractor cleaned the rest room twice each day, especially during high use periods.

Campsite/group area cleaning

14. The contracting of campsite cleaning was the most common O&M approach; sixty (50 percent) of the projects contracted all campsite cleaning and seventy-seven (65 percent) had at least some, if not all, of the cleaning done by contract. Campsite/group area cleaning was performed by in-house personnel at thirty-four (28 percent) of the projects surveyed. The combination approach was used at the remainder of the projects. It was common to use contractors only during peak seasons.

15. At thirty-three (43 percent) of the seventy-seven projects that contracted this work, the survey respondents indicated that this approach was best. However, contracting was perceived to be unfavorable at twenty-five (33 percent) of the projects that used it, mostly because of contractors failing to meet contract standards. Contractor performance was rated good to very good at forty-eight (62 percent) of the seventy-seven projects using the contract approach, and at least adequate at seventy-one (92 percent).

16. At twenty-two (65 percent) of the thirty-four projects using in-house labor, the respondents considered that approach to be best. The approach was also rated good to superior at twenty-nine (85 percent) of the thirty-four projects. When difficulties were noted, they were the same as for rest room cleaning (lack of personnel and high turnover), even though the workload was not as great.

Trash pickup

17. This activity was contracted entirely at seventy-two (60 percent) of the projects and contracted in combination with the use of in-house resources at twenty-nine (24 percent). The majority of projects using only contracting had provisions for increased pickup during peak seasons and reduced pickup during off seasons. The remaining one third used in-house personnel to bring trash to central points for pickup by contractors. New England and North Pacific Divisions utilized in-house resources significantly more than other Divisions.

18. Contractor performance was rated adequate to superior in the majority of cases; however, it was perceived to be the best approach at less than half of the projects. The respondents favored returning to in-house trash collection by a margin of nearly 2:1.

19. Contractor performance was rated adequate to superior at twenty-five (86 percent) of the projects using the combined approach. A large majority of those respondents indicated that the combined approach was preferred. The quality of service and the mode of operation also received high ratings at the small number of projects that used only in-house labor.

Pumping of pit toilets

20. Most of the projects requiring this service have it done entirely by contract. Only four projects used in-house personnel for this activity and four used the combined approach. The quality of the service was nearly always rated good to superior.

21. Most of the contracts for these services were the purchase order type. Respondents from sixty-nine (71 percent) of ninety-seven projects using contracts indicated that either contracts or purchase orders were preferable.

Administration/operations building cleaning

22. Administration buildings at eighty-one (68 percent), of the projects surveyed are cleaned by in-house personnel. Janitorial services are completely contracted at thirty-six (30 percent) of the projects and partially contracted at the remaining 2 percent.

23. Contractor job performance was rated superior at only seven (18 percent) and good to superior at twenty-one (55 percent). Seventeen (45 percent) of the managers who contracted janitorial services approved of the contracting approach, while nine (24 percent) did not.

24. Of the respondents who used in-house personnel to do janitorial work, most of them rated the quality of work high and preferred it over other approaches. In nearly all cases, this is a year-round function usually done about five times per week.

Routine/preventive maintenance of structures

25. Maintenance of structures was performed by in-house personnel at ninety-four (98 percent) of the projects surveyed. Total contracting of structure maintenance was reported at only two (2 percent) of the projects, while some contracting was reported at twenty-four (20 percent) of the projects. The most common type of contract arrangement is supplementing in-house effort with contracting of specific jobs by purchase orders. Most of the structural maintenance is done during peak season visitor usage.

26. A large majority of the managers rated in-house structural maintenance as good to very good and preferred this over other approaches. Likewise, most of the managers using the contractual approach rated it very high and preferable over other approaches. A number of respondents indicated that a shortage of good personnel and manpower limitations restricted the effectiveness of the in-house approach.

Road/pavement maintenance

27. A little over half (55 percent) of the projects surveyed carried out minor road repairs and maintenance with in-house personnel and major repairs such as resurfacing with contracts. Thirty-six percent of the projects did both types of this work with in-house personnel.

28. For these two approaches, the quality of the work was rated good to superior at 79 percent of the projects. Most in-house work was

performed prior to the peak recreation season, while major resurfacing was done as needed or as funding permitted. Routine in-house repairs supplemented with major resurfacing contracts were the preferred approach at forty-eight (73 percent) of the projects using that method.

Equipment maintenance

29. Of the one hundred and twenty projects surveyed, ninety-two (77 percent) perform preventive maintenance, i.e., oil changes, tune-ups, and minor repairs, in-house. Major repairs are generally performed at local garages through purchase orders. Twenty-two (18 percent) of the projects are reportedly able to perform all equipment maintenance in-house. A few projects indicated that in-house maintenance is performed at centralized areas and/or District maintenance garages.

30. There are no indications of variations in approaches according to seasonality. The quality of the in-house/purchase order approach was rated good to superior at seventy-eight (85 percent) of the ninety-two projects. The quality of the exclusive in-house approach was rated good to superior at most of the projects.

31. The combined in-house/purchase order approach was favored at sixty-six (72 percent) of ninety-two projects. Similarly, the exclusive use of in-house labor was rated as the best approach at fifteen (68 percent) of the twenty-two projects. Many respondents suggested that as much vehicle maintenance as possible should be done in-house to prevent delays often encountered at repair shops. However, they also recommended

that major repairs are best done through the use of purchase orders because of the cost efficiency that results from not having to keep seldom-used parts and equipment on hand.

Water supply/treatment facilities
O&M

32. The operation and maintenance of electric pumps, water towers, chlorinators, treatment plants, etc., are performed by in-house personnel at one hundred (83 percent) of the projects surveyed. No variations in approach were reported relative to any seasonality of the activity. No opinions were revealed on the quality of the work. However, the use of in-house labor to operate and maintain water supply and treatment facilities was preferred at sixty-five (65 percent) of the projects that use the in-house approach. Of the seven (7 percent) of the respondents preferring another approach, most preferred their projects being served by municipal or rural water systems.

Sewage treatment facilities O&M

33. Ninety-one respondents (76 percent) indicated that in-house personnel operated and maintained a variety of sewage systems ranging from simple septic tanks and field tiles to complex tertiary treatment systems. Variations in seasonal approaches and managers' opinions on the quality of performance were not reported. However, sixty-two (68 percent) of the respondents operating their systems with in-house personnel felt this was the best approach. Only seven projects identified a need for a better approach.

Fee collection

34. Thirty-nine (45 percent) of the eighty-seven projects collecting fees performed this activity with in-house personnel. Contracts with senior citizen couples, commonly called "Ma and Pa" contracts in the Corps, were used at eighteen (21 percent) of the projects surveyed. Fee collection at the remaining thirty (35 percent) projects involved a combination of in-house and contractual approaches.

35. Nothing was reported on seasonal variations in approaches or opinions on the quality of fee collection activities. However, the use of in-house personnel was preferred at twenty-five (64 percent) of the thirty-nine projects using only in-house personnel. Only three respondents from this group suggested another approach would be better, and the remaining eleven had no opinion. The total contract approach was preferred at thirteen (72 percent) of the eighteen projects using it, whereas the combined approach was preferred at twenty-five (83 percent) of the projects using that approach.

Law enforcement

36. Eighty-one (68 percent) of the one hundred and twenty projects surveyed obtain some degree of law enforcement through contracts with county or local authorities. Respondents indicated that at forty-three (53 percent) projects the contracts supplement the Title 36 Citizen Authority of Corps Rangers. This number would foreseeably have been higher, but many respondents felt that the rangers' citation authority

did not meet their definition of law enforcement and that rangers could not enforce laws in the true sense of the word. Law enforcement is provided by in-house personnel at only thirty-seven (31 percent) of the projects surveyed. In many of these cases, State statutes did not permit contracts with local authorities; however, local authorities are generally on call in these areas and may occasionally patrol the recreation areas.

37. Most contracts (73 percent) covered only the peak recreation season and required more patrol time on weekends when visitation was higher. Law enforcement received by contract was rated good at sixty-one (75 percent) of the projects using contracts. Very few respondents (six) felt that there was a better approach. Law enforcement through the in-house mode was rated good to very good at nineteen (51 percent) of the thirty-seven projects without contracts; adequate at seven (19 percent); and poor at seven (19 percent). Responses indicated that the in-house approach was preferred at only ten (27 percent) of these projects and that a better approach was needed at sixteen (43 percent) projects.

User surveys

38. Ninety-four (78 percent) of the projects surveyed conduct user surveys through the use of in-house personnel. From the information received, the largest portion of the remaining twenty-two percent use the contract approach and to a lesser extent the combined in-house/contract approach. Although this activity is seasonal in nature, the

approaches do not tend to vary. The frequency of surveys does vary considerably, ranging from once a year to every five years.

39. The quality of survey information was rated very good at seventeen (18 percent) of the projects using the in-house approach; good at thirty (32 percent); adequate at twenty-seven (29 percent); and poor at six (6 percent).

40. The in-house approach was favored at thirty-six (38 percent) of the ninety-four projects where it is used and disfavored at twenty-one (22 percent) of these projects. Managers of the remaining thirty-seven (40 percent) projects expressed no opinion.

41. User surveys evoked a significant amount of management dissatisfaction. Most of the dissatisfaction related to management perception that the survey results were of limited use in recreation area management.

Interpretation

42. Roughly 90 percent of the projects surveyed had interpretive programs, and all but one were conducted solely by in-house personnel.

43. Respondents rated ongoing interpretive programs good to very good at nearly three fourths of the projects. The in-house approach was favored at only sixty-eight (63 percent) of the projects, but not one of the respondents suggested a better approach. This relatively low rating reflects the attitude of some managers that the program is unwarranted at Corps projects.

Forest/timber management

44. Forest and timber management activities exist on a very limited basis at the projects surveyed; eighty-three (69 percent) had no major programs. Of the thirty-seven projects that had active timber management programs, the approach was almost evenly divided between in-house, contractual, and a combination of both. There were no variations in approaches reported according to seasonality. No data were collected on opinions of the quality of activities being conducted, and there were no preferences expressed about approaches. About half of the project managers who did not have a forest/timber management program responded that there was no need to implement one.

Pest control programs

45. Organized pest control programs on bothersome plant and animal species exist at sixty-nine (57 percent) of the projects surveyed. The remaining 43 percent of the projects control a species occasionally, but have no regular program. Of one hundred and twenty projects surveyed, 28 percent control pests with in-house resources, 26 percent use the contract approach, and 8 percent use the combined approach. No patterns arose relative to seasonality and approaches of conducting pest control.

46. The level of satisfaction expressed with the three basic approaches was generally high; however, the most frequent dissatisfaction was with in-house efforts to control pests. The reports indicate that most of this dissatisfaction was related to apparent overstatements

by salesmen on the efficiency of a pest control product. There was no clear preference expressed for either of the three approaches. However, comments by many managers indicated that government regulations and State pest controller licensing requirements had prompted a recent shift to contractual pest control.

47. The need for satisfactory places to mix and store chemicals and to dispose of wastewater after cleaning pest control equipment was indicated as being a problem.

Fish and wildlife management

48. Fish and wildlife management activities at Corps projects are substantive; one hundred and nine (91 percent) of the projects surveyed reported their existence. The method of accomplishment varied significantly among the three alternative approaches, wherein thirty (28 percent) of one hundred and nine projects relied on in-house personnel, thirty-eight (35 percent) relied on State agencies, and twenty-four (22 percent) projects with fish and wildlife management programs relied on cooperation between State and in-house personnel. At the remaining seventeen projects having fish and wildlife management activities, the approach varied from the use of contract labor to accepting donated labor from local sportsman's groups.

49. There were no findings reported on management's opinions relative to the quality of this work, other than that satisfaction was significantly greater than dissatisfaction with the approaches being used. No preferences for approaches were reported either.

Agricultural outleases

50. Agricultural outleases for grazing and hay and grain crops were common at Corps projects. Of the one hundred and twenty projects surveyed, seventy-two (60 percent) had some type of agricultural outleases. No data were collected relative to seasonality of agricultural outleases, opinions on quality, or preference for approaches. The only significant variations in the activity pertained to regional location and type of outleases. The main problems reported with agricultural outleases were encroachment, overgrazing, and administrative problems.

Combined contracts

51. Most Corps projects that contract for two or more O&M activities rely on a single contractor. The most prevalent combination service contracts are for mowing; cleaning comfort stations, campsites, and picnic areas; and trash pickup. The number of umbrella O&M contracts is comparatively insignificant at present. Of the forty-three (36 percent) projects not using combined contracts, none performed every activity entirely in-house. They used either single activity contracts or purchase orders to acquire some type of O&M services, such as pumping of pit toilets, major equipment maintenance, trash pickup, pavement resurfacing, law enforcement, mowing, or comfort station cleaning.

O&M Cost Documentation Results

In-house/contracted O&M costs

52. Average unit costs of routine O&M activities were derived from data collected at thirteen Corps projects. Cost data were collected by

means of "work tickets" that were completed by project personnel. Because of the small number of projects sampled and worker unfamiliarity with the forms, the results presented should be viewed as indicators of potential cost differentials rather than absolute differences.

53. The results reveal that, for each O&M activity, except for the mowing of campgrounds, average in-house costs exceeded average contract costs. A closer analysis of the data also revealed, however, that there was a high degree of variability in average costs associated with the in-house and contractual approaches. Therefore, given the rather small sample size of average costs, one cannot make inferences from the study to all Corps projects with much certainty.

Analysis of management strategies

54. In order to confirm whether there were significant differences between average unit costs of in-house and contracted O&M activities, further statistical tests were made on the data. The results of these tests were consistent with the previous calculations on in-house and contracted O&M activities in that contracted activities were comparatively more cost efficient for ten out of eleven activities examined. The only exception was the mowing of campgrounds, and, although it was statistically shown to be more cost efficient when done in-house, the comparative difference was relatively insignificant. For example, mowing costs were 1.018 dollars per campsite for in-house, whereas contractual costs were 1.115 dollars.

Effect of labor availability on O&M costs

55. In the development of this study, it was rationalized that Corps projects located in close proximity to high levels of available labor would be in a better position to realize lower O&M costs than more remotely located projects. This was thought to be especially true in the more competitive bidding environment.

56. The hypothesis proved invalid. There were no significant indications that either a higher or lower availability to labor had any effect on average unit costs. The findings indicated that, irrespective of a project's proximity to a small or large labor market, there was no likelihood of a project located in one geographic area having a unit cost advantage over another.

Effects of levels of overnight use on O&M costs

57. In developing the study it was further rationalized that higher O&M costs would be experienced at Corps projects that have both daytime and overnight usage. It was expected that increased O&M costs for activities like campground cleanup, litter pickup, and trash removal would be incurred with high levels of overnight use, whereas decreased O&M costs would be incurred with low levels of overnight usage. Lower overnight use was defined as 15 percent or less occupancy at campgrounds and high overnight use was defined as that exceeding 15 percent nightly occupancy.

58. The findings were surprising in view of what was anticipated. It was found that contractors generally incurred higher costs at Corps projects having low overnight usage and lower costs at projects with high overnight usage. The opposite results were generally found to be the case for O&M activities conducted in-house.

59. Analysis of the data suggested two plausible reasons for the unexpected results. First, in-house performance of maintenance tasks is labor intensive with comparatively less reliance on specialized equipment. Contractors, on the other hand, incur higher equipment costs and lower labor costs. Secondly, as the repetitiveness of routine maintenance increases, this fosters a greater degree of contractor specialization in methods and equipment used, thus resulting in greater cost efficiencies.

Effect on varying levels of visitation
on O&M costs

60. Overall project visitation levels were also expected to influence O&M costs. Low project use, defined as less than 2.4 million recreation days per year, was expected to result in decreased costs, whereas high use, defined as more than 2.4 million recreation days per year, was expected to result in increased costs.

61. The results of this part of the study are less conclusive because of the absence of data on low use projects. Six of the nine maintenance activities at low use projects could not be estimated or compared for this reason. However, Table 1 illustrates that contracting

Table 1

Summary of Differences in Cost Efficiencies Between In-House and Contract
Maintenance Services for Three Maintenance Activities on Seven Facilities
and Four Use Levels*

Use Level	A**1***	A2	A3	A4	A5	B1	B6	B7	C
Low overnight use	C	C	NE	C	C	C	C	NE	C
High overnight use	C	C	C	C	C	C	C	C	I
Low visitation	NE	C	NE	NE	NE	NE	NE	C	C
High visitation	C	C	C	C	C	C	C	C	C

*Interpretation of Table: Abbreviations in the cells of the matrix indicate comparatively lower mean average unit costs attributable to contracting (C), in-house (I), and data insufficient to estimate significant difference (NE). For example, lower overnight use had a total of seven routine maintenance activities (counting the C's) that were more cost-effective when performed by contracting than in-house.

**

A - cleanup
B - litter pickup
C - trash removal

1 - campsite (area)
2 - comfort station, vault
3 - comfort station, flush
4 - picnic tables (area)
5 - showerhouse
6 - beach/swim area
7 - open area

was nearly always the more cost efficient approach, on a per unit basis, for cleanup, litter pickup, and removal of trash under conditions of low overnight use, high overnight use, or high overall visitation. There was not enough evidence to indicate whether the contract or in-house approach was more cost efficient under conditions of low overall visitation. Therefore, it is uncertain whether the in-house or contract approach would be more cost efficient at projects characterized by low visitation.

Methodology for developing O&M performance standards

62. The methodology for developing O&M performance standards consists of a series of procedural steps designed to enable maintenance managers to systematically formulate, organize, and present information in a format illustrating local O&M standards. As illustrated in Figure 1, it consists of the following general steps for formulating and maintaining O&M performance standards:

- a. Development of a land use/maintenance classification system.
- b. Classification of areas and facilities according to the classification system.
- c. Inventory of areas, facilities, and equipment.
- d. Identification of key result areas (major functional groups of maintenance tasks) for which individual standards will be developed.
- e. Collection of data and application of formula that prescribes the component elements of a standard.

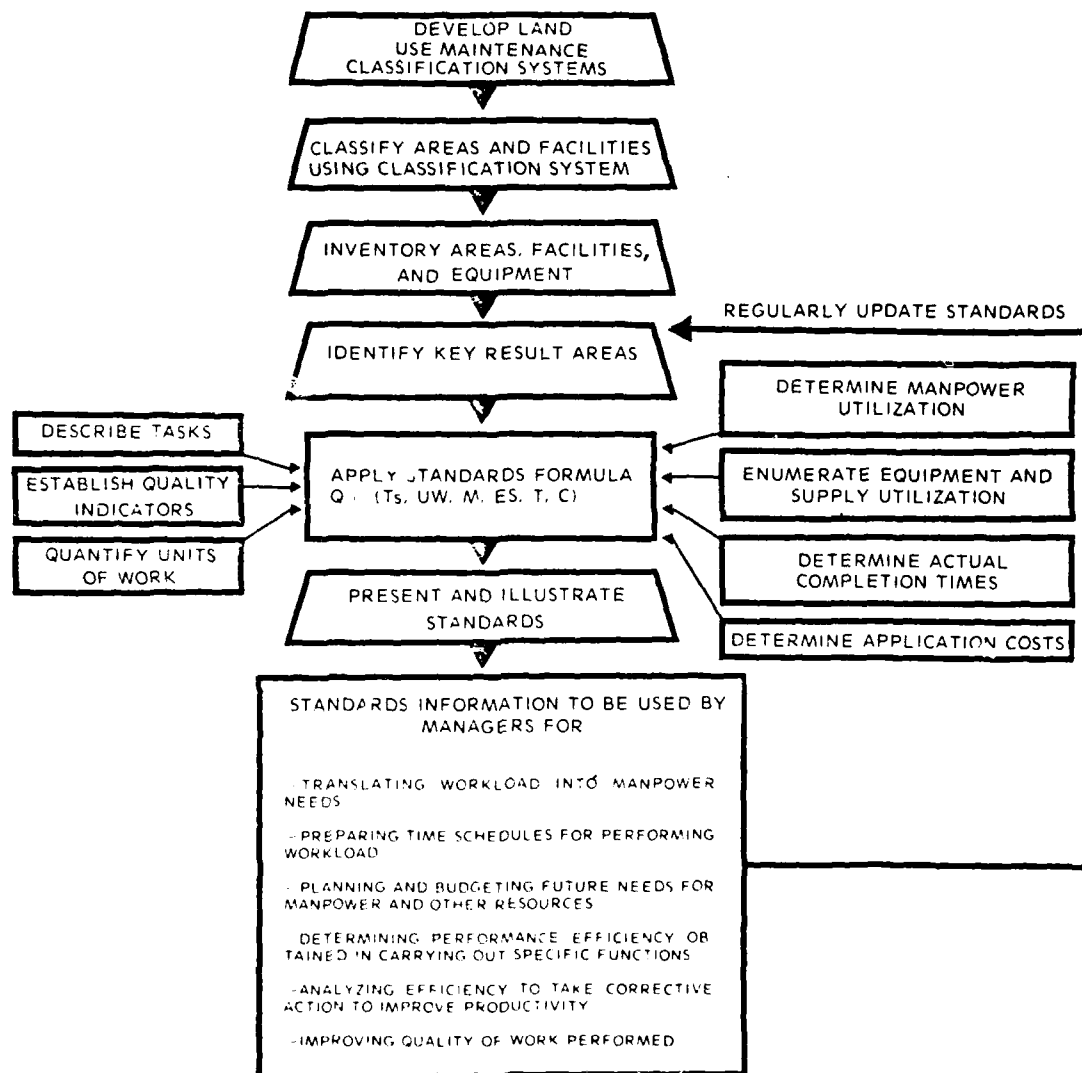


Figure 1. Illustration of methodology for developing and using O&M standards (standards formula is explained in paragraph 72)

- f. Presentation and illustration of the performance standards.
- g. Local application and regular updating of the standards.

63. What follows is an abbreviated description of the methodology and the steps involved in its application. A complete description is included in Bumgardner (1980).

64. Develop land use/maintenance classification system and classify areas and facilities. Because of the great variations that exist among land uses and the maintenance required to facilitate those uses, it is necessary to classify areas and facilities on a systematic basis. The primary purpose of developing a classification system is to determine the scope and variety of resources for which O&M performance standards will apply. It also serves as a means of identifying the levels and intensity of maintenance required by types of existing development.

65. For developing a classification system, it is recommended that the Corps' existing land use allocations system prescribed by Change 3 to Engineer Regulation 1120-2-400 (Headquarters, Department of the Army 1976) be utilized to account for local land use and development characteristics. Revisions in the land use allocations system are suggested in Bumgardner (1980) for improving the system and making it more adaptable to the formulation of O&M performance standards.

66. Using the information in the previous paragraph, developing O&M standards starts by establishing an appropriate land use classification system that contains descriptions of the various land use

categories. From there, all project areas and facilities are classified through the use of the land use classification system.

67. Inventory areas, facilities, and equipment. Next, areas and facilities are inventoried, using land use and maintenance equipment classification systems that serve as guides for unit location and identification. The amount and size of areas and facilities within each classification category are inventoried and tallied.

68. The existing system prescribed by Engineer Regulation 735-2-1 (Headquarters, Department of the Army 1978) provides for the needed equipment inventories. The Corps District Offices send "annual property accountability inventories" to projects that identify each of their equipment items by individual numerical codes and corresponding nomenclature.

69. Identify key result areas. Having completed the inventory and classification of areas, facilities, and equipment, the standards developer is prepared to proceed to the next step of the methodology: identification of key result areas (KRA's). Key result areas may also be referred to as O&M functional areas; in either case, they represent the systematic grouping of maintenance processes considered essential or key to a complete, effective O&M program.

70. When identifying KRA's (standard topics), the developer refers to the classification tabulation and the areas and facilities inventory. With this information, he formulates a list of pertinent maintenance tasks and activities. The list need not be exhaustive, but it should cover most of the activities involved in seasonal operations and

maintenance. According to the National Commission on Productivity and Work Quality (1975), as a rule of thumb, "consultants with expertise in this area generally agree that about 75-80 percent of the real property maintenance and repair work should be covered by standards."

71. Apply standards formula. Having completed the initial three steps of the methodology, the standards developer is prepared to apply a formula that enables identification and description of the components of individual O&M standards.

72. The formula incorporates all of the factors considered essential for describing the qualitative levels at which specific O&M tasks are to be performed. Represented by $Q_f (T_s + UW + M + T + ES + C)$, the formula is interpreted as: quality is a function (Q_f) of tasks (T_s), unit of work (UW), manpower (M), time (T), equipment and supplies (ES), and cost (C). It is not a statistical formula although it could potentially be developed into a regression equation.

73. To clarify the application of the formula, descriptions of each factor are as follows:

- a. Quality. A description of the condition expected upon completion of the work. Quality is a derivative of many factors such as consideration of aesthetics and orderliness, health and cleanliness, safety, and properly functioning equipment and facilities, as well as conservation and sound environmental practices.
- b. Tasks. A combination of the operation and maintenance activities required to accomplish the work defined in the task description. To the extent feasible, this includes a description of the processes and procedures that are the most efficient and effective for completing the work.
- c. Unit of Work. The quantification, in standard units

of measurement; e.g., individual numbers, acres, miles, square feet, square yards; of the amount (volume) of work for which the standards apply.

- d. Manpower. The identification of the number and classification of personnel that it would take to accomplish the tasks within the time frame allotted using the techniques, equipment, and materials specified. Where applicable, manpower identification should coincide with commonly used craft designations.
- e. Time. This represents the average time necessary for a qualified craftsman or adequately qualified individual, working at a normal pace, following prescribed methods, working under capable supervision, and experiencing only normal delays to perform a defined amount of work of a specified quality. These times include all operation times constituting the tasks for each standard, but do not include job preparation, travel, or unusual delays.

74. With an understanding of the formula and its components, the standards developer is ready to apply the formula and prepare individual O&M standards. Preparing the standard begins with the standard's title that was determined through grouping O&M tasks according to key result areas. Having titled a standard, the next step is briefly to list all of the inherent work tasks (Ts) pertaining to the standard's topic. Next, indicators of quality (Q) with which the tasks are to be performed are briefly described.

75. At this point, the procedure becomes primarily that of quantifying the remaining components of a standard. The unit of work (UW) (e.g., acres of grass) for which the standard applies is identified. The manpower requirements (M) (e.g., number of equipment operators) are identified for performing the unit of work. Average amount of time (T) (e.g., 30 to 45 min) required to complete the tasks is identified.

Equipment and supplies (ES) used to complete the tasks are enumerated. Finally, cost (C) involved in the application of the standards is calculated.

76. Alternative sources of information for completing each of the components of O&M performance standards are described in Bumgardner (1980).

77. Present and illustrate standards. This is an important step in the development of O&M performance standards; each item of the individual standards must be communicated in an easily comprehensible format.

78. The format used in the example standard in Appendix A is recommended as one style. A photograph would be useful to illustrate the optimum condition such as excellent, good, fair, or poor. Another approach might be illustration of acceptable and unacceptable conditions. In either case, the use of several photographs depicting degrees of quality would be the most effective means of communicating qualitative expectations. Color photographs, although more costly, would also be better than black and white, especially for illustrating such things as degrees of cleanliness.

79. Apply locally, and regularly update standards. In order to maximize the utility of O&M standards, they must be systematically applied and regularly updated. In the long run, this becomes as important an element in the development methodology as the initial information and data collection steps.

80. There are numerous ways in which O&M standards can be applied. Foremost is their use as a planning, programming, and scheduling tool

for determining and specifying the resources required to achieve a prescribed quality of work at any given time. That is to say, until the work specified by a standard is repeated, public use and natural processes will decrease the condition reached.

81. Aside from this primary application of performance standards, there are numerous other uses. The following uses are recommended by the National Commission on Productivity and Work Quality (1975):

- a. Translating workload into manpower needs.
- b. Preparing time schedules for performing workloads.
- c. Planning and budgeting future needs for manpower and other resources.
- d. Determining performance efficiency attained in carrying out specific functions.
- e. Analyzing efficiency to take corrective action to improve production.

82. Once a comprehensive set of standards has been developed, it cannot be applied indefinitely without change. Standards must be continually evaluated and adjusted to meet local and changing circumstances. They must be periodically updated to reflect changing agency objectives and priorities, capabilities, and the nature of the resources being maintained. Maintenance standards should be changed in accordance with improvements in work force proficiency, technology, mechanization, and availability of improved supplies and equipment. It is recommended that O&M performance standards be updated annually.

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APPENDIX A:

EXAMPLE O&M PERFORMANCE STANDARD*

<u>Key Result Area:</u>	Mowing and Trimming
<u>Tasks:</u>	Cut grass to height of 1 or 1-1/2 to 3 in.* aboveground. Grass trimmed horizontally around trees, shrubs, lights, guardrails and barrier posts, and buildings. Grass trimmed vertically along curbs and sidewalks.
<u>Quality Indicators:</u>	Grass cut evenly, not knocked down or left with ragged ends. No skinned surfaces, or damaged trees, shrubs or fixtures. Grass neatly and evenly trimmed.
<u>Unit of Work:</u>	1 acre of open space with 10 to 15 trees.
<u>Manpower:</u>	1 equipment operator and 1 laborer.
<u>Time:</u>	0.75 hr.
<u>Equipment and Supplies:</u>	1 tractor-mounted mower, 1 weedeater, 1 gal gasoline.
<u>Cost:</u>	\$8.75.

*This example O&M performance standard was formulated through application of the methodology presented but is only illustrative of the types of specifications that standards should contain and cannot be considered as accurate.

**A table of factors for converting U. S. customary units of measurement to metric (SI) is presented on page 4.

In accordance with letter from DAEN-RDC, DAEN-ASI dated 22 July 1977, Subject: Facsimile Catalog Cards for Laboratory Technical Publications, a facsimile catalog card in Library of Congress MARC format is reproduced below.

Bumgardner, Walter H.

Alternative approaches to operating and maintaining recreation areas / by Walter H. Bumgardner (Environmental Laboratory, U.S. Army Engineer Waterways Experiment Station). -- Vicksburg, Miss. : The Station ; Springfield, Va. : available from NTIS, 1983.

44, 1 p. : ill. ; 27 cm. -- (Technical report ; R-83-1)

Cover title.

"March 1983."

Final report.

"Prepared for Office, Chief of Engineers, U.S. Army."

At head of title: Recreation Research Program.

Bibliography: p. 44.

1. Recreation--costs. 2. Recreation areas--costs.

I. United States. Army. Corps of Engineers. Office of the Chief of Engineers. II. Recreation Research Program.

III. U.S. Army Engineer Waterways Experiment Station.

Bumgardner, Walter H.

Alternative approaches to operating and maintaining : ... 1983.
(Card 2)

Environmental Laboratory. IV. Title V. Series: Technical report (U.S. Army Engineer Waterways Experiment Station) ; R-83-1.

TA7.W34 no.R-83-1