EDRS PRICE MF $0.65 HC $4.67 Plus Postage.
DESCRIPTORS Agribusiness; *Agricultural Education; Career Exploration; Curriculum Guides; Management; Natural Resources; Off Farm Agricultural Occupations; Post Secondary Education; *Recreation; Recreational Facilities; Recreational Programs; Recreation Finances; Recreation Legislation; Teaching Guides; *Vocational Agriculture; Vocational Education
IDENTIFIERS *Outdoor Recreation

ABSTRACT

This curriculum guide for agricultural education contains nine chapters on outdoor recreation. Each is written by a different author (professors at Virginia Polytechnic Institute and State University) and follows a similar format: Objectives, list of references, list of teaching materials, notes on teacher preparation, content for presentation, notes on application, and notes on testing. The chapters are (1) Selecting a Career in Outdoor Recreation, (2) Exploring Opportunities for Establishing a Recreation Business, (3) Understanding the Economic Importance of Renewable Natural Resources, (4) Meeting the Requirements of Local, State, and Federal Laws, (5) Insurance for the Campground Owner, (6) Turfgrass Management, (7) Managing a Recreation Business, (8) Environmental Considerations in Outdoor Recreation, and (9) Repairing and Maintaining Sturctures. (HD)

for
Agricultural Education

Prepared by:

Robert McElwee
Tom Ford
W. R. Luckham
John Shoulders
David Groves
Fred M. Lamb
Cecil D. Wheary
Ivan Williams
William Dudley III

Edited by:

Martin B. McMillion

Agricultural Education Program
Division of Vocational and Technical Education
College of Education
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061

In Cooperation with

Agricultural Education Service
Division of Vocational Education
State Department of Education
Richmond, Virginia 23216

1976

them to write the chapters.

The authors of the chapters were all professors at Virginia Polytechnic Institute and State University. The authors and their departments follow:

Robert McElwee, Forestry and Forest Products

Tom Ford, Community Resource Development

W. R. Luckham, Agricultural Economics

John Shoulders, Agronomy

David Groves, Forestry and Forest Products

Fred M. Lamb, Forestry and Forest Products

Cecil D. Wheary, Agricultural Engineering

Thanks go to John E. Strode and James McGuire of Western Kentucky University for providing certain materials used in this publication.

The help of student assistants, William Dudley, III, Larry Powell and Ivan Williams in collecting materials, keeping various authors on schedule, and performing other duties was crucial to the completion of Outdoor Recreation.

Martin B. McMillion

3. To inform students of the types of schools offering study and training in preparation for a career in outdoor recreation.

4. To inform students of the educational background needed for work in the outdoor recreation field, including jobs requiring specialized vocational training.

REFERENCES:

1. Field and Stream, "Outdoor Career Guide" by Charles Nansen, April, 1967.

2. Forestry Curricula Brochure, Division of Forestry and Wildlife Resources, VPI & SU.

3. Forestry and Its Career Opportunities, by Hardy L. Shirley, McGraw-Hill Book Company, New York, Rev. 1965, 454 pp.

4. Careers in Forestry, USDA Misc. Pub. 249, U.S. Gov't. Printing Office, Washington, D.C.

5. Opportunities in Forest Service Management Careers, USDA Pub. 535, U.S. Gov't. Printing Office, Washington, D.C.

6. Careers in the United States Department of the Interior, U.S. Gov't. Printing Office, Washington, D.C.

7. Recreation in American Life, Carlson, Deppe, & MacLean, Wadsworth Publishing Co., Belmont, Calif., 530 pp.

8. Forest Recreation, Robert W. Douglas, Pergamon Press, 366 pp., Revised.

9. Recreation Use of Wild Lands, Brockman et. H. McGraw-Hill, 329 pp., 2nd edition.

10. Elements of Park and Recreation Administration, Charles E. Doell, Burgess Pub. Co., Minneapolis, Minn., 340 pp.

16. Trees and Forests in an Urbanizing Environment, Cooperative Extension Service, University of Mass., 168 pp.

17. The Virginia Outdoors Plan - 1974, Commonwealth of Virginia, Commission of Outdoor Recreation, Richmond, Va., 192 pp.

18. Economic Survey of Wildlife Recreation, Environmental Research Group, Georgia State University, Atlanta, Ga.

19. Guidelines to Planning, Developing, and Managing Rural Recreation Enterprises, Bulletin 301, Extension Division, VPI & SU.

TEACHING MATERIALS:

1. Chalkboard

2. Bulletin Board

I. PREPARATION

A. Motivation

With the increase in leisure time (that time free from labor when one is at liberty to choose what one wishes to do) that we are experiencing today, ever-increasing demands are being made to provide recreational facilities of all conceivable types. An affluent, mobile population with shorter working hours, such as that envisioned for the next several decades in the United States, will continue to pursue recreational interests of many kinds.

Recreation, the pleasurable and constructive use of spare time, means many things dependent upon the abilities, talents, and likes of the individual. It takes many forms. For the sake of our discussions, recreation can be broken into passive and active types. Passive forms of recreation are those not associated with physical exercise or movement such as reading, playing musical instruments, theater, spectator sports, cards, some hobbies and crafts, and the like. Active recreation involves some type of physical exercise of movement and can be further subdivided into concentrated and dispersed types. Concentrated recreation activities are those taking place primarily within a confined

B. General Situation

Discounting the economic slump of the mid-1970's, the American people have more disposable income while spending less time on the job to sustain themselves and their families, are more mobile and have more time from occupation-oriented duties than any civilization in recorded history. More time and resources are available for leisure activities than ever before. Americans are thus demanding and supporting a wide range of recreational pursuits to the extent that the total recreation industry is one of the largest in the country. Many types of recreational pursuits are available today that were not envisioned 25 or even 10 years ago. Take, for example, skydiving or winter sports in the Southern Appalachians, or the development of theme parks such as Disneyland or in Virginia, King's Dominion and Busch Gardens. Additionally, traditional recreational pursuits such as water sports, hunting, fishing, bicycling, and camping have grown tremendously in the last several years. Each pursuit offers investment and employment areas with food service, housing, transportation, and tourism in addition to working directly with the particular recreation interest. Presently, and for the foreseeable future, a healthy proportion of the total American income will be spent for recreation, offering a wide variety of employment opportunities.

C. State Situation

Virginia has a unique advantage in catering to the recreation public in that:

1. Physiographically, our state has within its borders the complete array of topography found in Eastern North America. Between the salt-water beaches on the east and the near-boreal forests on the mountain-tops in the Appalachians lies the flat coastal plain of the Southern U.S., the rolling hills of the Piedmont, and the deep valleys associated with mountain country. Such a diversity of land forms offers all types of both summer and winter recreation.

2. Geographically, Virginia is the nearest neighbor to the highly populated Northeast and most vacation-seeking people in these highly urbanized areas pass theough Virginia on their way elsewhere if indeed Virginia is not their final destination. The

interest in recreation and tourism. If properly developed, this industry is potentially one of the most important to the state, offering opportunities for investment and creating jobs for our people.

II. PRESENTATION

A. Introduction

1. Types of employment in the general field of outdoor recreation are many and varied.

2. Opportunities are varied and the exact place of each individual seeking employment depends on individual interests and talents, capabilities and training.

3. Space limitations preclude listing all the many types of jobs in this field. The list below is merely indicative and can be expanded independently by an imaginative person.

B. Examples of Job Opportunities in Outdoor Recreation

1. Water Based Activities

a. boat rentals
b. mechanic
c. fishing vessel crew
d. bait farm operator
e. fishing guide
f. concessionaire
g. fish hatchery operator
h. fee fishing lake operator

2. Land Based Activities

a. park ranger
b. campground operator
c. hunting guide
d. equipment rentals
e. grounds keeper
f. equipment operator
g. concessionaire

d. entertainment director
e. sports directors and instructors
f. law enforcement
g. safety officers
h. maintenance supervisor

3. Technical and Professional - 4-year college degree or higher

a. planner
b. naturalist
c. researcher
d. park ranger

D. Types of Organizations Employing Recreationalists

1. Federal Government

a. U.S. Forest Service
b. National Park Service
c. Corps of Engineers
d. Soil Conservation Service
e. Fish and Wildlife Service
f. Bureau of Land Management
g. Bureau of Outdoor Recreation

2. State Government

a. State Parks Commission
b. The Division of Forestry
c. Game Commission
d. Commission of Outdoor Recreation
e. State Planning Commission

3. Local Government

a. Planning Commissions
b. Town Recreation Boards

4. Private Enterprise

a. campgrounds

A. Unskilled - basic laborers and all unskilled jobs employed at an hourly rate based on minimum wage of $2.10 per hour. Very small increases and no fringe benefits can be expected for this type job, except possibly for unskilled but permanent employees of Federal and State Government Agencies.

B. Semi-skilled and Skilled - These, based on a craft such as mechanics, equipment operating, and other manual skills, demand salaries comparable to these trades in other occupational areas, i.e. $4-5/hour. Many of the jobs in this category are seasonal and do not offer year-round employment. Where such jobs are full-time, however, the job usually has provision for fringe benefits such as vacations and group insurance.

C. Professional and Managerial - These are true career jobs with industry or governmental organizations with entering salaries of $9-12,000/year or higher, plus normal benefits. Most require a B.S. degree from an accredited college or university. Most Federal Government jobs at this level are at the GS-7 Grade with entering salary of $10,520 per year in 1975. Advancement in both responsibilities and salary is dependent upon the skills and initiative of the individual.

IV. APPLICATION

A. Have students list the outdoor recreation facilities and attractions in your area; name and classify the various jobs associated with each.

B. Bring in an administrator from a local recreation enterprise and have him review the jobs, training required, and salary scales of the employees in the enterprise.

V. TESTING

Have students prepare a job description in recreation in which they are interested, giving qualifications needed, training, duties performed, and any other information pertinent to the job.

3. To make students aware of existing as well as potential recreation oriented businesses existing within their community.

REFERENCES:

1. Handbook of Outdoor Recreation Enterprises in Rural Areas, Farmers Home Administration, U.S. Government Printing Office: 1966 0-200-460 (22).

2. Income Opportunities for Rural Families from Outdoor Recreation Enterprises, U.S. Department of Agriculture, Economic Research Service, Resource Development Economics Division, Agricultural Economic Report No. 68.

3. Rural Recreation: New Opportunities on Private Land, U.S. Department of Agriculture, Miscellaneous Publication No. 930.

4. Rural Recreation Enterprises For Profit, U.S. Department of Agriculture, Agriculture Information Bulletin No. 277.

5. Action For Outdoor Recreation For America, Citizens Committee For The ORRRC Report, Library of Congress Catalog No. 63-22303.

6. Rural Recreation For Profit, Clodus R. Smith, Lloyd E. Partain, and James R. Champlin, The Interstate Printers and Publishers, Inc., Danville, Illinois, 1968.

7. Recreation and Leisure in Modern Society, Richard Kraus, Appleton-Century-Crafts (Meredith Corporation), 1971.

8. Forest Recreation, Robert W. Douglass, Pergamon Press, 1969.

9. Tips For Employees of the Virginia Travel Industry, Cooperative Extension Service, VPI & SU, Publication No. 6212.

TEACHING MATERIALS:

1. 16mm projector

2. In Search of Space, 16mm film, Bureau of Outdoor Recreation.

b. There exist a variety of recreation enterprises which may be considered to be potential sources of revenue.
c. There are several crucial factors which must be considered when determining the economic feasibility of developing a recreation enterprises in a particular location.

2. General Situation

a. Many private property owners unknowingly possess lands which have much potential for a recreation oriented business.
b. Forty-two million travelers spend more than a billion dollars in the Old Dominion every year. In addition to benefitting the State's entire economy, these visitors provide incomes and jobs for Virginia's seventeen thousand travel-related businesses and their 105,000 employees.
c. There exists many untapped resources and potentials in Virginia which can provide recreational opportunities for our citizens, as well as those many out-of-state tourists who visit our state annually.

3. Local Situation

a. Determine the following information from the students:
   1. What recreation areas or tourist attractions exist within your community?
   2. What potential recreation areas or tourist attractions exist within your community, both private and public?
   3. What types of recreation areas or tourist attractions do the people in your community think would be successful if developed or what do the people want in terms of recreation areas or tourist attractions?
b. Summarize the information obtained.
c. Discuss the possibility of disclosing the findings and/or suggestions to local public agencies or private citizens interested in the propagation of recreation enterprises.
d. Invite community businessmen who are presently operating recreation enterprises to discuss with the class some of the various ramifications of organizing and conducting recreation businesses (or have students interview these businessmen and relate their findings to the class).

1. Social Factors Influencing Recreation

A variety of social factors indicate that our society will continue to become more recreation and leisure oriented in the future.

a. Growth of Leisure

As our work day and work weeks become shorter, our vacations grow longer and our retirements come earlier. We see an increased number of discretionary hours and days which can be considered to be increased leisure.

Biological Needs	Subsistence (work or school)	Leisure
10 hours	9 hours	5 hours

If we break our day down into the three categories of: biological needs which includes sleeping, eating, etc.; subsistence which includes work/school and travel time to and from work/school; and leisure which is unobligated time, we can see that the average individual has approximately 25 hours of leisure during what we refer to as the "work week". During the weekends, the time usually devoted to subsistence reverts to leisure; therefore, we have approximately 28 hours of unobligated time during the weekend or 53 hours per week. These figures do not include holidays, retirement, vacations or shorter workdays and weeks.

b. Population Explosion and Urbanization

As our population continues to expand, our rural areas are being consumed by urban development. Fewer people have open fields, forests, or lakes and streams which have provided man with recreational outlets in the past. Predictions indicate that by 1985 we will have in excess of 300 million people. Approximately half of these people will be under the age of 25. We will also have in excess of 20 million retired people. This indicates that the recreation market has not even begun to reach its peak.

c. Automation and Technology

Our continuously increasing numbers of labor saving devices in the home, on the farm, in business and industry add to the snowballing effects on recreation and leisure. Mass communications relate ideas and plant "seeds of desire" within the consumer. We desire to participate in those activities to which we are exposed through television, radio, magazines, newspapers, etc. We also desire to buy recreation equipment, participate in new or challenging activities and travel to distant places via automobile, airplane, boat, bicycle, snowmobile, motorcycle or any other means of transportation.

d. Education and Affluence

We are a better educated population than those who preceeded us. We have been exposed to a wide variety of recreational pursuits. We have become aware of cultural arts, historical preservation, ecology, travel and other areas to which

our leisure time.

e. Other Factors

There are many other social factors which continue to influence the recreation and leisure market. The changing public attitude concerning the potentials of wise use of leisure time has prompted many agencies such as local communities, churches, nursing homes, schools, hospitals, correctional institutions, etc. into the recreation arena.

The travel industry also influences the recreation and leisure market. Studies indicating that the average "visitor" spends $35 a day per couple for food, lodging, visiting attractions, gasoline, shopping and miscellaneous purchases, encouraging communities to become actively involved in the business of recreation and tourism. Approximately 36 cents of every travel dollar spent in an area is contributed to payrolls of local business. One couple attracted to the area a day for 365 days per year adds over $12,000 a year to the economy of the county or city. A promotion program that attracts 100 couples a day for 365 days of the years would mean a visitor increase of $1,300,000 to the area.

Other factors relating to the physical, social, mental and emotional stability of individuals involved in wholesome recreational pursuits provides an additional plus or positive mark for the propagation of recreation enterprise.

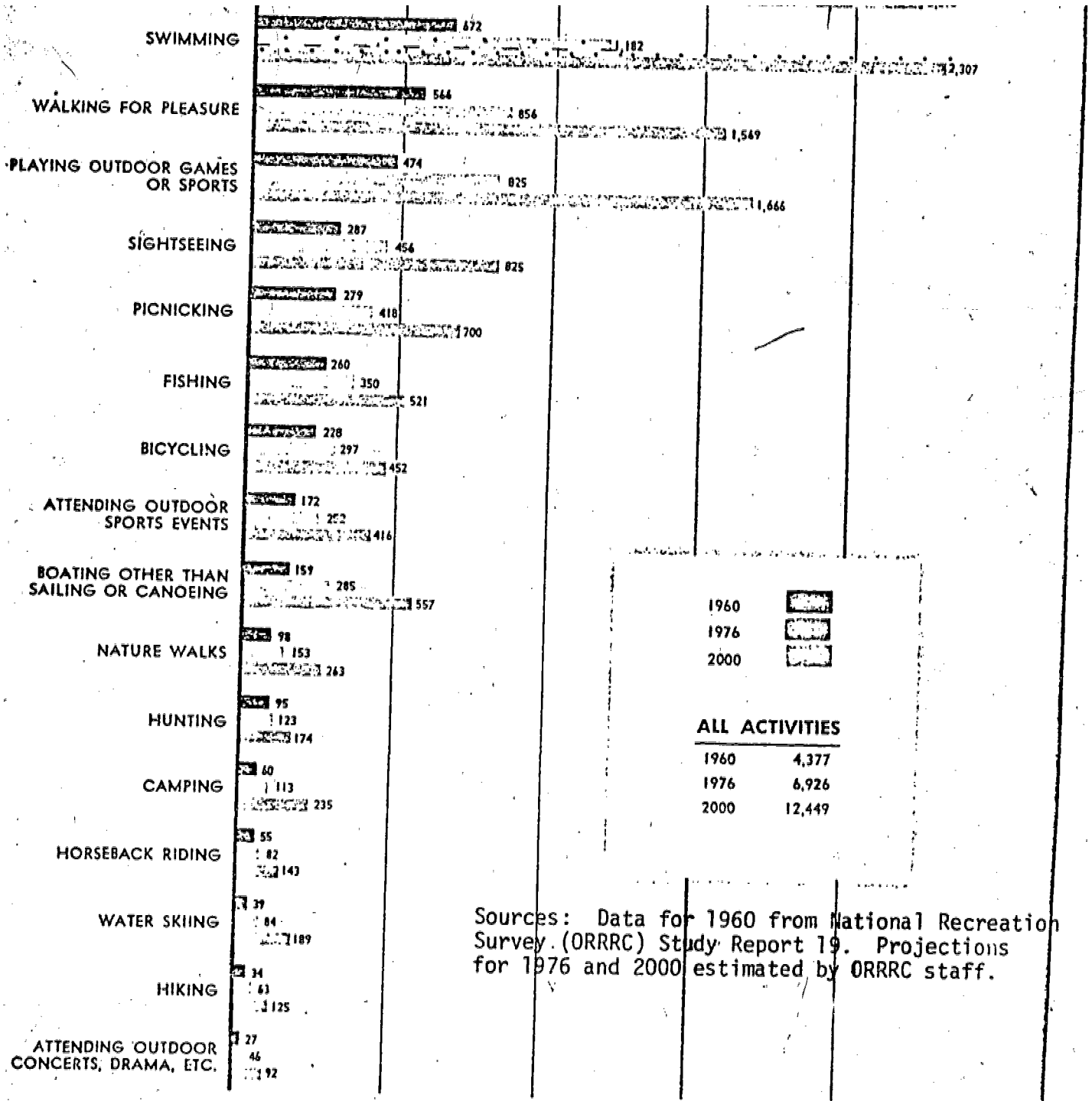
Probably one of the key factors for consideration when pondering the future of recreational developments is the fact that people want something to do during their leisure. They have money and are willing to pay for what they receive.

2. Recreation Demand

During the 1950's, the growing public demand for the outdoors and the sharpening competition for recreation resources became matters of increasing concern. In 1958, Congress recognized a need for a nationwide study of these problems and established the Outdoor Recreation Resources Review Commission (ORRRC). Congress directed ORRRC to survey the outdoor recreation needs of the American people over the next 40 years and to recommend actions to meet these needs. The Commission consisted of eight members of Congress, four members of each party from both the House of Representatives and the Senate and seven private citizens appointed by President Eisenhower.

ORRRC took inventory of the Nation's supply of outdoor recreation areas including parks, forests, and fishing and hunting areas. It questioned 16,000 persons to learn what Americans do for recreation and what they are likely to do in the future.

The Commission found that adequate provision is not being made for the rapidly expanding outdoor recreation needs of the American people. It found that the gap between demand and adequate supply of recreation resources and facilities will widen over the coming



Sources: Data for 1960 from National Recreation Survey (ORRRC) Study Report 19. Projections for 1976 and 2000 estimated by ORRRC staff.

See Table 23, Appendix

shortcomings are better understood after looking at some of the facts of outdoor recreation supply and demand.

a. By the year 2000 our population will nearly double; the over-all demand for outdoor recreation will triple.
b. The kinds of outdoor recreation most people take part in today are relatively simple: walking and driving for pleasure, playing outdoor games and sports, swimming, sightseeing, picnicking, fishing, bicycling, boating and hunting.
c. What people now do for outdoor recreation is not necessarily what they want to do in the future. For instance, more than 20 percent of those covered by ORRRC's survey said that while they do not now go fishing they would like to, or that they would like to fish more often. Other outdoor activities for which ORRRC found large unsatisfied demands include swimming, camping, horseback riding and boating.
d. Water is a focal point of outdoor recreation. Wherever they live, most people seeking the outdoors look for water--to swim and to fish in, to boat on, to walk, picnic and camp by, and just to look at.
e. People want outdoor recreation close to home and for most people home is in the fast-growing metropolitan areas. Two out of three Americans now live in metropolitan areas and by the turn of the century, three out of four will. It is here that demand for most types of outdoor recreation is concentrated.
f. As mobility continues to increase, more people will travel farther to enjoy outstanding scenic, wildlife and wilderness areas. These places are where you find them and they provide outdoor experiences of memorable quality which cannot be duplicated elsewhere. Continuing transportation improvements, higher incomes and longer vacations will result in increased pressures on high-quality recreation resources that now seem remote from population centers.

B. Suggestions for Recreation Businesses

Based on present and future demand for recreation, there are many types of recreation businesses which could provide a profitable investment. Some possible suggestions for recreation businesses are enumerated in the following paragraphs.

1. Camping areas - Many families are now traveling with many different types of mobile campers. Campgrounds offer tourists an opportunity to stay overnight or for an extended period of time at a reasonable expense. Some of the campgrounds are used by families as a base while they visit historical places, natural phenomenon, or enjoy recreational facilities in the area. Sportsmen often use campgrounds

Property owners with land in desirable locations may find campgrounds to be a profitable investment. The three types of campgrounds most commonly found are transient camps for overnight and short stays by guests, recreation or vacation camps for family camping of several days, and residential or organized camps for such groups as the Boy Scouts, Camp Fire Girls, church groups, and others (youth camps).

2. Golf Courses - The National Golf Foundation indicates that on a nationwide basis the demand for golf courses far exceeds the supply. Not only is the population increasing several millions each year but also the proportion of golfers to total population is increasing. One of the greatest advantages to the game of golf lies in the age range of those able to participate. Youths of varying ages as well as those in their retirement may be found participating. Moreover, increasing age does not seem to cause a great loss of skill, as is the case in many sports. Some of the development variations relating to golf may be the 18-hole golf course, putt-putt or miniature golf course, or a driving range.

3. Riding Stables - As our quest for returning to "days of old" enters into our leisure pursuits, interest in horseback riding appears to be a growing concern. We see many schools, colleges and universities introducing the art of horsemanship. We also see a growing interest in pleasure riding, hunting by horse, horse shows, etc. There are two general types of businesses in this category. One is riding horses for adults and the other is pony rides for children. Supplementary enterprises are horseback riding camps, boarding horses for others, pack trips for hunters, riding academies, and riding trails.

4. Vacation Farms and Ranches - More and more tourists are discovering that they can enjoy a refreshing change of pace by vacationing on one of the many farms and ranches that take in paying guests. The charges are moderate for the tourist, yet they can add income to the farm or ranch business. The appeal of farm or ranch vacations rests on the release from the confinement of city life, the opportunity to return to nature, and the mystery and fascination that farming holds for most city-bred Americans. Ranch life has the added appeal of Western atmosphere, work with horses and livestock, and "cowboy living." Parents also appreciate the opportunity for their children to experience country or western living. Some vacation farms or ranches make special arrangements to care for school-age guests without their parents in a setting similar to an organized camp.

5. Ski Slopes - As far as winter sports are concerned, skiing is by far the most popular, However, all winter sports should be considered in the light of their possibilities for making multiple use of the facilities. An example may be a ski lift that operates summer months to provide a scenic or thrilling experience

[illegible], variety of facilities, variety of terrain, and relatively dependable snow conditions. These areas are generally found on the larger mountains and include a multi-lift complex, spacious base lodges, overnight facilities, and eating establishments. Weekend oriented ski areas are characterized by somewhat limited ski terrain, relative ease of access, and a minimum of supporting facilities, yet, located in snowbelts. Areas oriented to the day skier are located within an hour's drive of the major center of population. They are characterized by severely limited terrain. There business is generated mainly by their convenient location. All of the areas may include lights for night skiing and snow making equipment.

6. Shooting Preserves - A shooting preserve usually depends on pen-raised game. The season for hunting on licensed preserves usually is much longer than for wild game. The shooting preserve is usually the primary business of the operator, with farming a supporting activity to raise food for the penned game and to provide cover for the game when released. Farming also helps to use the land, equipment, and labor during the non-hunting season. The game is usually purchased from a commercial producer although it may be profitable to raise your own. A shooting preserve enterprise may be enlarged to include meals for customers, boarding and training hunters' dogs, and cleaning and dressing the game.

7. Water Sports - The Outdoor Recreation Resource Review Commission (ORRRC) in a national survey found that water is the key focal point for recreation. Projections by ORRRC indicate that by the year 2000, swimming will be the most popular of all outdoor recreational activities. There are a variety of water based recreation businesses associated with marinas and swimming facilities which could provide a profitable investment. Some of the enterprises associated with marinas may include docking space rentals, off-season storage, rentals of paddle boats, rowboats, sailboats, and outboard motors, launching ramps, mechanical repairs, gasoline and oil sales, tackle or boat shops for fishermen, eating establishments, and instructions in boating, small crafts, water skiing or swimming. Swimming facilities may include man-made swimming pools, impoundments with natural swimming areas, and covered swimming pools. All of these areas may be operated in concert with a multitude of other types of support facilities.

8. Fee Fishing and Raising Live Bait - Just as hunters are often willing to pay for hunting privileges on private lands, some of the fishing public are also willing to pay for fishing privileges on private streams, ponds and lakes. Fishing privileges can be leased similar to hunting privileges as a source of income.

Fish out ponds are very popular in some areas. Ponds are stocked with catchable sized fish and the public is charged by the pound or inch for each fish caught. The area around the pond can be used for picnicking and camping. Additional income can be

ers or fishermen can become a profitable business. The first step towards establishing a fish bait business is to determine the availables markets. A chat with local sporting goods stores or bait vendors will give you some idea of the demand. It will also give some ideas on how big an operation would be justified.

Earthworms are easy to raise and require little in terms of facilities, space or time. They can be raised indoors or outdoors in specially prepared beds or containers. Redworms are preferred and recommended by earthworm growers because they are prolific breeders and easy to raise. Night crawlers are more difficult to raise but make excellent fishing bait and are preferred by many fishermen.

Minnows make excellent bait and can be raised in small ponds. The bait fishes most economical to propagate are those that have a high reproductive capacity, spawn on submerged objects and feed on microscopic plants and animals. Fathead minnows and golden shiners will spawn in small ponds and are the most common minnows to raise.

A variety of larval and adult forms of insects make excellent fish bait and can be raised commercially with only a limited expenditure of time and money. Crickets, roaches and meal worms are commonly raised for fish bait. All three can be raised indoors.

Several types of live bait commonly used for fishing cannot be raised profitably but can be collected in suitable habitats. Frogs, salamanders and hellgramites are three popular baits that can be collected in or near water and kept in damp moss for sale to bait dealers and fishermen.

9. Lodges and Cottages - Land with attractive natural features or that can be developed into a pleasing recreation area offers the opportunity for constructing and renting cottages and lodges. These facilities may also cater to family reunions, professional or civic groups, and similar organized groups which may desire overnight facilities for conferences, meetings, etc. These types of facilities may best serve in a supportive fashion to nearby historical sites, natural scenic beauty, or highly developed recreational areas. Lodges and cottages may also be considered as support facilities of a planned unit development which may include a variety of various types of developments previously discussed.

10. Other Businesses - There are a variety of additional recreation businesses which have not been mentioned. The possibilities for any particular type of enterprise is limited only by the vision and innovations of the operator. There cannot be an all inclusive listing of recreation enterprises because everyday innovative investors discover new ways to attract the tourists' or recreation seekers' dollars. Some additional considerations for recreational developments may include development of historical sites and places; skeet and trap ranges; fishing ponds, lakes or areas; hunting areas; combination picnic and recreation sports areas; archery or rifle

tourist attractions such as your local chamber of commerce, etc. or reports compiled by the students.)

C. Evaluating the Feasibility of Development

After a potential investor has decided on some possible alternatives for developing a recreation business, there are many factors which should be considered. One of the most helpful things an investor can do as he or she begins to eliminate some of the alternatives would be to personally visit a business similar to the business which he or she plans to develop. This will give the investor an opportunity to observe a similar business in operation, as well as talk to the owner and employees concerning the strengths, weaknesses, and suggested changes in operation or development. After the preliminary alternatives have been narrowed down, some of the basic factors to be considered are enumerated and discussed in the following paragraphs. You may receive assistance when evaluating these factors by contacting the many resource people within your community. Examples of these resource people include your county extension agent, Soil and Conservation Service, Chamber of Commerce, local planners, architects, landscape architects, college or university personnel, recreation enthusiast concerned with development of areas similar to those you propose, bankers, accountants and many other people with expertise in the variety of areas you need to consider.

1. Accessibility - The success or failure of a recreation development will depend heavily on the accesibility of the site by a variety of transportation methods. How easy, or how difficult will it be for the potential customers to get to the facility? What are the traffic patterns of the area? Are major highways or interstate roads near the development? Can bus, train, or airplane transportation be utilized to attract visits by tourists, based on conveniency?

2. Proximity - Is your proposed development close to a high density area or population center? Will other attractions in the area support your business? Do adequate support facilities such as motels, restaurants, and auto service stations exist?

3. Future Changes - What future changes will affect your proposed development? Are new highways planned for the area? Are large tourist developments planned by other entities? Will anticipated changes in the environment, zoning or some other factor affect your development positively or negatively?

4. Competitive Enterprises - Do other businesses in your area attempt to cater to the same audience you plan to serve? Will the supply of a proposed service exceed the demand?

for your development? Where will you get your employees? Who will train them? How much will you have to pay them?

7. Public Interest - To what extent will the public be interested in utilizing your development? How does your community react to your proposed development? Do your local community members feel that the development will be a liability or an asset to the total community development?

8. Size and Terrain - Is the size and terrain of your proposed site adequate for the proposed development? Have you taken into consideration future expansion?

9. Water(Surface) - Does your proposed site have any water impoundments which could be utilized as an asset for your development? Will the quality and quantity of water in relationship to recreational as well as basic needs be adequate?

10. Soils - Will your soils be suitable for the type of development you plan? Is or will erosion be a problem? What about your soils as a foundation for roads, buildings, trails, swimming pools, etc.? Will sewage disposal present a problem?

11. Utilities and Services - Will your water and sewage disposal be part of a community system or will you have to provide these utilities? What problems will you encounter in regards to telephone service, electrical power, gas or water lines (if piped in), garbage pick-up, or general services often provided by governmental or private enterprises, yet may be readily available for your development?

12. Climate-Site Orientation - To what extent will factors such as average temperature, wind, air drainage, position on a slope, etc. influence the success or failure of your development? How will the aspect or the direction facing the sun affect your development? Would you want your ski slope facing a southern or western aspect? Will the average amount of rainfall in your area affect the probability of success of recreation business?

13. Aesthetic Qualities-Natural Features - How may the natural features or aesthetic quality of your site be utilized to best enhance your total development? To what extent will existing or potential wildlife and fish enhance your total development? How does existing vegetation play a role in your development plans? To what extent will the existing area support anticipated vegetation? Will rocks or geology affect your development decisions?

14. Capital Investment and Current Expenditures - What areas and facilities will you have to develop? How much will the initial cost be? After you have completed construction, what will you need to oper-

Will your anticipated participation multiplied times your fees over a period of time equal your capital outlay as well as your current operating expenditures?

15. Positive Attitude - If you are not relatively assured that your investment will be sound, based on the foregoing considerations, perhaps you should look at some other alternative. However, if you feel your anticipated development will be a success, you should continue to develop your plan of action by working with professional developers, planners, financiers, and related specialists to further assure successful development.

(The foregoing suggestions may be discussed more elaborately by the students and outside speakers with expertise in the various areas considered, or researched by the students for indepth information relating site and facility development.)

III. APPLICATION

A. Take students on a field trip to a recreation site presently being developed and/or in operation.

1. Discuss preliminary steps taken prior to developing the recreation business.

2. Discuss strengths and weaknesses in development and/or operation.

B. Have students assist with evaluating the potentials of a site for a recreation enterprise.

C. Have students brainstorm and report on innovative ideas for recreation developments or businesses.

IV. TESTING

A. Awareness of factors influences the potential of a site for recreation development.

B. Evaluating the potentials of an actual site.

C. Awareness of some of the various types of recreation businesses which could be developed.

D. Awareness of recreation developments existing within their areas.

E. Awareness of those types of recreation businesses which do not exist, yet may provide ideas for future developments.

OBJECTIVES:

1. To acquaint students with the scope of activities encompassed by outdoor recreation.

2. To illustrate existing and projected demand (in activity days) for specific types of outdoor recreational activities.

3. To acquaint students with the different types of recreational developments and complexes.

4. To provide students with some concepts useful in estimating the population to be served by a recreation facility and in calculating the break-even point.

REFERENCES:

1. Guidelines to Planning, Developing and Managing Rural Recreation Enterprises, V.P.I. & S.U., Bulletin 301, September, 1966.

2. Conducting a Feasibility Study for an Outdoor Recreation Enterprise, V.P.I. & S.U., Circular No. 1011, April, 1966.

3. The Virginia Outdoors Plan - 1970 - Commission of Outdoor Recreation, Commonwealth of Virginia.

I. PREPARATION

A. Motivation

1. Lesson Approach

a. Plan a tour of selected outdoor recreation developments to:
   (1) observe the activities that are combined to provide a successful recreational experience for the user.
   (2) discuss with the owner/manager the process by which he developed his existing operation - include demand factors recognized, site selection, planning process, development and operation.
   (3) discuss with operator, the opportunities and requirements for a successful enterprise.
   (4) if possible, visit both privately owned and publicly owned recreational facilities.

b. Discuss with class the types of outdoor recreation in which they and/or their families participate.
   (1) list types
   (2) frequency of participation

2. General Situation

a. There is a large variety of outdoor recreation type activities.
b. Some of these are free, some publicly financed for which a fee is charged and some privately financed where fees are charged to provide a profitable enterprise.
c. Demand for both public and private type recreation enterprises is expanding rapidly as work weeks shorten and income rises.
d. Being people-oriented businesses, substantial amounts of capital must be invested and a high degree of managerial ability applied to the operation to be successful.
e. Most enterprises are highly seasonal, with peak operations during the three summer months. Even within this period, demand tends to be concentrated on the weekend and holiday periods.

3. Local Situation (Before starting to teach this unit, the teacher should collect as much information as possible on the local situation, as follows.)

a. Public Recreation - town or county recreation director
- parks, picnicking facilities, outdoor sports facilities
- programs, i.e. sandlot, little league, etc.
- campgrounds
- others

b. Private Recreation - open to the public on a fee basis
- types available, capacity, activities available
- season of operation
- fees or use charges
- others

II. PRESENTATION

A. General

Recreation means many different things to different people. It is what one does with his leisure time. Leisure is time to be used as one chooses. It excludes existence time (that portion of time devoted to maintaining life in such activities as eating, sleeping, and personal hygiene) and subsistence time (that portion of time spent mainly in working or preparing for work, in training, and in participating in socially or group determined activities in which the individual would prefer not to participate).

The majority of Americans, both urban and rural, are already experiencing more leisure time as work weeks shorten and income rises. Leisure and recreation are closely related, but they are not the same. Leisure is time of a special kind, while recreation is activity (or inactivity) of special kinds. Recreation takes place during leisure time, but not all leisure time is spent in recreation.

of doors. There are eleven generally accepted categories of outdoor recreation developments.

1) Vacation Cabins, Cottages and Homesites
2) Camping grounds (vacation site, transient, pack trips, etc.)
3) Picnic and Field Sports areas
4) Fishing waters
5) Golf courses
6) Hunting areas and Shooting preserves
7) Natural, Scenic and Historic areas
8) Riding stables
9) Vacation farms
10) Water Sports areas
11) Winter Sports areas

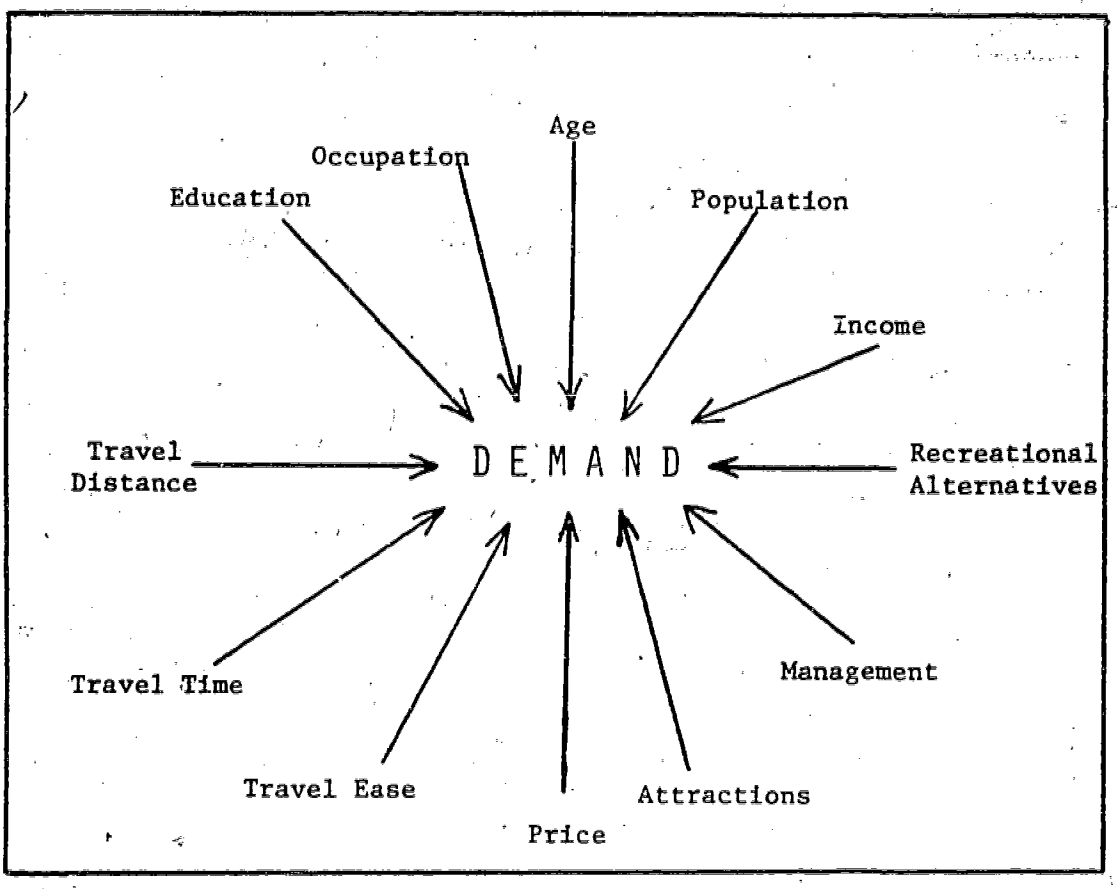
B. Types of Recreational Activities and Estimated Demand for 1968 and 2020 in "Activity Days".

		Annual Demand in Activity Days		
	Recreational Activity	1968 thousands	2020 thousands	% Increase Per Year
1.	Walking for Pleasure	147,135	640,650	8.36
2.	Games and Sports	128,674	831,040	12.42
3.	Pleasure Driving	91,525	426,820	8.97
4.	Bicycling	53,351	215,850	7.78
5.	Swimming	38,609	257,594	12.83
6.	Sightseeing	33,670	192,547	11.00
7.	Picnicking	24,786	114,072	8.85
8.	Attending Outdoor Sports	21,134	104,875	9.54
9.	Boating	11,413	78,746	13.27
10.	Bird Watching	8,867	41,044	8.90
11.	Nature Walks	8,160	37,430	8.82
12.	Horseback Riding	5,920	26,729	8.68
13.	Attending Outdoor Concerts & Plays	4,966	30,577	11.84
14.	Camping	3,547	27,655	14.99
15.	Water Skiing	1,753	17,055	18.71
16.	Sledding and Toboggoning	1,562	7,539	9.28
17.	Hiking	1,329	10,345	14.97
18.	Canoeing	1,304	8,923	13.16
19.	Wildlife Photography	1,104	5,102	8.89
20.	Sailing	921	6,344	13.25

21.	Mountain Climbing	322	2,541	15.18
22.	Ice Skating	283	2,211	15.02
23.	Snow Skiing	103	830	15.50
	Total all activities EXCEPT Hunting and Fishing	590,438	3,086,519	10.05

Hunting demand for 1968 was estimated at 4,799,000 activity days and projected to 17,395,000 activity days by the year 2020. Fresh water fishing demand in 1968 was calculated to be 7,120,000 activity days and projected to increase to 31,000,000 activity days by the year 2020. Approximately three-fourths of this increase in demand for recreational activities will originate in the Eastern quarter of the state.
(Taken from: The Virginia Outdoors Plan - 1970, Volume II, prepared by the Commission of Outdoor Recreation.)

C. Factors Affecting Demand



investments, etc. These two portions of the record must be summarized in a final statement that reflects profits and losses. From these records a plan of attack can be designed to make necessary changes.

E. Directing the Business

Directing the business is the day to day execution of facilities operation, that is, handling complaints, seeing that the facilities are clean, etc. It is the most detailed part of managing an operation and must be carried out with great care. Without the proper direction at the primary responsibility level, the business will not function and the customer will not be satisfied. Customer satisfaction is the essential ingredient to profit. A satisfied customer will spread the word just as efficiently as a national advertising campaign. This is the most difficult level of management because it is concerned with details of operating the enterprise. It is important not to get hung up in the specifics of management. A practice that may help in the execution of the daily routines is the formation of daily standard operating procedures. A difficulty with this procedure is that it can be so rigid that it does not adapt to change. A routine will only work effectively if it has some type of feedback system that will allow the daily standard operating procedure to adapt to change.

F. Acquiring Equipment and Supplies

Acquiring equipment and supplies is an extremely important function because the individual wants to have the right quantity of supplies to fill his needs. This is a most critical point of the business, where profits can be gained or lost. Purchasing supplies in quantity permits the operator to buy at a cheaper price, and allows him to increase his profit margin. Records help to insure the proper quantities on hand at the proper time. The practical nature of purchasing equipment must be stressed because many problems such as storage, access, etc. are critical to increasing profits. Any practices that will allow you to increase a profit margin without causing troubles in storage, access, and delivery are good practices for your business.

Another very important practice in purchasing equipment and supplies is to keep an open mind and shop the market. There are often new types of equipment that can improve your operating efficiency. There may be distributors who will give you lower prices if competition is keen. Remember that equipment and supplies, if purchased properly and with foresight in planning, can increase efficiency and profits in terms of time and motion.

G. Coordinating Various Aspects of the Business

Coordination is seeing that all parts in the business are brought together in the proper mix at the proper time to achieve the desired objectives. The size of the business is the main factor that determines the duties of the director. Some businesses are large enough

to employ people to manage the business, leaving the owner free for coordination of activities, but other businesses are small and coordination is only one function of the manager. Regardless of the size, all coordination depends upon the individual's ability to isolate the minutest details that can cause delays in production of the product. These are the areas that will save time and thereby increase efficiency, effectiveness and ultimately profit.

There are management techniques such as Planned Program Budgeting, PERT, and other management devices that have been developed to aid management in the coordination of business activity. Although these are helpful they are only tools and it must be remembered that the manager is the person who is the main element in directing the business.

The usual cause of delays in any business, especially at the coordination level, is people. Success of the manager in overcoming such delays is in direct proportion to his ability to use his interpersonal contact to achieve fairness and rapport with employees so they will strive through cooperation to achieve the final product.

Such devices as flow charts and employee training are used by managers to help in the orientation of employees to their jobs. Newsletters and inter-departmental memos are tools to keep the employee informed about changes in the status of his job. Effective communication is the key to achieving coordination.

H. Personal Records

Business records are those that are maintained, filed, and used on a systematic basis. Personal records are usually those that are written on the back of scratch paper of a 3 x 5 index card. This type of record often adds the personal touch to the record keeping system. It allows for flexibility between the business record and the ideas that may be lost. It is a process that permits individualization of a record system.

I. Training

Training new personnel is always a problem and the quicker new employees adjust to the environment, the less time is wasted. If new employees are taught good habits, time and money will be saved. Most operations do not have training programs but it has been found that those with them have less employee problems later.

There are many types of traditional programs for training employees, but there have also been many new techniques developed. A very successful type of training program has been that called role simulation. This is an approach that simulates a real life experience, yet allows the trainer to maintain control over the situation so that bad and good points of the experience can be pointed out.

Training is a delicate process that can either hinder or benefit the employee. The primary thing to remember is that the part to whole relationship of the training process must be stressed for success. With such instructional techniques the employee will be able to see the importance of his function in the total process.

III. APPLICATION:

A. Have students conduct a feasibility study and develop a preliminary and long-range plan.

B. Have students break up into small work groups and simulate the implementation of the plans developed. Special note should be given to competition for resources, market, etc.

C. Have general discussion.

IV. TESTING:

A. Have written or oral exam with probing application questions such as:

If you wanted to develop a recreation business in County A with the following conditions:

1._____, 2._____, 3._____, 4._____, and 5._____, what are some of the problems you would encounter?

ENVIRONMENTAL CONSIDERATIONS IN OUTDOOR RECREATION

by Fred M. Lamb

OBJECTIVES:

1. To develop an understanding of the importance of environmental protection.
2. To provide the student with a basic understanding of the environmental impact of pollution.
3. To acquaint the student with the sources and effects of various environmental pollutants.
4. To make the student aware of the need to consider the environmental impact that may result from various outdoor recreational activities.

REFERENCES:

1. Environment and Man. 1971. R.H. Wagner, W.W. Norton and Company, New York, 491 pp.
2. Ecology, Pollution, Environment. 1972. A. Turk, J. Turk, and J.T. Wittes, W.B. Saunders Company, Philadelphia, 217 pp.
3. Cleaning our Environment: The Chemical Basis for Action. 1969. American Chemical Society, Washington, D.C., 249 pp.
4. A Citizen's Guide to Clean Water. 1973. Environmental Protection Agency, Washington, D.C., 94 pp.
5. The Campaign for Cleaner Air. 1973. Public Affairs Pamphlet 494, Public Affairs Committee, New York, 29 pp.
6. Toward a New Environmental Ethic. 1971. Environmental Protection Agency, Washington, D.C., 23 pp.
7. Ecology Series, Virginia Polytechnic Institute and State University, Extension Division, Blacksburg, Virginia:

   Pub. No. 331 - Ecology
   Pub. No. 332 - Agricultural Chemicals
   Pub. No. 446 - Air Pollution
   Pub. No. 448 - Noise

8. Population, Resources and Man. 1970. P.R. Ehrlich and A.H. Ehrlich, W.H. Freeman and Company, San Francisco, 320 pp.
9. A Citizen's Guide to Clean Air. 1970. Conservation Foundation, Washington, D.C., 100 pp.
10. Clean Air and Your Car. 1974. Environmental Protection Agency, Washington, D.C., 24 pp.

11. The State of Virginia's Environment. Governor's Council on the Environment, Richmond, Virginia. 59 pp.

TEACHING MATERIALS:

1. Environment Film Review: A Guide to Ecology Film. Environment Information Center, New York.

2. Slide Projector and Screen

3. 16mm Projector

I. PREPARATION

A. Motivation

1. Lesson Approach

a. Ask the students to explain their views on ecology, the environment, and the impact of people and technology on the environment.
b. What are the major types of pollutants that contribute to air pollution and water pollution, etc.?
c. Our life styles, our technology, and in fact, almost all of our activities have some impact on the environment. In some situations this impact is small; in other cases it can be very detrimental. The major thrust must be to create an awareness of these environmental impacts so we can meet the challenge of how to maximize the benefits of our modern technological society while at the same time minimize the present and future hazards to our environment.
d. The new environment ethic: "Maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations" (From the National Environmental Policy Act of 1970).

2. General Situation

a. Virginia is experiencing increasing pressures on the environment due to an increasing population, urbanization, and industrialization.
b. A growing tourist industry is bringing unique environmental pressures and problems.

3. Local Situation

Through discussion with the students determine the following:

a. What are the local pollution problems?
b. What are the major local sources of pollution?
c. What local environmental damage has occurred or is occurring?
d. What environmental problems exist at local recreational areas?

II. PRESENTATION

A. Environmental Quality

Over the past years, the environmental fervor and emotion have given way to a commitment to protect the environment but still the question "how clean, how pure, and at what cost?" is asked. As a people we are still groping to define what we mean by environmental quality as well as determining how much quality and how much we are willing to pay. These are hard social, moral, and philosophical questions but questions we must answer.

At this point in time, we are encourage to think that we have made progress in our movement for a cleaner environment. How much depends on your point of view. This is like asking if a glass is half empty or half full. One fact is certain, we have gained maturity in our struggle with environmental issues. If nothing more, this maturity will help prepare us for the even more taxing and contradictory challenges regarding the environment we have yet to face. The years of confronting and solving environmental problems and developing public policy on the environment has made apparent the fallacy of portraying the issues as Polluters versus the People, People versus Industry, or You versus Me. Environmental quality is a deadly serious matter. It cannot and should not be reduced to overly simplistic slogans. Indeed, it can be simplified very little. The choices are rarely ever black and white. Decisions are not simply yes or no. All involve careful identification of costs and benefits, social implications, and environmental trade-offs. Yet, there should be little argument that the commitment to environmental quality must be maintained. We can ill afford to do otherwise, for in many situations, the time is running out - at an accelerating rate.

B. Air Pollution

Air pollution is atmospheric contamination put into the outdoor air by man and his activities. Each year about 200 million tons of manmade waste products are released into the air. About one-half of this pollution is produced as a result of our transportation systems, coming chiefly from the internal combustion engine.

1. The major sources of air pollution are:

   a. Motor vehicles
   b. Fuel combustion in stationary sources (power plants, heating systems, boilers, etc.)
   c. Industrial processes
   d. Solid waste disposal practices (incinerators, etc.)
   e. Construction
   f. Quarries and mines
   g. Open burning
   h. Other miscellaneous sources

2. The major air pollutants are:

   a. Particulate matter such as dusts and smokes arising primarily from fuel burning

b. Sulfur oxides
c. Carbon monoxide
d. Hydrocarbons
e. Nitrogen oxides
f. Photochemical oxidants such as smog ("Photochemical oxidants" is a category of secondary pollutants formed in the atmosphere under sunlight by the combining of nitrogen oxides and gaseous hydrocarbons.)
g. Other noxious gases and particulates such as lead, mercury, and asbestos.

(Note: Particulate matter and sulfur oxides are primarily the result of burning fossil-type fuels with high sulfur content. Carbon monoxide, hydrocarbons and nitrogen oxides primarily result from motor vehicle emissions.)

3. The effects of air pollution are:

a. Reduction of visibility and other atmospheric effects such as localized weather effects.
b. Damage to vegetation such as trees, fruits, vegetables, and ornamental shrubs and flowers.
c. Direct effects on man such as acute illness, chronic respiratory effects and general respiratory or mucous membrane irritation.
d. Injury to animals.
e. Deterioration of materials such as paint and rubber, corrosion of metals, and erosion of stone.

C. Water Pollution

Water pollution is the addition of undesirable foreign matter which deteriorates the quality of the water. Water quality is defined as its fitness for the beneficial uses of drinking by man and animals, for the support of aquatic life, for the irrigation of land, and for recreation. The polluting foreign matter may be either living or nonliving.

1. The major sources of water pollution are:

a. Municipal sewage
b. Oil spills from vessels and offshore drilling
c. Animal wastes from feedlots and farm operations
d. Fertilizer and pesticide runoff from agricultural fields and forests.
e. Industrial wastes and manufacturing processing discharges.
f. Acid and sediment drainage from mining operations.
g. Soil erosion and sedimentation.
h. Heated water discharges from industry and power plants.
i. Solid waste from industry, communities, and recreational activities.

2. The major categories of water pollutants follow.

a. Toxic Pollutants - Heavy metals such as lead, tin, copper, and arsenic can be discharged into waterways and accumulate in the aquatic systems.

b. Saline Pollutants - Occasionally salt brines from mines or oil wells are released into normally fresh water. Many large rivers normally keep brackish sea water out by their continuous outflow of fresh water. During times of low runoff, river currents cannot resist the pressure of tidal flow from the sea and the tide lines may advance upstream.
c. Acid Pollutants - This includes acid mine drainage and the discharge of chemicals into waterways.
d. Turbidity Pollutants - Relatively inert and finely ground particles are easily suspended in water. The discharge of this material into waterways cuts down on the light transmittance enough to inhibit photosynthesis of aquatic plants.
e. Deoxygenation Pollution - Most common pollutants are organic and their effect on stream life is very subtle. Most organic materials are attacked and decomposed by bacteria and other microorganisms. To accomplish this, the microorganisms need oxygen. The more organic food in the water, the larger the population of bacteria and microorganisms and thus the greater the demand placed on the oxygen supply of the water. This demand for oxygen is called "biological oxygen demand" or BOD. The BOD is a useful index of the degree of pollution of water, especially relating to organic pollution load.

3. The effects of water pollution follow.

a. The most harmful effect of polluted water on man and animals is that of disease transmission due to microorganisms.
b. Polluted water may also cause the reduction or complete elimination of aquatic life in a waterway.
c. Polluted water may be unsightly, odorous, corrosive, difficult to wash clothes in, and unpleasant to the taste.
d. Polluted water is usually unsafe for most recreational purposes.

D. Noise Pollution

Noise is sound; but it is unwanted sound, sound that is unnecessary, uncomfortable, and maybe even unhealthy. Noise is defined as unwanted sound that is capable of damaging or degrading some human quality.

Noise is measured in units called decibels, abbreviated db. The decibel is a multiplication scale like the numbers on a slide rule and not a linear scale like the numbers on a ruler. You cannot add and subtract decibels like you do inches. A noise level of 100 db has 10 times more energy than a level of 90 db and 100 times more energy than a level of 80 db.

1. Some typical noise levels are:

db	Source of Sound	db	Source of Sound
0	Threshold of hearing	80	Heavy street traffic at 20'
20	Very soft whisper	90	Subway train at 20'
35	Library	100	Thunder
40	Quiet residential area	110	Riveting machine
50	Quiet office	115	Auto horn at 2'
60	Normal conversation	120	Jet takeoff at 200'
70	Freeway traffic at 50'	135	Threshold of pain
75	Living room music		

2. You will also encounter the abbreviation dbA, especially in new laws dealing with noise control. This is still decibels, but measured with an instrument called a sound level meter. The "A" setting on the meter is designed so that the instrument measures sound similar to the way our ear would hear it. The "A" is put after the abbreviation for decibels (db) to show that the measurements are taken using this "A" setting.

3. Some major sources of noise follow.

   a. Virtually every activity and every individual adds to the growing cascade of noise.
   b. Transportation including all types of vehicular traffic, railroads, and aircraft.
   c. Construction activities and construction equipment.
   d. Manufacturing activities.
   e. Home appliances and equipment.
   f. Recreational vehicles and equipment.

4. Some effects of noise follow.

   a. The environmental noise can affect us in various ways. Some of these effects include:
      (1) Possible temporary or permanent hearing loss
      (2) Possible physical or mental disturbances
      (3) Interference with conversation
      (4) Disruptions in job performance
      (5) Disruption of rest, relaxation and sleep
   b. Long time exposures to high noise levels may produce temporary or permanent hearing loss. This noise-induced hearing loss is believed to be the most serious physical health hazard posed by excessive noise, especially occupational noise. Community and home noise exposures are usually less severe or occur for only a short time; therefore, they do not pose the same hazard of noise-induced hearing loss as is the case in industry. Yet, with the collection of modern appliances in the home and the increase in community noise levels, this situation is changing. Community and home noise levels are rising to the point where they can contribute to the hearing loss problem.
   c. Presently, there is much question as to whether excessive noise can cause other physical or mental health disorders. Many noise and medical experts believe that man's tolerance to noise is quite high and he can adapt to most environmental noise without ill effects. Yet, other experts maintain that the stress effects of noise, either alone or in combination with other stresses, can eventually overwhelm man's ability to adapt to noise and will result in physical or mental health problems. Scattered evidence exists supporting both points of view. We need to learn much more about noise and its effects.
   d. There is little doubt that noise can be annoying and even frustrating when one is trying to talk, concentrate on a task, relax, or sleep. Even noise of lower levels can cause irritation or annoyance when it invades one's privacy. And, to the individuals concerned, these are real problems, not imaginary ones.

E. Solid Waste

1. While accounting for only 7 percent of the world's population, Americans consume about one-half of the earth's industrial raw materials. Until recently, we were not concerned with the environmental problems concerning the collection and disposal of trash, garbage, or other solid wastes.

2. Solid waste produced in the U.S.A. now totals 4.3 billion tons per year. Of this, 360 million tons are household, municipal, and industrial wastes; about 190 million tons or 5.3 pounds per person is annually picked up by some collection agency and hauled away for disposal. In addition, there are 2.3 billion tons of agricultural wastes and 1.7 billion tons of mineral wastes. The annual cost is over $4.5 billion. Most present disposal methods contribute to either air or water pollution or pollute the land.

3. It is estimated that our solid waste load is increasing at twice the rate of our population increase. This solid waste will cause not only environmental pollution and scenic blight, but it has the capacity to choke our urban areas and our recreational areas as well.

4. Solid waste is a "people-problem" and only informed, concerned people can help minimize the impact on the environment. Recycling of solid waste may be our future answer to the dual problems of raw material shortages and solid waste disposal.

F. Population Pressures

A growing population places an increasing demand on resources and the environment. In the final analysis, it is people who ultimately cause the pollution of our environment, either directly or indirectly. As population grows, so does the demand for goods and services, land for food production, energy and fuels, land for housing and transportation systems, and land for recreation. Many of these demands place competitive pressures on land and exert increasing pressures on the environment.

G. Environmental Considerations in Recreation

1. Environmental pollution can limit the potential of an area to offer recreational opportunities. Air and water pollutants can seriously degrade, damage, or limit an area's recreational possibilities. Solid waste and noise can make an area unattractive or unacceptable for recreation.

2. Recreational activities themselves can have a serious impact on the environment.

   a. Vehicular traffic, especially heavy traffic in a small area, can add to the air pollution problems as well as increasing noise levels. Congestion and land for parking add to the considerations.
   b. Recreational equipment such as portable power generators,

motor boats, motorcycles and snowmobiles, all produce relatively high noise levels. Added to this are the problems of oil and fuel spillage as well as emission to the air. In many cases, our mechanized recreational equipment is the major pollution source in recreational areas.

c. People themselves contribute to pollution problems. Effective methods of handling human wastes and solid wastes, including garbage, are extremely important.

d. In developing and operating a recreation area, consideration must be given to minimizing the environmental impact of people and their activities on a relatively confined area, while still providing a meaningful and enjoyable experience for them. Too often we have simply made our recreational areas into extensions of our urban areas with all the environmental problems being carried over from one to the other.

III. APPLICATION

A. Consider taking the students on a field trip to observe recreational areas and the possible environmental problems that could arise.

B. Observe the development going on around recreational areas and determine what impact this could have on the recreational potential of the area now and in the future.

IV. TESTING

Give the students a written test on the concepts discussed in this unit.

REPAIRING AND MAINTAINING STRUCTURES

by Cecil D. Wheary

OBJECTIVES:

1. To teach the student the importance of an organized structures maintenance program in the efficiency and economics of operating a recreational facility, even though there may be only one or two units.

2. To teach the student basic elements involved in setting up an annual maintenance and repair program.

3. To have students develop a degree of skill in making some simple repairs such as replacing broken window panes.

4. To have students develop some basic knowledge on mixing, placing, curing, and finishing concrete.

REFERENCES:

1. Simple Home Repairs, Leaflet ME-70, Extension Service, VPI & SU, Blacksburg, Virginia.

2. Concrete Improvements for Farm and Ranch, Portland Cement Association, Skokie, Illinois.

3. Building Better Farm Homes With Concrete, Portland Cement Association, Skokie, Illinois.

4. Fireplaces and Chimneys, USDA Farmer's Bulletin No. 1889.

5. Maintaining the Home, Small Homes Council Circular A 1.5, University of Illinois, Urbana, Illinois.

6. Crawl Space Houses, Small Homes Council Circular F 4.4, University of Illinois, Urbana, Illinois.

7. Moisture Condensation, Small Homes Council Circular F 6.2, University of Illinois, Urbana, Illinois.

8. How To Build Storm Resistant Structures, National Forest Products Association, 1619 Massachusetts Avenue, N.W., Washington, D.C.

9. Exterior Paints and Painting, Publication 315, Extension Service, VPI & SU, Blacksburg, Virginia.

10. Simple Plumbing Repairs, USDA Farmer's Bulletin No. 2202.

11. Basic Home Carpentry, A Wise Book, William H. Wise & Co., Inc., New York.

12. Maintenance for Camps and Other Outdoor Recreation Facilities, Alan A. Nathaus, Ed. D., National Board of YMCA, Associated Press, 291 Broadway, New York, New York 10007.

TEACHING MATERIALS:

1. Hand tools such as hammer, saw, measuring tapes, pliers, putty knife, and screwdrivers from shop.

2. Materials for mixing a trial batch of concrete, including wheelbarrow, shovel, hoe, cement, sand and trowel.

3. Window sash without glass panes; also some glazing compound and glaziers points.

4. A screen door or window in or near the classroom which needs patching and some new screen wire or fiberglass for making patches.

I. PREPARATION

A. Motivation

1. Lesson Approach

a. Structures such as cottages, cabins and service buildings are important capital outlay considerations in developing recreation enterprises.
b. It is essential that developers of recreation-oriented facilities become aware very early of the many aspects of care, maintenance and repair.
c. There will be a demand for people who not only can organize maintenance programs, but also have the skills to handle the necessary care and repair.
d. A properly organized program for care and maintenance is one of the most important factors in the successful operation of recreation facilities.

2. General Situation

a. The public demand for recreation facilities is such that it cannot be met on public lands alone. More private recreational enterprises will be developed.
b. The market for rental recreational homes and owner-occupied second homes is increasing every year. In the United States it is rapidly approaching 200,000 per year.
c. A number of groups and individuals are either planning, developing or have built recreational facilities. Many of these developers need guidance in many areas of basic knowledge and skills necessary for successful planning, developing and managing a recreational enterprise or complex.
d. A large number of completed facilities are understaffed and have management problems primarily because there is a lack of trained personnel in critical areas. One of these areas is care and maintenance of structures.

3. Local Situation

a. Determine the following information about the local situation:
(1) Are there campgrounds, summer cottages, parks, and other types of recreational facilities in the community?

(2) Are there any groups or individuals who are presently planning or developing a recreational facility?
(3) Do present recreational units have an organized care and maintenance department?
(4) How many local contractors are organized to do building maintenance and repair?
(5) Are there one or more ready-mix concrete plants or masonry block plants within the community?

b. Summarize the information and discuss possibilities of making it available to local agencies or individuals interested in recreational enterprises.

c. Have an owner or manager of a recreational facility meet with the class to discuss his method of operation and problems related to care and maintenance of structures.

II. PRESENTATION

A. Surveying Repair and Maintenance Needs

A preventive maintenance, routine maintenance, or repair program for buildings should be an organized program and not simply a crash program after the situation becomes critical.

Seasonal Checklist: A simple organizational procedure would be to prepare a list of points on components of buildings which are likely to require maintenance or repair most often. Early spring and early fall would probably be the most logical seasons for making the checks. An example of things which might be included on a spring checklist follows:

a. Examine foundation walls, piers, footings and concrete slabs for damage from winter weather freezing, etc.
b. Check roofs, gutters, downspouts, and flashing for possible damage from wind and/or snow load.
c. Examine paint for failure or excessive weathering.
d. Check water pipes and plumbing fixtures for damage from freezing.
e. Check all glazed windows for broken panes or damaged glazing compound.

Of course, periodic checks of a general nature would be made throughout the year. Special surveys would be wise after severe windstorms, rainstorms, and flooding from stream overflow.

B. Determining Materials Needed

After maintenance and repair jobs have been outlined in order of priority, the next step is one of planning maintenance or repair procedures and assembling materials, tools and equipment for doing the job. Recreational units which are properly organized and managed will have a shop which is adequately equipped for proper maintenance of the buildings and other facilities. Most shops will carry an inventory of many materials used frequently in maintenance and repair.

Bill of Materials: The maintenance man or crew should make up an estimated bill of materials for each job. Bills requiring similar

materials such as concrete, lumber and paint should be consolidated. This complete bill of materials would then be checked against inventories to determine necessary replacements.

C. Maintenance and Repair

Most structures in recreational units are used seasonally, so much of the repair and maintenance is also seasonally concentrated. Preventive maintenance on structures minimizes possible damage from such things as wind, water, freezing, fire, insects, decay, corrosion and vandalism. Repairs of damage would then be less costly.

The following are some important considerations in maintenance and repair of:

1. Foundations

Structures which have masonry foundations (block, brick or stone) on properly designed concrete footings generally require little maintenance. The same is true of masonry piers on concrete footings. All footings should be of proper size and placed below freeze line on a consolidated substrata.

For most comparatively lightweight recreational buildings, foundations of 8" blocks on 8" x 16" concrete footings are adequate (Fig. 1). Piers 8" x 8" on 16" x 16" x 8" footings, spaced properly to carry the design load, are good (Fig. 1). Note that the depth of footing is the same dimension as the width of the wall or pier, and the width of footing is twice the width of wall or pier.

In the case of a plain concrete footing for a pipe column, the depth of the footing should be 1-1/2 times the distance from the edge of the column to the edge of the footing (Fig. 2). Of course the area of the column footing must be designed to carry the total load on the column.

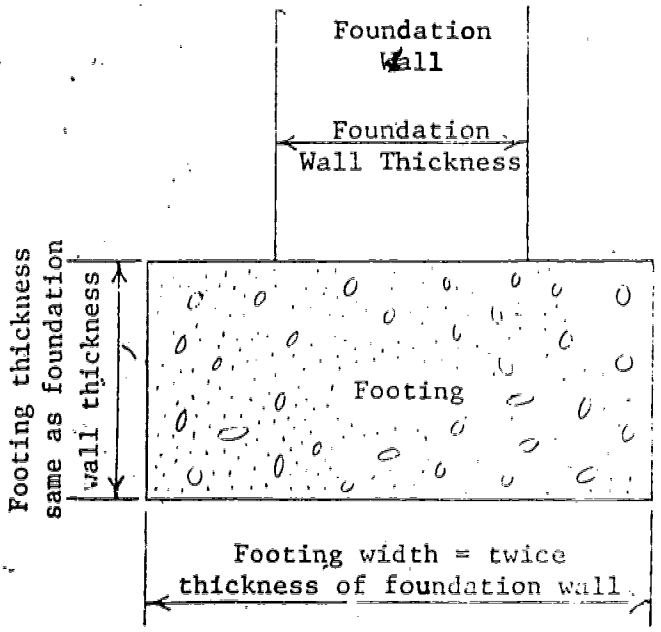


Figure 1

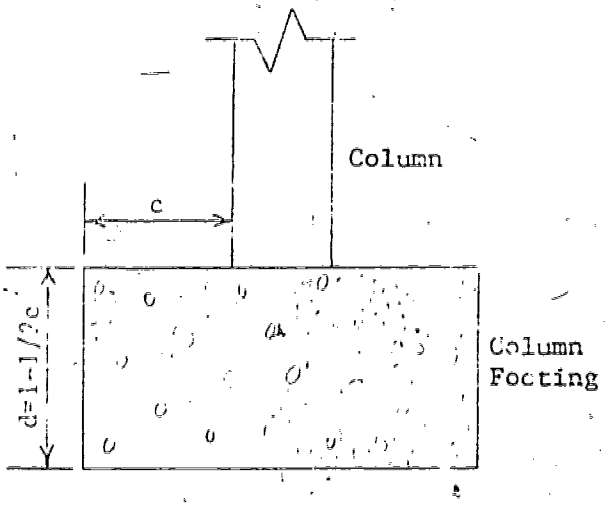
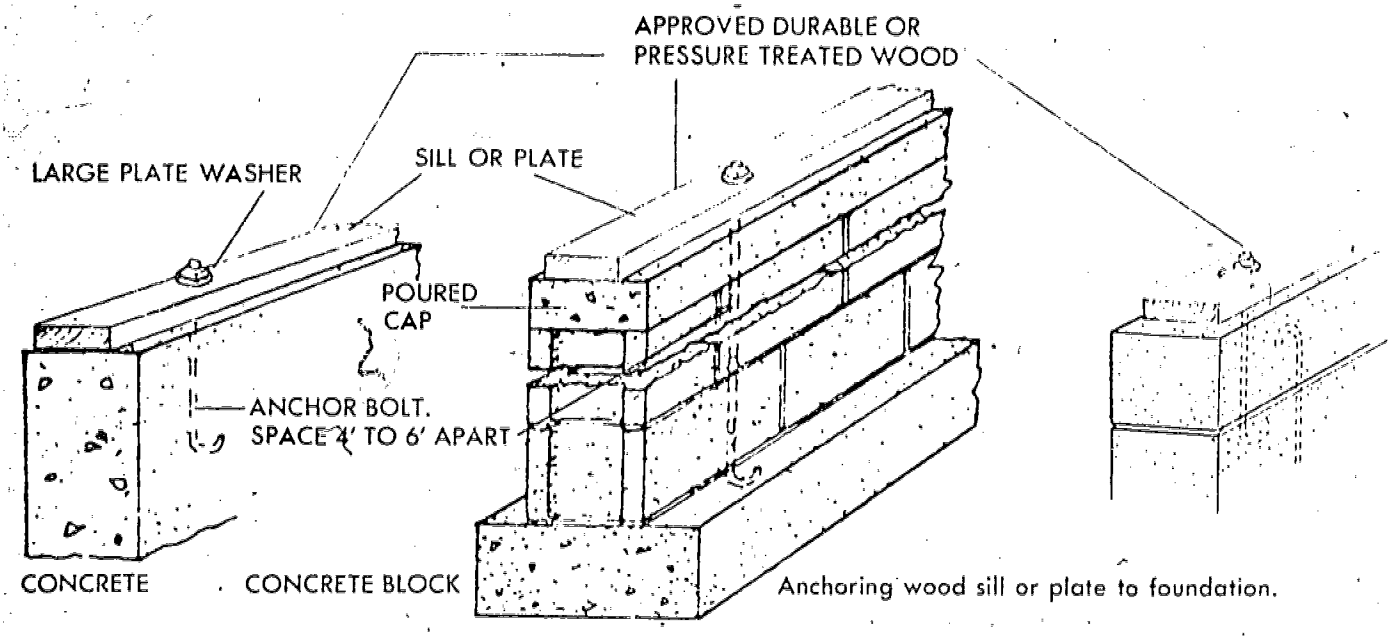
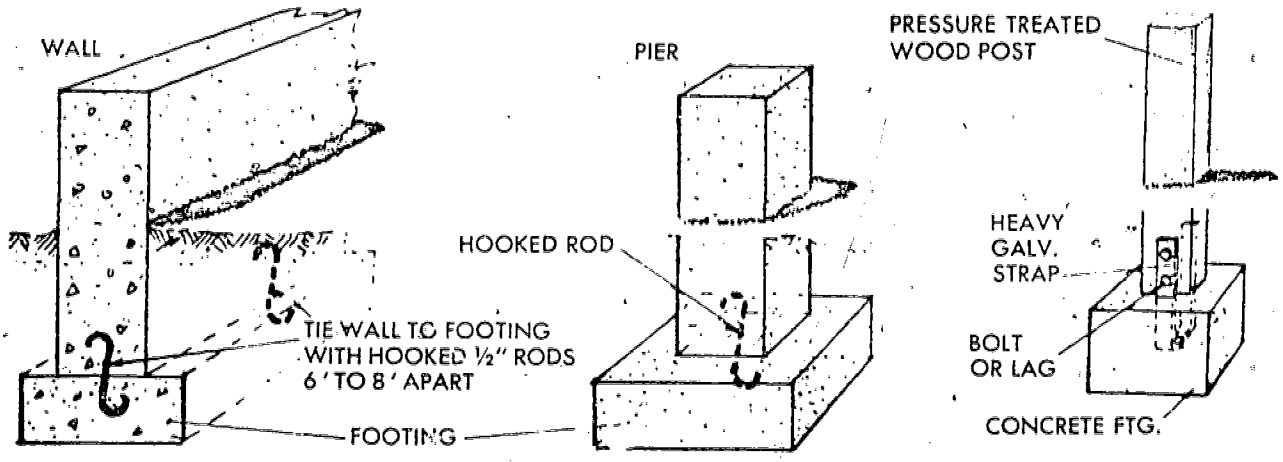


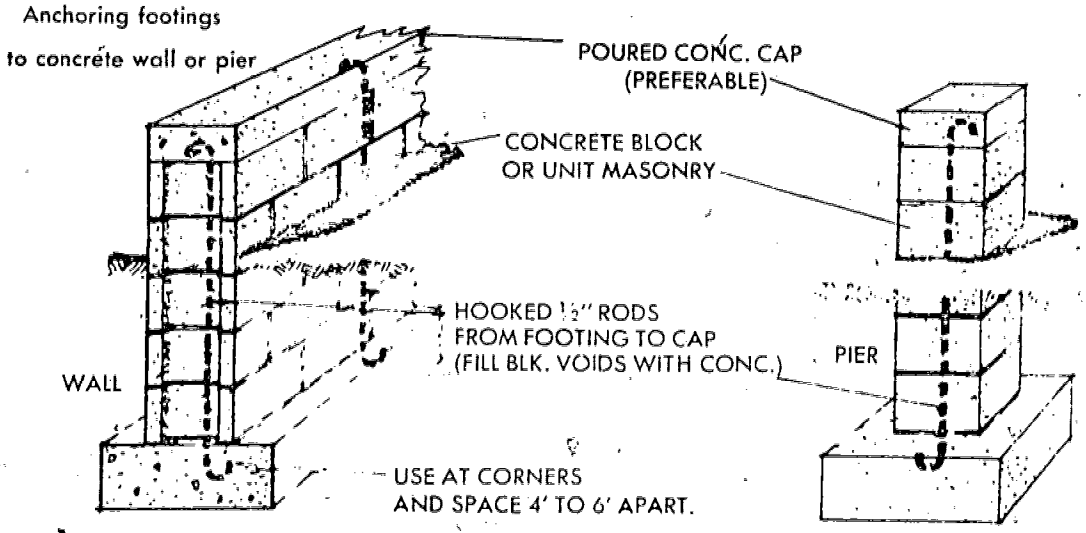
Figure 2



Anchoring wood sill or plate to foundation.



Anchoring footings
to concrete wall or pier



Anchoring footings to concrete block wall or pier

Figure 3

In initial construction, preventive maintenance, or repair, foundation anchorage against storm damage is most important. Anchorage of foundation walls, piers, and wood posts to concrete footings is shown in Figure 3.

Suggestions for pole construction anchorage are given in Figure 4. Some suggestions for anchoring the superstructure to the foundation are shown in Figure 5.

It is important that all wood used in foundations, i.e. posts, poles, sills, and skirting, be pressure treated with a wood preservative.

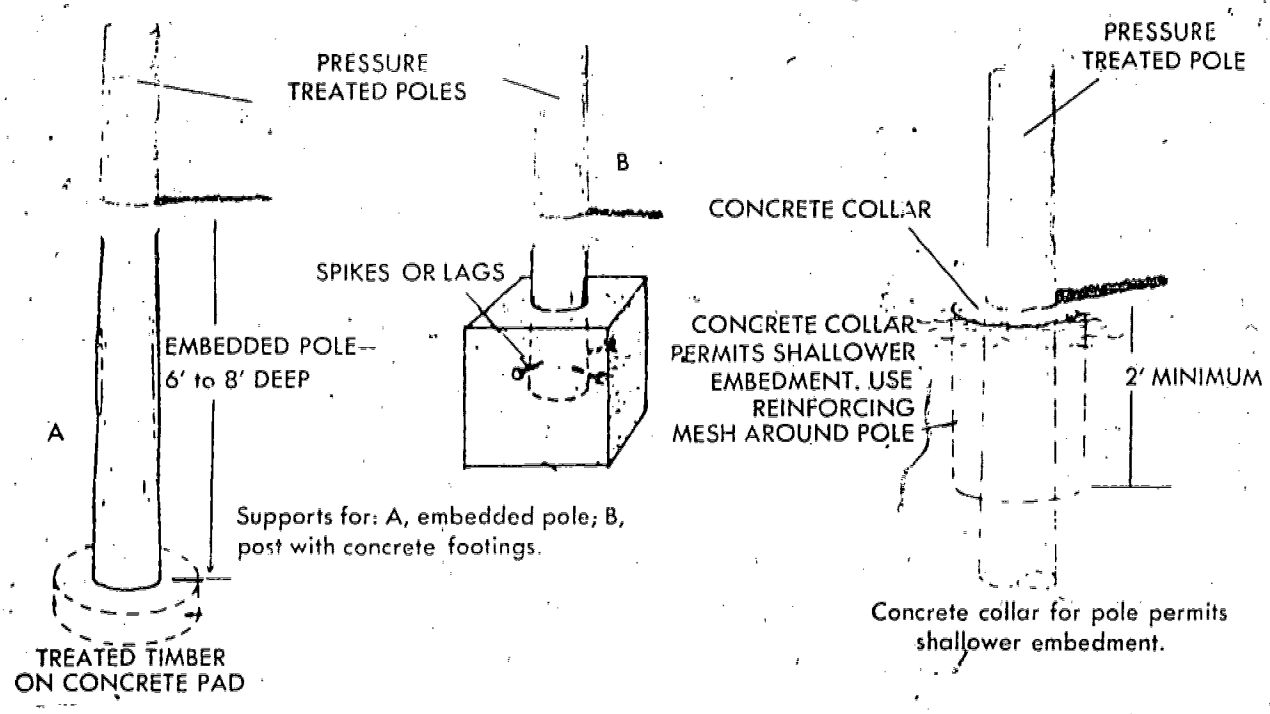
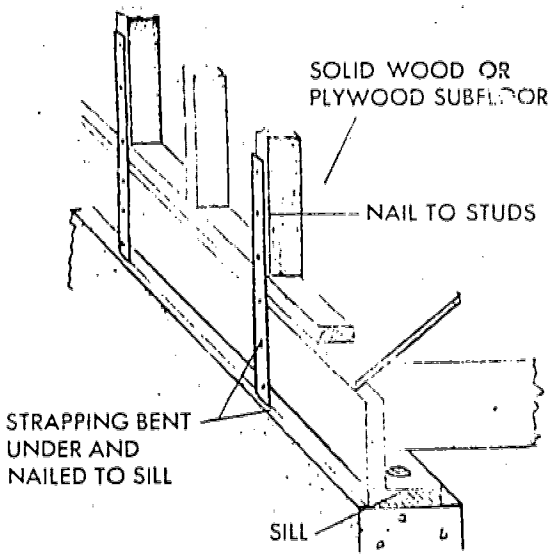


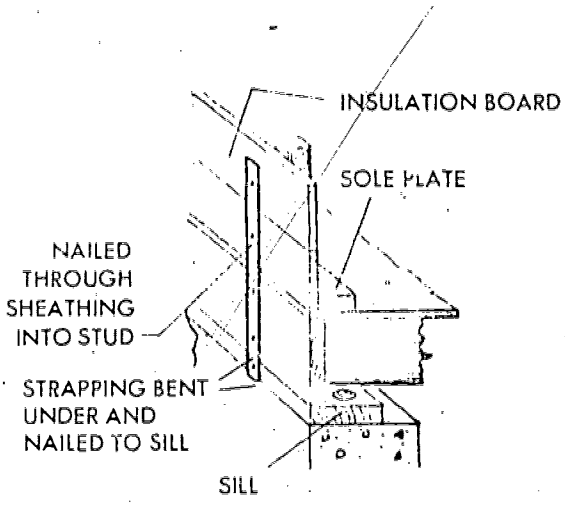
Figure 4

2. Moisture Damage

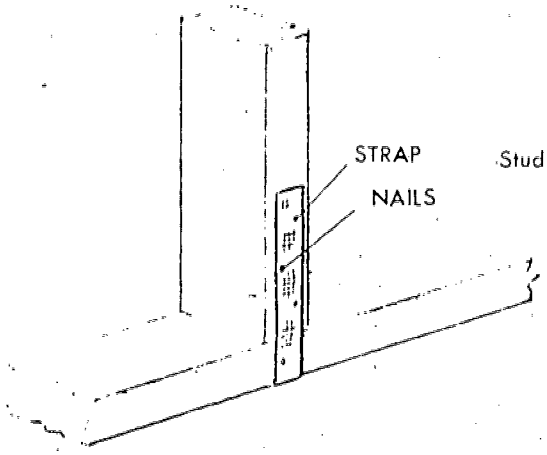
Wood damage from decay, buckling, peeling paint, and termites results in many maintenance problems. Water or excessive moisture is the primary cause of the damage. The following are some suggested control measures.

a. Slope ground around foundations so surface water drains away from foundations on all sides.
b. Vent the crawl space under all buildings.
c. Where evaporating ground moisture from crawl space is a problem, cover the ground with a vapor barrier such as 4 mil. plastic sheets.
d. In recreation buildings with ceilings, the attic should be well vented.
e. Of course, all leaks should be located and patched as soon as possible.





Stud wall to sill where nonstructural sheathing is used or does not extend to sill



Stud to sill slab on Ground

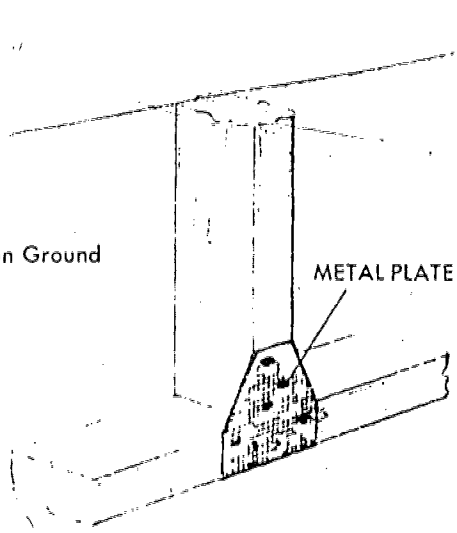


Figure 5

3. Porches and Steps:

Many recreational buildings such as rental cottages or cabins have wood porches and steps. Both get much wear from constant use.

If porch floors are two feet or more off the ground, there should be sturdy rails around the porch and on the steps for safety. Constant inspection and maintenance may be necessary to maintain safety.

Because of constant exposure to weather and contact with ground, wood porches and steps are subject to decay and termite damage. Where possible, treated wood should be used for either initial construction of replacement. Clear wood preservatives or wood preserving stains are good as maintenance materials on porches and steps. The lower end of wood step stringers should rest on a concrete base both for protection against termites and for anchorage.

New or replacement porch floors should be constructed of decay resistant wood or treated with a wood preservative. Leaving cracks of 1/8" to 1/4" between floor boards minimizes damage from buckling and decay.

Where feasible, wood porches and/or steps which have failed should be replaced with concrete.

4. Doors, Windows, and Screens

Doors in recreational structures are generally subject to rough usage, so constant care and maintenance are necessary.

Sticking and sagging of doors is generally caused by either hinge failure, warping, or expansion from moisture.

In repairing, check hinges first. There may be loose screws. Sometimes doors may be aligned properly by simply adding thin shims under one or more hinges.

It may be necessary to remove the door and sand, file or plane the edges in order to get a good fit.

Exterior doors can be protected from moisture damage by finishing them with either a clear wood preservative or a preserving stain.

Some recreational buildings have only screen windows with protective wood shutters. These shutters may be made to swing up, to the side, or to slide to the side. The sliding one is safer, easier to maintain, and protects against vandalism.

Glass windows are being used in a number of recreational buildings. Usually screens are used with these and in off-season, protective wood shutters are added. Preventive maintenance is very important with glass windows. If broken panes and loose putty are not repaired at once, the entire sash and frame may be damaged in a short time. Follow this procedure in replacing a window pane:

(a) Carefully remove the broken glass and old glazing compound with putty knife or chisel.
(b) Spread a thin layer of putty or glazing compound in the rebate of the sash. This seals the glass against the sash making a weatherproof seal.
(c) Press the glass firmly into the sash until the putty oozes up around the edges. Apply pressure firmly and evenly.
(d) Fasten the glass in place with glaziers points spaced about 6" apart. Do not use tacks or nails. They create tension on the glass causing it to break more easily. Drive points deep enough so glazing compound will cover them.
(e) After applying the glazing compound, smooth it out with a putty knife so it makes a neat, even bevel that does not extend beyond the rebate of the sash (Figure 6).
(f) Clean the glass both inside and out with a soft paper or dry cloth. Do not disturb the new glazing compound.

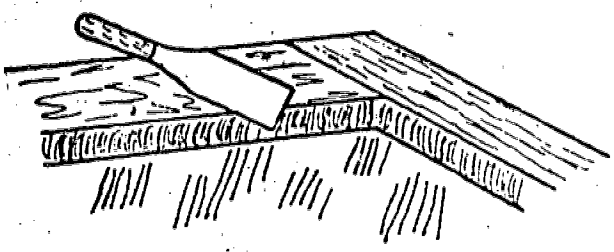


Figure 6

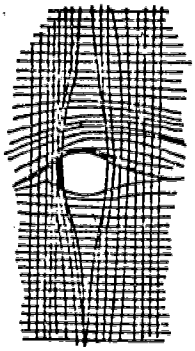


Figure 7

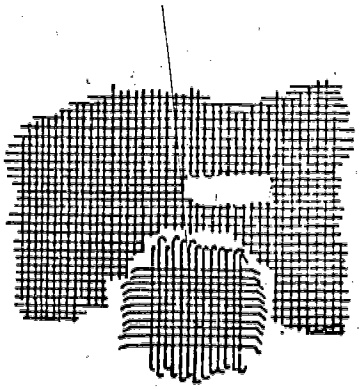


Figure 8

Practically all recreational buildings will have both screen doors and screen windows. Aluminum, galvanized steel, or fiberglass screen materials are most commonly used. Galvanized steel will rust after the zinc wears off. Aluminum can stain walls when it corrodes and should not be used where it is subjected to salt spray. Fiberglass does not corrode and is not affected by salts. It may be cleaned easily by washing. Small holes in screens may be patched by one of the following methods.

a. If the hole is caused by punching a pointed object such as a pencil through the wire screen and no wires are broken, the hole can be closed by simply realigning the wires using a nail or an ice pick (Figure 7).
b. When wires are broken, trim the hole neatly as near rectangular as possible. Cut a screen wire patch about 1" wider than the hole in each direction. Remove about three or four strands of wire from each side. Using a straightedge, turn the projecting ends down at a sharp right angle. Insert them carefully through the screen, turn them down, and tap them flat, using a hammer or small mallet and a flat back support to prevent bending the screen (Figure 8).
c. When patching a fiberglass screen, cut a patch about 1" larger than the hole and sew it in place using a heavy nylon thread which closely matches the fiberglass in color.

5. Sidewalls and Ceilings

Recreational buildings are constructed usually of masonry or wood with wood, perhaps, predominating.

When wood sidewalls are finished with a clear wood preservative or a preserving stain, there is usually very little maintenance necessary.

When wood or masonry sidewalls are painted, there will be more maintenance. The amount will depend on the type of paint used and the application.

The exterior and interior acrylic latex paints have proven very satisfactory. Be sure to use the paint which was formulated for the particular surface to be painted, such as exterior wood,

concrete, metal, masonry blocks and asbestos shingles, or interior plaster, wallboards and wood. Always read labels and follow directions to the letter.

Living units such as cabins and cottages can be made more comfortable in summer and winter if they are ceiled and insulated.

The ceiling material, whether wallboard or wood paneling, may be damaged and need repair so periodic inspections should be made.

6. Floors

Regardless of types, floors in recreational structures receive constant wear, thus requiring frequent maintenance.

Where feasible, unpainted concrete floors are economical. They are easy to maintain by simply sweeping or mopping and are not damaged by fire, decay, or termites.

Probably the next best floor from the care and maintenance standpoint is a sheet of vinyl over a plywood subfloor. It wears well and is easy to maintain. Sheet vinyl is preferred over tile because there are fewer cracks or joints which can cause trouble.

Wood floors which receive rough wear are difficult to maintain. The initial finish should be either a tough penetrating floor seal with a wax coating if desired or a hard polyurethane surface finish. With these finishes, worn spots may be refinished without having to do the entire floor.

Some recreational units use wood strip flooring over subflooring and treat the surface with a penetrating floor oil or boiled linseed oil. This floor is not difficult to maintain, but there is always a slight oil residue which some people find undesirable.

It is very important that wood floors be nailed properly to prevent creaking and buckling. The ring or screw shank nails now available are good for floors. Creaking and sagging floors may be caused by bending joists or pier failure.

Sometimes the creaking may be stopped by driving wood shims between joists and subfloors (Figure 9). In other cases, it may be corrected by nailing 2" x 2" or 2" x 4" strips on the sides of the sagging joists to level the subfloor (Figure 10). Failing piers should be replaced, and the joists jacked as near as possible into alignment before the strip supports are nailed on.

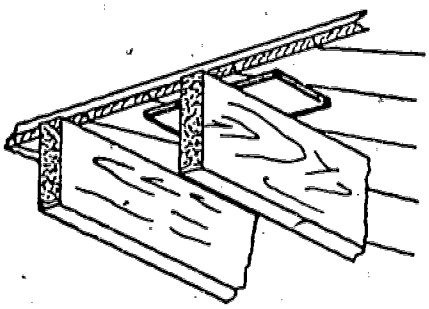


Figure 9

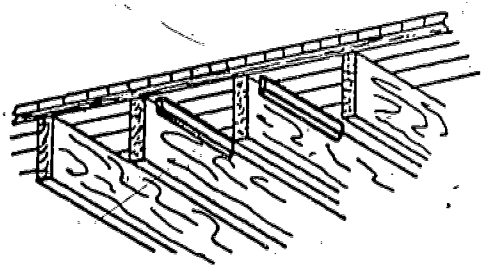


Figure 10

Buckling floors are generally caused by excessive moisture. Proper measures for control of moisture should be taken. This means good surface drainage, proper ventilation of crawl spaces, and use of vapor barriers where necessary.

7. Roofs

Roof repair and maintenance is even more critical than foundation maintenance. Neglected roof leaks can cause extensive and expensive damage to the structure.

Roofs may be damaged during any season throughout the year by such things as windstorm, lightning, snow, ice, and heat from the sun.

The most common types of roofing materials are galvanized steel, aluminum, asphalt shingles, asbestos shingles, and wood shingles. Maintenance varies somewhat for each type.

a. Maintenance to galvanized steel roofs usually involves painting and renailing. Painting should be done when very slight patches of rust occur. A metal primer such as metallic zinc or zinc chromate should be used as a first coat on galvanized steel (lead primers are not recommended generally for roof primers). Other types of paint, including exterior acrylic latex, may be used if desired. When nails have worked loose, they may either be driven back or removed and replaced with screw-shank or cement-coated nails. Most metal roofing nails will have special heads with either zinc or neoprene washers to give waterproof seals.
b. Aluminum roofs will not need painting unless color is desired. Generally no primer is required. When replacing nails in an aluminum roof, especially in areas where salt spray may occur, aluminum nails with neoprene washers should be used.
c. Replacing shingles which have been broken or blown off is the most common repair problem with asphalt shingled roofs. Some extra shingles should be purchased and saved for repair purposes when the roofing is initially installed. The method of replacing an asphalt shingle is generally quite simple. Carefully lift the shingle and remove nails or broken pieces of shingle if necessary. Slip the new shingle into place and nail. Place a bead of asphalt or mastic along the upper edge and over the nailheads, then seal the top shingle in place. Entire replacement roofing may be added over the old. Be sure to use longer roofing nails to insure adequate fastening of the new roof.
d. Replacing broken shingles of both asbestos and wood is more difficult than asphalt. A device for cutting the hidden nails must be made or purchased. A hacksaw blade with an improvised handle of friction tape can be used. A flat piece of metal with a sharpened notch in the edge can be made for this purpose. Once the nails are cut and the broken pieces removed, a new shingle can be slipped into place and nailed.

Roofs which are covered with either shingles or metal sheets should have a slope of at least 4" in 12".

Both galvanized steel and aluminum roofs and siding should be properly grounded for lightning protection.

When working on roofs, even though the pitch may be low, safety ladders should be used. An end rack or hook may be bolted to a regular ladder for use as a roof ladder. The so-called "chicken ladder" is made by nailing 2" x 2" cleats onto a 10" or 12" wide board. This board is fastened to the end of the ladder for hooking over the ridge of the roof.

Some temporary repairs can be made on roofs by using one of the asphalt-base roof paints which contain fibers to give a heavy coat. These sometimes have metal dust in them to give a metallic appearance.

8. Chimneys

Chimney maintenance includes cleaning, replacing broken mortar, and painting or replacing flashing.

Chimney flues should be kept free of excessive soot. One mechanical means of cleaning is to put straw in a burlap bag. Add a couple of bricks or stones for weight to pull it down the flue. Tie the sack to the end of a rope long enough to let it down and pull it up the flue. Another mechanical method is to wrap burlap around a chain and swing this about in the flue.

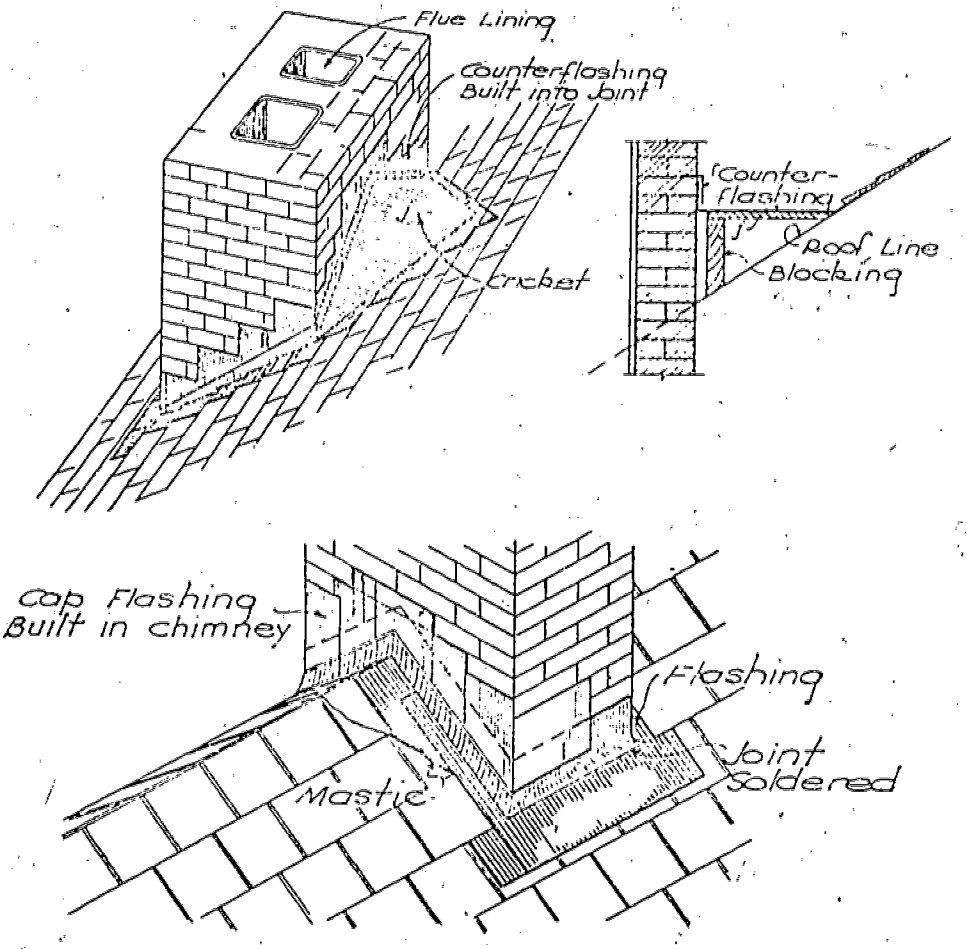


Figure 11

One chemical means recommended is to burn old dry-cell flashlight batteries in the fireplace or firebox. Another is to burn table salt with about 10% zinc dust added.

Chimney flashing must be properly installed or maintenance will be difficult as leaks develop. (Figure 11) Galvanized steel flashing should be kept painted with a rust inhibitive paint or an asphalt paint. Aluminum and copper flashing require little maintenance. When possible, flashing should be nailed with nails of the same metal as the flashing because of corrosive electrolytic action which occurs.

9. Gutters and Downspouts

Some types of recreational buildings do not require gutters and downspouts, such as buildings with wide roof overhang and good drainage away from the foundation.

When gutters and downspouts are used, they should be inspected and cleaned frequently.

Galvanized steel gutters and downspouts should be painted when necessary in the same manner as galvanized roofing. The inside of gutters may be coated with an asphalt paint if desired. Small pin holes in gutters can be patched with one of the bathtub caulking compounds after cleaning the surface.

Splash blocks should be placed at the base of downspouts to direct the water away from the building.

D. Mixing, Placing, Finishing, and Curing Concrete

Concrete and mortar mixes are used for various maintenance and repair jobs ranging from repointing mortar joints to pouring concrete floors, sidewalks, and steps. Maintenance personnel must have some knowledge and skills in mixing, placing, curing, and finishing concrete if quality work is to be realized.

With permission from the Portland Cement Association, the following recommendations were taken from their technical publications:

1. Mixing

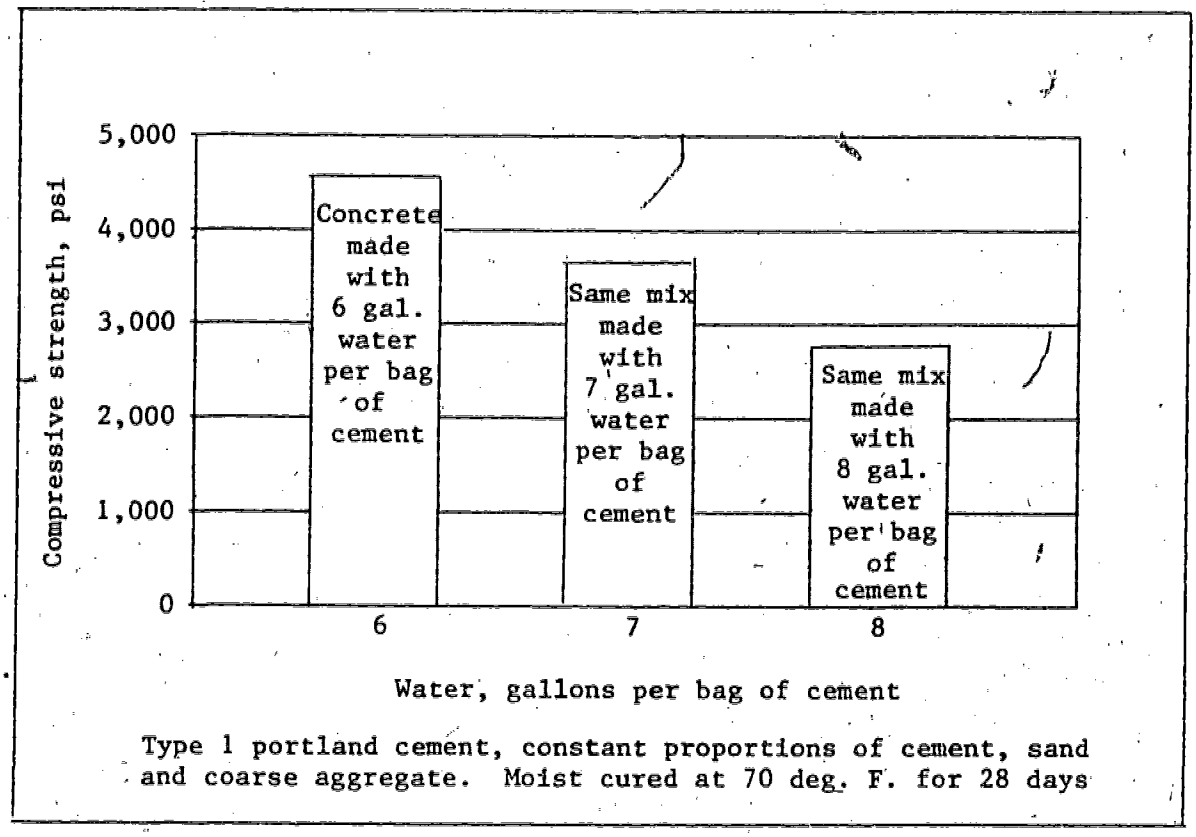
a. Ready-Mixed: For larger jobs, it is economical to use ready-mixed concrete which is generally available in most areas. It is important to know how to order ready-mixed concrete for a particular job. Table 1 gives this information. From the table it may be concluded that a general rule-of-thumb for ordering ready-mixed concrete is to remember the numbers 6-6-6. These stand for six bags of cement per cubic yard, six gallons of water per bag of cement, and 6% entrained air. The amount of cement and water used is one of the most important keys to quality concrete. As less mixing water is used, the strength of the concrete increases rapidly as shown in Table 2.

Table 1

KIND OF WORK	ORDER THE FOLLOWING
Bond beams Chimney caps Lintels Reinforced concrete beams, girders, and other sections Reinforced concrete floors, roof slabs, and top courses Septic tanks	A mix containing at least 6-1/2 sacks of portland cement per cubic yard and a maximum of 6 gallons of water per sack of cement (using 3/4 inch maximum size aggregate).
Basement floors Curbs Driveways Entrance platforms and steps Garage floors Patio slabs Sidewalks Slabs on ground Stairs Swimming pools	A mix containing at least 6 sacks of portland cement per cubic yard and a maximum of 6 gallons of water per sack of cement.
Footings Foundation walls Retaining walls	A mix containing at least 5 sacks of portland cement per cubic yard and a maximum of 7 gallons of water per sack of cement

NOTE: Order 6% air-entrained concrete for all concrete exposed to freezing and thawing.

Table 2



Type 1 portland cement, constant proportions of cement, sand and coarse aggregate. Moist cured at 70 deg. F. for 28 days

b. On-Job Mixed: For smaller jobs or places where ready-mixed concrete is not feasible, quality concrete can be mixed at the site. Table 3 gives recommended proportioning for mixing concrete on the job. Carefully note the recommended amount of water. It is not likely that the sand used will ever be dry, so note the water allowance. Once the water amount is determined, do not vary it. Keep the amount of cement and water constant. If the mix needs adjustment, vary the sand or coarse aggregate or possibly both.

Table 3

Suggested Mixes Made With Separated Aggregates

Kind of work	Gal. of water added to each 1-bag batch if sand is:			Suggested mixture for 1-bag trial batches††		
	Damp*	Wet** (average sand)	Very wet†	Cement, bags (cu.ft.)	Aggregates	
					Fine, cu.ft.	Coarse, cu.ft.
5 gal. of water per bag of cement (DRY SAND)						
Concrete subjected to severe wear, weather, or weak acid and alkali solutions	With ¾-in. max. size aggregate					
	4½	4	3½	1	2	2¼
6 gal. of water per bag of cement (DRY SAND)						
Floors (such as hom… basement, dairy barn), driveways, walks, septic tanks, storage tanks, structural beams, columns and slabs	With 1-in. max. size aggregate					
	5½	5	4¼	1	2¼	3
	With 1½-in. max. size aggregate					
	5½	5	4¼	1	2¼	3½
7 gal. of water per bag of cement (DRY SAND)						
Foundation walls, footings, mass concrete, etc.	With 1½-in. max. size aggregate					
	6¼	5½	4¾	1	3	4

2. Placing concrete

Concrete should not be placed on mud or frozen earth. In dry weather, the subgrade must be dampened to lessen the absorption of the mixing water by the supporting soil. All forms should be carefully set, plumbed, and leveled. They should be braced adequately and oiled to prevent bond of the concrete to the forms (Figure 12). To keep segregation of the coarse and fine materials to a minimum, the freshly mixed concrete should not be moved any farther than necessary. The use of chutes is recommended when the fresh concrete must be dropped more than three or four feet.

3. Finishing concrete

After the concrete has been placed, it is struck off with a straightedge (Figure 13). In flat work it is difficult to strike off sections wider than 10 to 12 feet. The straightedge is usually a 2 x 4 and should be one to two feet longer than the section being finished. A wood or light metal float is then used to float the concrete. In flat work a bullfloat is very handy; it has a long handle and is easy to use on the wider slabs. Many experienced concrete finishers use a bullfloat first and finish

with a hand float. Floating gives a gritty finish that wears well, is attractive, and provides good footing.

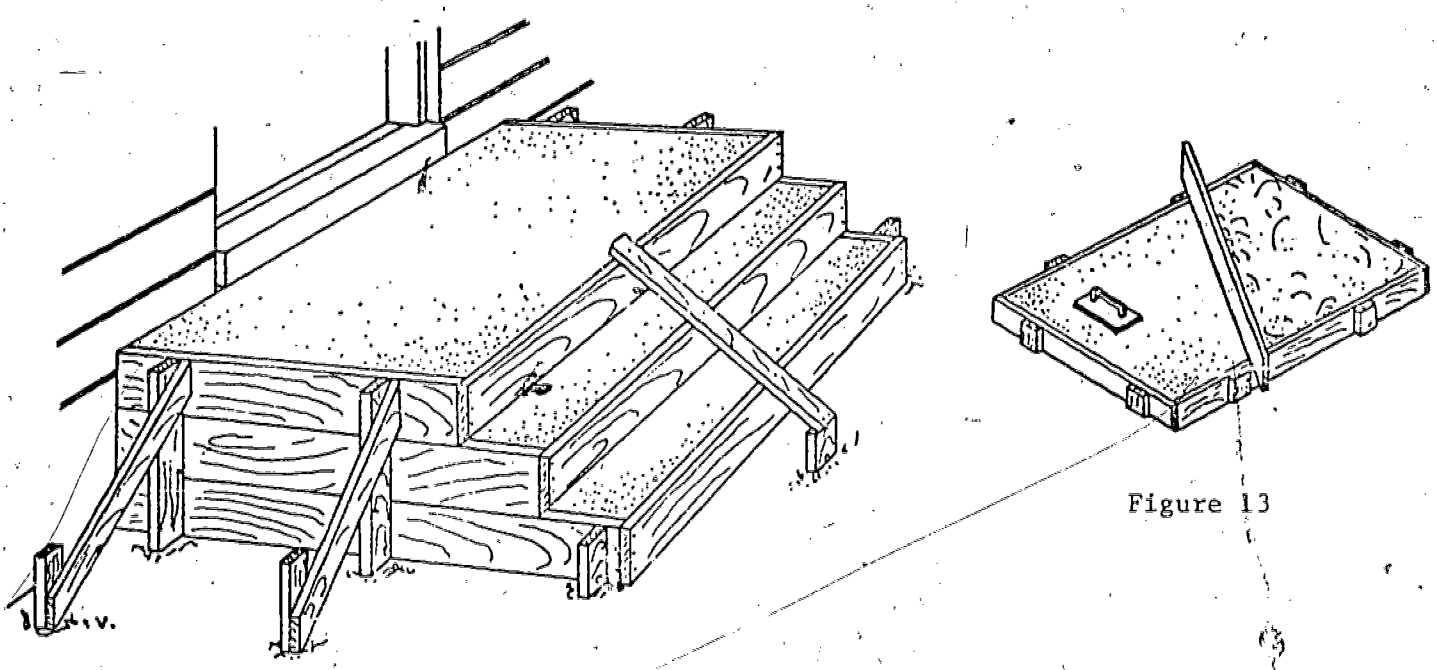


Figure 12

Figure 13

If a smooth finish is desired, it will be necessary to steel-trowel the concrete. Steel-troweling must be delayed until the concrete can be finished without bringing an excessive amount of water, cement and fine sand to the surface. An excessive amount of these materials produces a surface that does not wear well. Power trowels are being widely used to finish concrete. The concrete must be hard enough to hold the power trowel. Here again, premature troweling must be avoided. If the operation brings a soupy slurry to the surface, the concrete is too plastic to be finished and troweling should be delayed until it is firm.

A textured finish can be obtained by dragging a broom across the surface. The stiffness of the broom bristles, the amount of pressure applied to the broom, and the plasticity of the concrete will determine how deep the broomed finish penetrates.

4. Curing concrete

Concrete should be cured for a least five days to prevent evaporation of the mixing water and to develop all the properties of the concrete. If too much water evaporates, there will not be enough water to react with the cement, and the concrete will not gain sufficient strength or durability. The exposed portion of concrete is naturally the first to lose the mixing water. Since the surface will be exposed to the weather, abrasion, and other factors, it must necessarily be durable. Curing is an essential part of every concrete job.

Concrete can be cured by one of several methods. It can be covered with sand, straw, burlap, or other similar material that is dampened and kept damp for the duration of the curing period. Another method is to cover the concrete with a vapor-sealing material such as water-resistant kraft paper or plastic film such as polyethylene. Commercial curing compounds can also be sprayed on the fresh concrete to seal in the mixing water. In vertically-formed concrete, cure the concrete by leaving the forms intact for the five-day period.

III. APPLICATION

A. If possible, visit a recreational facility where the use of various structures in involved. Have students list some areas where maintenance and repair are needed now or might be critical in the future.

B. Have students develop some skills in making a few simple repairs, such as replacing a window pane and patching or replacing a screen.

C. If feasible, have students mix a small batch of concrete, make a small form, place, finish and cure a small slab. This might be a sidewalk, small concrete step or base for wood steps.

D. Visit a ready-mix concrete plant. Observe the operation and discuss procedures with the manager. Ask about types of mixes, types of materials used, air entrainment, and quality control methods.

IV. TESTING

Give students a short, but comprehensive test on how to repair structures.