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CONCEPTS AND OPTIONS FOR A MICHIGAN FISHERIES CENTER

Fisheries Division

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CONCEPTS AND OPTIONS FOR A MICHIGAN FISHERIES CENTER

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EXECUTIVE SUMMARY

Introduction

Background

- Agency - The Fisheries Division, in the Michigan Department of Natural Resources, is a large and complex organization with an international reputation for innovation and excellence. It actively manages and improves hundreds of fish habitats, on behalf of more than 1.5 million anglers, 120 commercial fishing enterprises, and over 1,000 charter licensees. With a recent operating budget of approximately $16 million, and a staff of 269 full-time equated positions, the Division also provides extensive research and consulting services. Six State fish hatcheries support a program to stock 12 million yearlings and 8 million fingerlings. Other projected activities include resource and problem inventories on 400 inland public fishing waters, and implementation of a Federal aid-related strategic management system.

- Project - Within Michigan's unparalleled lake, stream, and shoreline environment, an important goal for the Division is to foster and contribute to public and scientific understanding of fish, fishing, and fisheries management. Department officials have decided accordingly to explore possibilities for developing a facility or facilities which might function simultaneously as a tourist attraction, a research and training site, and a public educational facility.

  In July of 1986, the Division engaged a team of outside experts for this purpose by means of a consulting agreement with the Office of Management and Information Systems. The first objective for the project, with results presented in this report, is to develop, analyze, and document potential concepts and options for a proposed Michigan Fisheries Center.

Scope

Tasks undertaken in this conceptual phase have included:

- Formulating the project framework - with emphasis on facility alternatives in relation to Division goals
- Researching similar facilities and contacting knowledgeable individuals
- Generating planning guidelines and development options

Method

Initial consensus on desirable features in a potential Michigan Fisheries Center is that it:

- Be highly attractive to visitors well into the 21st century, but not overly commercial.

- Relate to fish, fishing, and fisheries management in the Great Lakes and on Michigan wetlands, inland lakes, and streams.

- Display and interpret--rather than merely archive--living fish and other aquatic species of the region.

- Educate the public in an interesting manner.

- Offer programs to relatively large numbers of Michigan anglers.

- Facilitate research and professional training activities of the Fisheries Division, or related organizations.

Specific methods used in this phase of the project have included:

- Interviewing organizational staffs to determine the goals and aspirations of the Fisheries Division, and to gain insight into current programs and facilities which could be incorporated into a proposed development.

- Documenting selected facilities in the State and the nation, then identifying and analyzing various characteristics such as attendance levels, operating budgets, and special programmatic features.

- Applying professional judgment to selected comparative data, and to determining space needs and costs to accommodate projected attendance levels.

- Based on the above analysis of goals, desirable program features, attendance, and costs, developing appropriate and viable options for potential development.

Appendix A maps and lists key characteristics for the 37 attractions with an aquatic component which were selected for analysis.

Pertinent data about the selected institutions was garnered from industry directories, by telephone inquiries and questionnaires, and from the personal files of consultant staff. Appendix B lists the organizations and persons contacted for this purpose.

Facility Types and Characteristics

Types of Facilities

- Theme Parks - These large corporate attractions, such as the Sea Worlds and Marineland, have entertainment as their primary focus. They feature aquarium exhibits and aquatic animal shows. Theme parks tend to have large sites, very high costs for development, operation, and admission, and massive attendance levels. Since their main aim is entertainment, they do not fulfill the Fisheries Division's goals. Facilities of this type, therefore, were not considered relevant to development of a proposed Michigan center.

- Traditional Aquariums - This category generally includes the older, metropolitan area aquariums in the country, which tend to be archival museums of live aquatic species displayed in tanks. Generally, they have small sites, moderate to high development and operating costs, low admission fees, and moderate to high attendance levels. They often feature popular visitor attractions such as salt water species, exotics, and tropical fish.

- Enhanced Aquariums - These facilities share many of the characteristics of traditional aquariums, but incorporate marine mammal shows into their programs. They tend to have small sites, moderate to high development and operating costs, moderate admission fees, and moderate to high attendance.

- Museums - Selected museums related to fish and fishing also were studied. Centered around preserved or mounted fish exhibits, they usually are fairly small in size, with low to moderate development and operating costs, low admission fees, and low attendance levels.

- Interpretive Centers - Interpretive centers' primary purpose is public education on specific sites, subjects, or environments, by means of natural exhibits (living or dead) and artifacts. These facilities are characterized by low to moderate development, operating and admission costs, and low to moderate attendance levels.

Comments on Selected Facilities

Of the few dozen aquariums and interpretive centers analyzed in this project, five have physical facilities and offer programs which are particularly relevant to the goals envisioned for a potential Michigan Fisheries Center. They are:

- North Carolina Aquariums--with individual facilities at Fort Fisher, Roanoke Island, and Pine Knoll Shores
- Cabrillo Marine Museum--San Pedro, California
- Monterey Bay Aquarium--Monterey, California
- Mystic Marinelife Aquarium--Mystic, Connecticut
- Michigan Fisheries Interpretive Center at Wolf Lake--Mattawan, Michigan

Overview discussions and facilities plans are provided on each.

Planning Guidelines

Attendance

Analysis is done on size and cost implications for an attendance level of 300,000 visitors annually at a single center. "Design-day" attendance estimates are derived as a basis for evaluating space needs.

Space

During the busy summer months, both indoor and outdoor displays and activities would be possible. Outdoor activities could include stocked fish ponds,

casting ponds, nature trails, etc. Indoor facilities could include exhibits, tanks, an auditorium, gift shops, etc. Needs for administrative, research, and conference space also are estimated.

Indoor space needs are projected to be, at a minimum, on the order of 19,000 square feet. Outdoor visitor area space will require at least 18,000 square feet, and parking somewhat more than two acres.

The total area needed for a 300,000 annual visitation level, then is calculated to be a minimum of three acres. In practice, of course, it is desirable often to have considerably more acreage. The Wolf Lake facility, for example, is on a 350 acre wooded tract.

Costs

Using an estimated cost of $100 per square foot for indoor space and $38 per square foot for outdoor development, current estimates of construction costs for facilities to serve 300,000 visitors per year (plus or minus) are:

Annual Visitation	Cost
100,000 visitors	$1 million
300,000 visitors	$3 million
500,000 visitors	$5 million

Development Options

Facilities - The analysis indicates that three basic options for development of a Michigan Fisheries Center should be considered:

- Single Facility--one center, designed as a major tourism attraction, which interprets all aspects of Michigan fish, fisheries, and related resource management.

- Adjunct to an Enhanced Aquarium--a "wing" devoted to Michigan fish and fishing, to be part of a potential larger enhanced aquarium which might be built in a major metropolitan area of the state.

- System of Facilities--an integrated set of smaller, more focused interpretive centers at a number of locations.

Exhibits and Programs - A "menu" of ideas for exhibits, programs, activities, and approaches is given, including innovative features which are not typically offered at existing facilities.

Next Steps

Decisions

This section briefly indicates the type of decisions needed in order to proceed further on a potential center, or system of centers. The consultants' main decision recommended is for a system of centers. This option appears to offer the greatest potential for serving Fisheries Division goals. It could

appropriately include the Division's existing Fisheries Interpretive Center at the Wolf Lake Hatchery. Limitations of the multiple facility concept also are mentioned.

Analysis

If there is a decision to develop a system of centers, decisions on initial numbers and locations must be made. A series of tasks is presented, which include programmatic, site, planning, and priority analysis and decision-making. Detailed facility studies, it is noted, should include:

- Site planning
- Market estimation
- Economic feasibility analysis

* * * * * *

CHAPTER I
INTRODUCTION

Background

Agency

The Fisheries Division, in the Michigan Department of Natural Resources, is a large and complex organization. Michigan has long been noted for its relative abundance of inland lakes and streams, and its record shoreline on the world's largest bodies of fresh water, the Great Lakes. Responding to this environment over many decades, the agency has gained an international reputation for innovation and excellence.

In the fiscal year ending on September 30, 1986, the Division had an annual operating budget of approximately $16 million, and a staff of 269 full-time equated positions. During the 1985-86 licensing year, sports fishing licenses were issued to over 1.5 million anglers, accounting for direct revenues to the State of more than $13.8 million. The Division also works with 120 commercial fishing licensees and over 1,000 charter licensees.

As described in the Fiscal Year 1987-88 Executive Budget, the Fisheries program is active in managing fish habitats, improving these habitats through in-stream construction projects, propagation, optimum utilization of Great Lake and inland lake hatchery stocks, and researching proper fish management techniques. Consultant services are provided to individuals needing information on fish ponds, lake management, use of chemical treatment, and dams. Specifically, the program is designed to analyze angler preferences, determine and obtain fishing locations, and serve as a liaison between the angler and fishing opportunities; to promote development and adoption of more effective fishing, processing, and management practices in commercial fishery; to maintain an information base related to fishing activities for the Great Lakes and inland lakes; prescribe methods for ensuring fish populations; assess environmental impacts on fishing activities; and, to develop and maintain hatcheries for reliable fish production and diversity of stock that meet the needs of fish management.

For the coming fiscal year, the proposed level of activity will provide fishing information to 450,000 licensed anglers; determine the status of 65 Great Lakes fish stocks; complete resource and problem inventories on 400 inland waters having public fishing; carry out fishery improvement projects on 120 inland waters; stock 12 million yearlings and 8 million fingerlings; and implement a strategic management system satisfying all current Federal aid requirements for sport fishery restoration and enhancement.

The six hatcheries throughout the State are:

- Harrietta State Fish Hatchery
- Marquette State Fish Hatchery
- Oden State Fish Hatchery

- Platte River State Fish Hatchery at Beulah
- Thompson State Fish Hatchery at Manistique
- Wolf Lake State Fish Hatchery at Mattawan

Physical plant, equipment, and technology to support the $4.5 million per year fish production program at these hatcheries includes computerized monitoring and, in recent upgradings at Wolf Lake, a $7 million national prototype solar facility and a $1 million interpretive center. This center alone, although off the beaten path and with thus far little more than word-of-mouth advertising, already attracts around 30,000 visitors per year.

Several years ago, as a guide to decisions on planning and budgeting, Fisheries Division staff codified the agency's mission and goals. The overall mission was stated as:

> "Protect and enhance populations and habitats of fishes, reptiles and amphibians, and other forms of aquatic life, and promote optimum use of these resources to benefit the people of Michigan."

Resulting agency goals include:

- Protect and maintain healthy aquatic environments and fish communities, and rehabilitate those now degraded.

- Secure assured public access and appropriate facilities on all public waters which support or have the potential to support significant public fisheries.

- Provide diverse fishing opportunities within geographic areas, and maximize the value to fishermen of recreational fisheries.

- Recover the cost of management from resource users.

- Foster and contribute to public and scientific understanding and stewardship of fish, fishing, and fisheries management.

Project

Building particularly on the last stated goal, but recognizing its relationship to the other goals, department officials have begun to consider the desirability and feasibility of a facility, or a set of facilities, which would tell the story of Michigan fish, fishing, and fisheries management. An appropriately planned and developed Michigan Fisheries Center, it is thought, could function simultaneously as a tourist attraction for the State, a research and training site, and a public educational facility.

In July of 1986, to explore these possibilities using especially qualified outside expertise, the Division engaged consulting services for this purpose from the Department of Management and Budget's Office of Management and Information Systems. The first objective for the project, with results presented in this report, is to develop, analyze, and document potential concepts and options for a proposed Center.

Scope

Tasks undertaken in the conceptual planning phase of the project have included:

- Formulate project framework - with special emphasis on facility alternatives in relation to agency goals.
- Conduct background research - with documentation and analysis of pertinent facilities in operation elsewhere.
- Develop planning guidelines and development options - sufficient for generating an agenda of the next steps to be taken, if a decision is made to continue with the project.

Method

Planning parameters for this phase of the project were developed by means of an intensive small group "think tank" session, held at the Wolf Lake Center, with additional interviews and follow-up discussions as needed. Initial consensus on desirable features in a potential Michigan Fisheries Center is that it:

- Be highly attractive to visitors well into the 21st century, but not overly commercial.
- Relate to fish, fishing, and fisheries management in the Great Lakes and on Michigan wetlands, inland lakes and streams.
- Display and interpret--rather than merely archive--living fish and other aquatic species of the region.
- Be designed to educate the public in an interesting manner.
- Offer programs to relatively large numbers of Michigan anglers.
- Facilitate research and professional training activities of the Fisheries Division, or related organizations.

Specific methods used in this phase of the project consist of:

- Interviewing client staff to determine the goals and aspirations of the Fisheries Division, and to gain insight into current programs and facilities which could be incorporated into a proposed development.
- Documenting selected facilities in the State and the nation, then identifying and analyzing various characteristics such as attendance levels, operating budgets, and special programmatic features.
- Applying professional judgment to selected comparative data, and to determining space needs and costs to accommodate projected attendance levels.

- Based on the above analysis of goals, desirable program features, attendance, and costs, developing appropriate and viable options for potential development.

Information on facilities of the type envisioned in this project tends still to be quite fragmentary. For that reason, much effort deliberately went into systematically searching out, arraying, and analyzing secondary data, including development of a typology of facilities. Appendix A maps and lists key characteristics for the 37 attractions with an aquatic component which were selected for this purpose by means of professional knowledge and judgment.

Pertinent data about the selected institutions was garnered from industry directories, by telephone inquiries and questionnaires, and from the personal files of consultant staff. Appendix B lists the organizations and persons contacted for this purpose.

CHAPTER II
FACILITY TYPES AND CHARACTERISTICS

Types of Facilities

Analysis of the data on selected attractions with an aquatic component suggests that the variety of facilities usefully can be divided into a number of categories which share certain characteristics. Although there is some overlap, categorical general comments can be made with regard to operating data and respective facility requirements. Comments also are included on how various facilities and programs relate to the stated goals of the Fisheries Division. Abbreviated tables accompany each category of comparable facilities. More complete data is given in Appendix A.

Theme Parks

A number of large attractions in the nation have, as a primary theme or as a major component, an aquarium or a "show" featuring aquatic animals. They are designed to capture the tourist market through their entertainment values. By their very nature, however, they have some educational impact on their visitors.

Theme Parks with an Aquatic Component

Facility	Estimated 1985 Attendance	Size (Acres)	Admission (Adult)	Annual Budget	Number of Employees
Sea World of FL	3,500,000	135	$16	$22,000,000	1,800
Sea World of CA	3,100,000	135	15	35,000,000	1,500
Marine World CA	1,200,000	145	13	19,000,000	1,100
Sea World of OH	1,200,000	80	14	16,000,000	1,200
Marineland CA	1,000,000	105	10	12,000,000	550

Some of the characteristics which these facilities share are:

- High initial development costs
- Large staffing requirements
- High admission fees
- High attendance experience
- Little relation between area population and attendance
- Large sites
- Largely an outdoor experience (If not located in warmer climates, a seasonal operation is indicated.)
- Aquatic "shows," featuring marine mammals, performing in large outdoor tanks

- A wide variety of activities (rides, food, entertainment)
- Educational programs and research which are incidental to normal profit seeking operations

While theme parks can be highly effective as attractions for their entertainment values, they fulfill few of the parameters set forth for the Fisheries Division. Therefore, no more consideration was given to these types of facilities.

Traditional Aquariums

This category of facilities includes some of the older aquariums in the country. The aquariums usually are "museums" of aquatic species, displayed in tanks of an appropriate size to accommodate the species displayed. These facilities play a more community-oriented role than do theme parks. Their collections often are limited to fish--both fresh and salt water species--but sometimes include reptiles and amphibians. The fact that marine mammals are not featured in the displays is the primary component separating these facilities from the "enhanced aquariums" described below.

Traditional Aquariums

Facility	Estimated 1985 Attendance	Size (Acres)	Admission (Adult)	Annual Budget	Number of Employees
Monterey Aqu CA	2,000,000	2	$7.00	$7,600,000	250
Shedd Aqu IL	900,000	n/a	2.00	4,300,000	95
Seattle Aqu WA	540,000	4	3.00	1,600,000	55
Dallas Aqu TX	350,000	2	Free	300,000	10
Waikiki Aqu HI	300,000	2	1.50	600,000	25

Traditional aquariums share some common characteristics:

- Moderate to high initial development costs
- Moderate operating budgets
- Small staffing requirements
- Low admission fees
- Moderate to high attendance figures
- Close relationship between area population and annual attendance
- Recognized as a community cultural asset
- Year-round operation
- Small sites (usually a single structure)
- Tanks sized to fit individually displayed species
- Usually feature salt water species, exotics, and tropical fish
- Do not feature marine mammal "shows"
- Educational programs primarily confined to lectures and guided tours

A traditional aquarium limited to fresh water species would lack many of the elements which make such facilities attractive to visitors. There is little doubt that a large shark, a whale, or an electric eel is more fascinating to the general public than a sucker or northern pike.

Of the facilities included in this category, the Monterey Bay Aquarium poses a problem in classification. Features which make this facility unique will be discussed later in the chapter.

Enhanced Aquariums

Facilities in this category, while sharing many of the characteristics of "traditional aquariums," feature marine mammals in their collections (whales, dolphins, seals, otters, etc.). The popularity of these animals is reflected in the increased attendance experience. Most of the facilities in this category are more recent developments.

Enhanced Aquariums

Facility		Estimated 1985 Attendance	Size (Acres)	Admission (Adult)	Annual Budget	Number of Employees
Baltimore Aqu	MD	1,200,000	3	$6	$5,700,000	175
Boston Aqu	MA	1,100,000	3	6	5,700,000	140
Mystic Aqu	CT	654,000	19	6	2,800,000	130
Vancouver Aqu	BC	652,000	2	5	2,100,000	120
New York Aqu	NY	600,000	14	3	3,200,000	60

The common characteristics which they share are:

- Moderate to high development costs
- Moderate to high operating budgets
- Moderate staffing requirements
- Moderate admission fees
- Moderate to high attendance figures
- Less relationship between area population and attendance than the "traditional aquariums"
- Recognized as a cultural asset to the community
- Year-round operations
- Small sites (usually a single building)
- Feature large, aquatic-community tanks
- Feature marine mammals performances
- Educational programs usually limited to lectures, tours and "shows" or "feedings"
- Research programs usually incidental to operations

It is quite apparent that the addition of marine mammal "shows" can greatly increase projected attendance over that at a traditional aquarium. In that such displays have been deemed inappropriate for the facility under study, it is not likely that such a facility would meet parameters for the Fisheries Division.

Museums

While it is not the purpose of this study to include an examination of museums as a broad category, some museums do relate to fish and fishing. Therefore

they are included in this analysis. Those listed are centered around collections of fish--preserved or mounted, but dead--or equipment which relates to fishing. These examples are included because of their direct focus on aspects of fishing.

Museums

Facility	Estimated 1985 Attendance	Size (Acres)	Admission (Adult)	Annual Budget	Number of Employees
Fishing Mus WS	160,000	7	$3.00	$300,000	9
Calvert Mus MD	100,000	n/a	Free	400,000	27
New Bedford MA	62,000	1.5	2.50	700,000	24
Fishing Mus VT	2,000	1	Free	300,000	4

Their characteristics are:

- Low to moderate development costs
- Low operating budgets
- Small staffing requirements
- Small attendance experience
- Usually housed in a single structure
- A collection of objects which is preserved and interpreted
- A focused interpretation

Since the differentiation between museums and interpretive centers frequently is misunderstood, it is important that the differences be clarified. Museums are centered around a collection of objects: historical artifacts or natural history items such as bird skins, butterflies, or minerals. The objective of a museum traditionally is to preserve, protect, and interpret those collections to the public. A museum's focus may be broad or narrow, depending on the scope of the collections. In this light, zoos and traditional aquariums have some relationship to museums as defined here. Zoos and aquariums collect, preserve, and interpret living collections of animals or fishes. A museum also may be incorporated as a element of an interpretive center.

Interpretive Centers

Interpretive centers have, as their primary purpose, education or enlightenment of the public about a particular site, subject, or environment. While objects and creatures--living or dead--may be used in the educational process, they are not in themselves the focus of the interpretation. The focus of an interpretive center may be narrow or broad--explaining the events which took place on a single battlefield, say, or creating awareness of an environment. In any event, the intent of the facility is to teach the visitor about a specific subject. Means for carrying out this activity may range from static exhibits to highly interactive programs. The interpretive facilities which are listed below all relate to some aspect of aquatic life or environments, and incorporate living aquatic specimens in their programs.

Interpretive Centers

Facility		Estimated 1985 Attendance	Size (Acres)	Admission (Adult)	Annual Budget	Number of Employees
NC Aquariums						
Fort Fisher	NC	350,000	1	Free	$333,000	9
Roanoke	NC	336,000	1	Free	333,000	9
Pine Knoll	NC	335,000	1	Free	333,000	9
Cabrillo	CA	275,000	1	Free	337,000	10
Scott Marine	MS	80,000	1	$2.00	43,000	5
Wolf Lake	MI	30,000	320	Free	85,000	2
Alley Pond	NY	15,000	618	Free	290,000	7

Characteristics shared by these facilities are:

- Low to moderate initial development cost
- Low to moderate operating budgets
- Low staffing requirements
- Low to moderate attendance experience
- Frequently serve as the visitor center for a large site or environmental area
- A focus upon a specific site or environment
- An emphasis on education or environmental awareness
- A mix of graphic, audio/visual, and living exhibits
- Emphasis frequently placed on interactive exhibits
- Usually incorporate outdoor activities

Comments on Selected Facilities

The foregoing analysis of facilities which include an aquatic component in their physical structure or interpretive intent suggests that there are distinct lines of separation between the types described. This is definitely not the case. In fact, there are many areas where overlapping activities make it very difficult to assign a particular facility to one of the above types. In this section, we attempt to determine which of these facilities offer programs and physical facilities which meet goals paralleling those of the Fisheries Division.

Of all the facilities examined, the interpretive centers--with their emphasis on focused interpretation and education--appear to offer the best concept around which to structure a facility, or conceivably a set of facilities, capable of meeting the goals of the Fisheries Division. But interpretive centers frequently are modest operations, with limited public attraction and low attendance rates.

The North Carolina Aquariums, with three facilities and a combined annual attendance of one million, and the Cabrillo Marine Museum, with an annual attendance of 275,000, stand out as particularly worthy of further examination in the context of this project.

Among the facilities which are not interpretive centers, two stand out for further study: the Monterey Bay Aquarium, and the Mystic Marinelife Aquarium. Although the Monterey facility is classed as a traditional aquarium, it has many characteristics of an interpretive center. With an annual attendance of two million, it is very attractive to the public. Its imaginative exhibits can offer some insight for a potential development in Michigan. The Mystic Aquarium, an enhanced aquarium, is included as an example of a facility located in an area with a low resident population but a high tourist count.

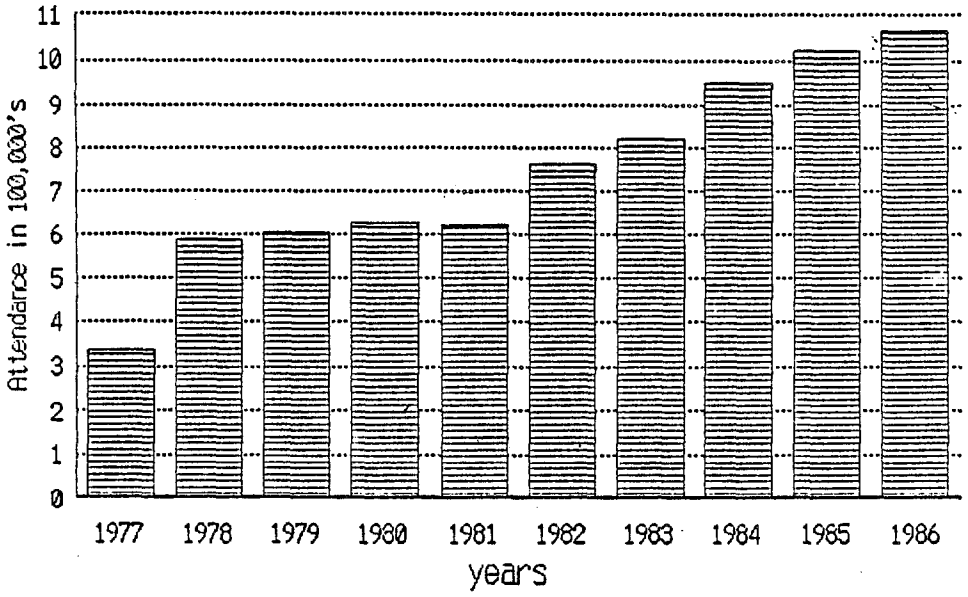
Finally, the existing Fisheries Division facility at the Wolf Lake Fish Hatchery should be examined further to see what role it might play in potential development plans.

In the sections below, we discuss each of these facilities briefly, to see what they distinctively offer and how their successes might be applied in Michigan.

North Carolina Aquariums

The North Carolina Aquariums consist of three separate facilities located along the North Carolina coast. They are operated by the state. There are no admission fees, but there is a charge for some activities. Each of the three facilities features different aspects of the overall interpretation in the combined facilities. They are each of approximately the same size and complexity. Their purpose is "to promote an awareness and understanding of this state's relationship with the sea..., a relationship which dates back four centuries, ...that will remain important to our state's social, cultural, and economic development in the centuries to come."

In 1985, for the first time in their ten-year history, combined annual attendance of the three facilities exceeded a million visitors. Attendance at individual sites ranged from 335,000 to 350,000. The combined attendance has grown from just over 341,000 in 1977, the first full year of operation, to the point where, with the exception of the combined attendance at all 33 state parks, the aquariums are the most visited state facilities in North Carolina.



North Carolina Aquariums Attendance

All three of the Aquariums are people-oriented places, featuring displays of live marine animals and plants native to the North Carolina coast. All have "touch tanks," where visitors can handle living species such as horseshoe crabs. The aquarium tanks are supplemented with graphic exhibits on such topics as blue crabs, whales, and water-barrier islands. Each of the facilities houses classrooms, laboratories for teaching and research, libraries, and facilities for Sea Grant Marine Advisory Services. The research laboratories are made available to scholars whose work shows promise of solving problems related to marine and coastal resources.

Each of the Aquariums has programs designed to promote marketing of underutilized marine species, hurricane preparedness, beach and boating safety, teacher training, "shoulder season" tourism, and in general the wise use of coastal and marine resources. The centers have many activities which involve the visitor in exploratory walks, boat trips, scuba diving, and other off-site activities. One of the facilities features a shark tank, another a turtle pond. Each has a number of tanks, the largest of which contains 20,000 gallons of sea water. (For comparison, a large tank at a major new aquarium could range upwards of 300,000 gallons.)

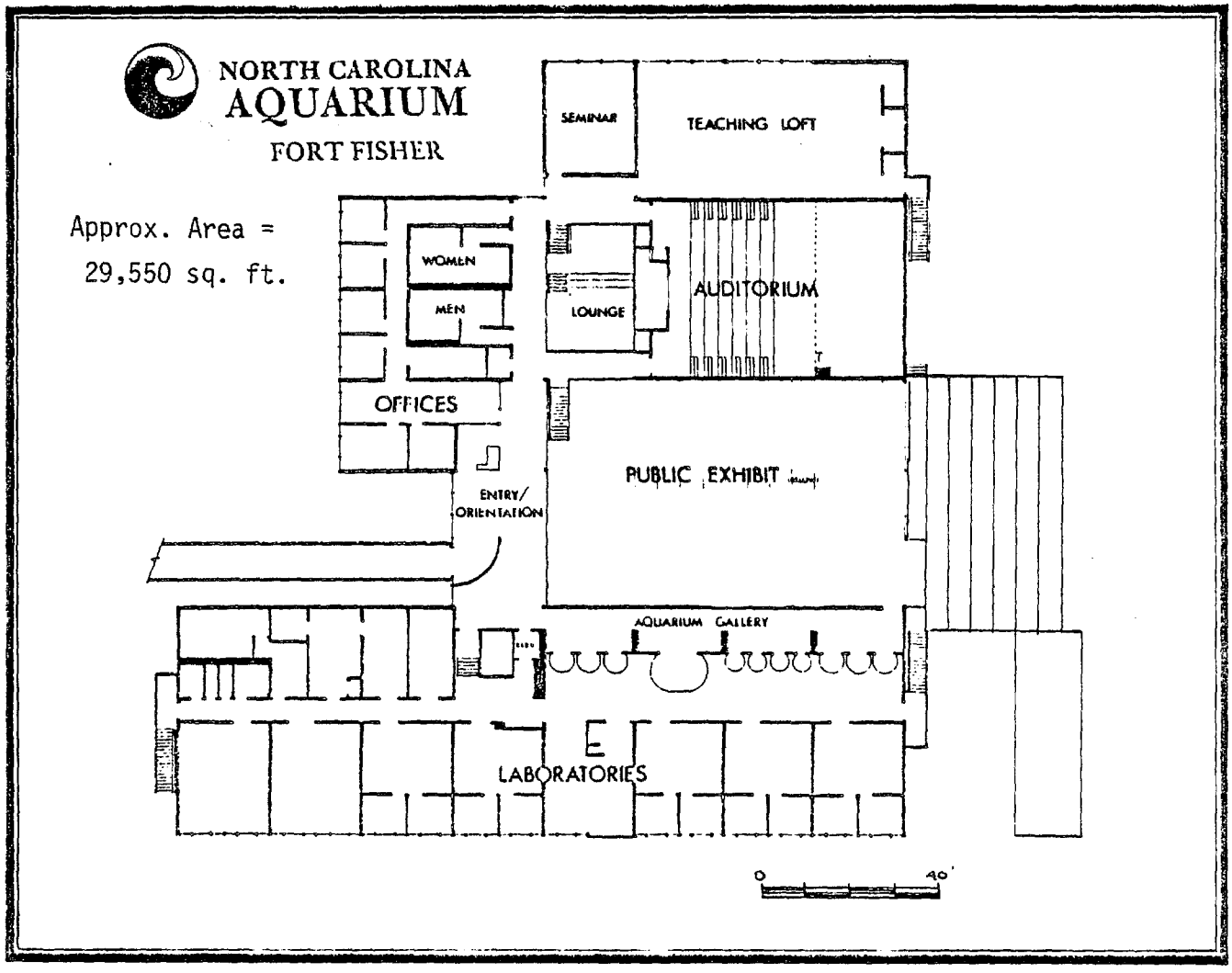
Construction costs for all three facilities, in 1976, were $1,500,000. Applying a national consumer price index adjustment, 1987 costs would be approximately $2,700,000, or about $900,000 for each of the installations. Plans on the following pages give some indication of the layout at the three North Carolina Aquariums.

Cabrillo Marine Museum

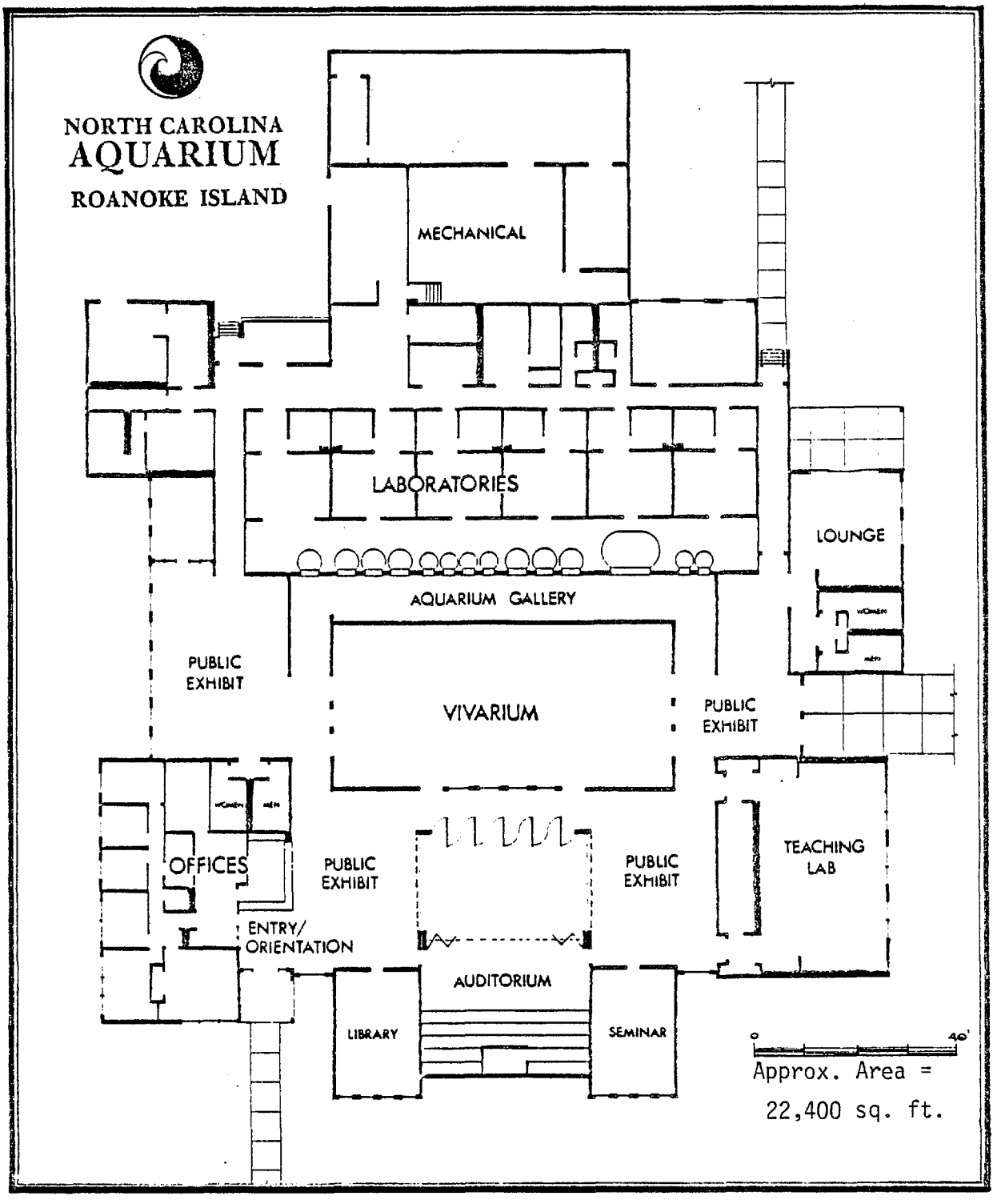
The Cabrillo Marine Museum and Aquarium, in San Pedro, California, is dedicated to promoting knowledge and awareness of the marine life of Southern California through recreational, educational, and research programs. It attracts 275,000 visitors annually to its complex of buildings on the Pacific shore.

The facility includes a combined aquarium and exhibit area. Total volume of the 35 tanks is 40,000 gallons. Large fish, marine mammals, and birds are interpreted through the use of mounted specimens and models. A "touch tank" is provided. Other components are an auditorium, classrooms, laboratories for staff and visitor use, a gift shop, and administrative offices. The museum offers a varied and active series of tours, demonstrations, classes, and workshops on-site, and boat trips to view whales and marine environments in the area.

The facility staff are particularly popular among young people and work closely with public schools in the area.



Note: A lower floor contains the exhibit hall (the upper portion is shown here), a small auditorium, a lounge, an exhibits shop, and a mechanical room.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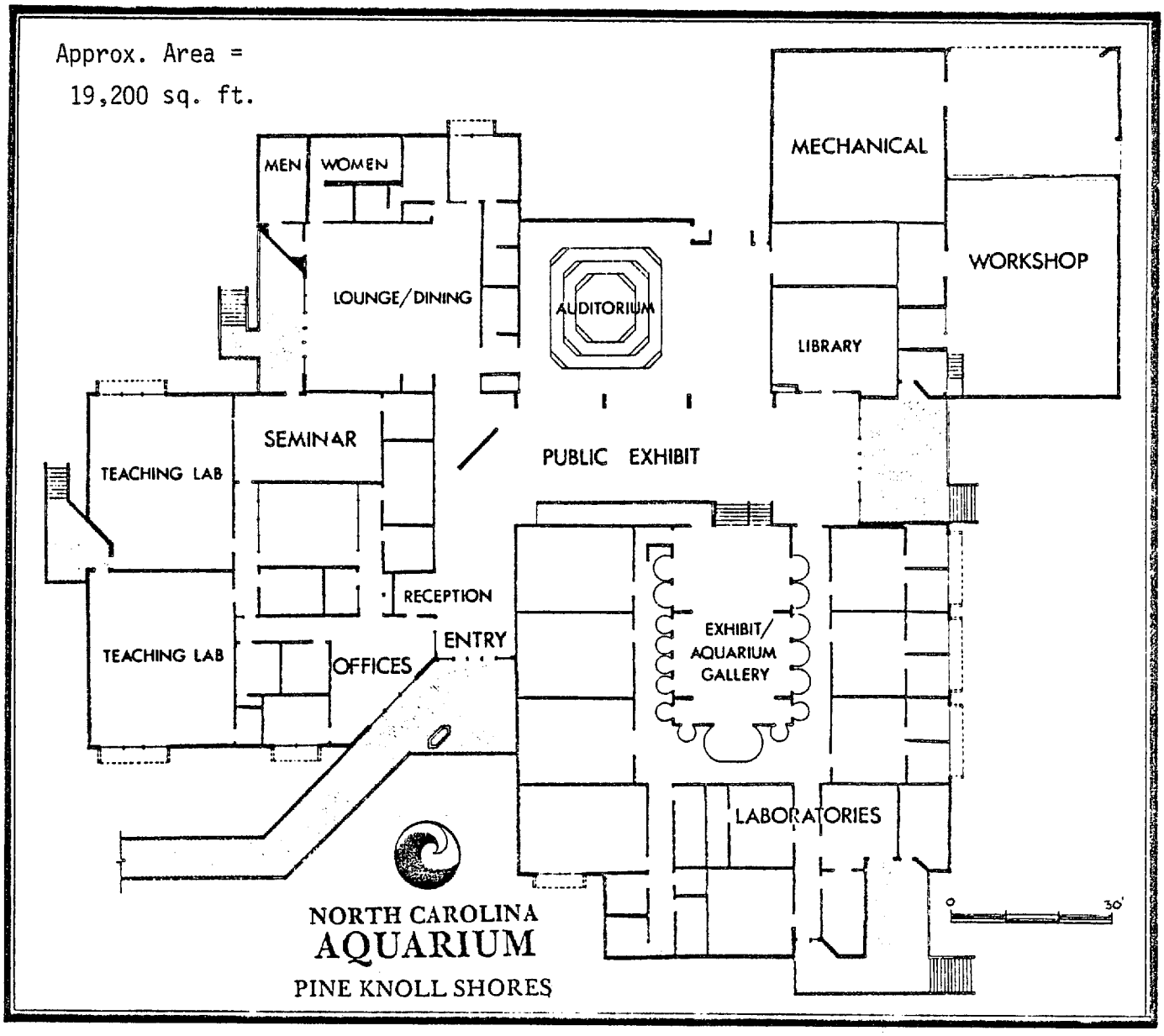
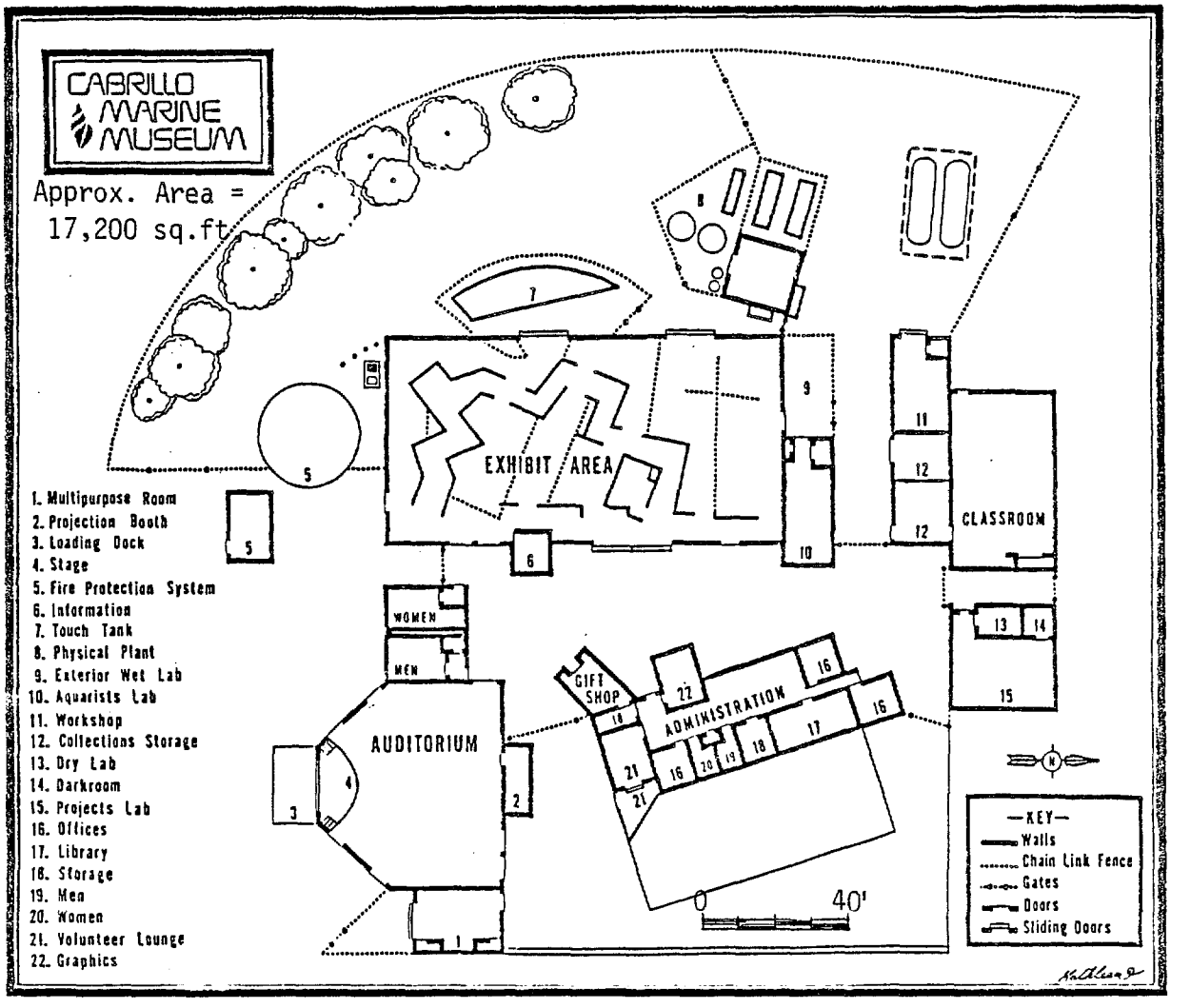
AQUARIUM
ROANOKE ISLAND
MECHANICAL
LABORATORIES
LOUNGE
AQUARIUM GALLERY
PUBLIC EXHIBIT
VIVARIUM
PUBLIC EXHIBIT
OFFICES
PUBLIC EXHIBIT
PUBLIC EXHIBIT
TEACHING LAB
ENTRY/ ORIENTATION
AUDITORIUM
LIBRARY
SEMINAR
0
40'
Approx. Area =
22,400 sq. ft.


Approx. Area =
19,200 sq. ft.
MEN
WOMEN
LOUNGE/DINING
AUDITORIUM
MECHANICAL
WORKSHOP
LIBRARY
SEMINAR
TEACHING LAB
PUBLIC EXHIBIT
RECEPTION
ENTRY
TEACHING LAB
OFFICES
EXHIBIT/
AQUARIUM
GALLERY
LABORATORIES
0
30'
NORTH CAROLINA
AQUARIUM
PINE KNOLL SHORES


CABRILLO MARINE MUSEUM
Approx. Area = 17,200 sq.ft.
EXHIBIT AREA
AUDITORIUM
CLASSROOM
ADMINISTRATION
GIFT SHOP
WOMEN
MEN
1. Multipurpose Room
2. Projection Booth
3. Loading Dock
4. Stage
5. Fire Protection System
6. Information
7. Touch Tank
8. Physical Plant
9. Exterior Wet Lab
10. Aquarists Lab
11. Workshop
12. Collections Storage
13. Dry Lab
14. Darkroom
15. Projects Lab
16. Offices
17. Library
18. Storage
19. Men
20. Women
21. Volunteer Lounge
22. Graphics
0
40'
KEY
Walls
Chain Link Fence
Gates
Doors
Sliding Doors

Monterey Aquarium

The Monterey Bay Aquarium is a non-profit, self-supporting institution whose galleries and exhibits explore the facts, myths, and mysteries of one of the world's richest marine regions: Monterey Bay, on California's Pacific shore. Through active public education and scientific research programs, as well as sea life displays, the aquarium contributes to a greater knowledge and awareness of the marine environment. While marine mammal "shows" are not featured, feedings of sea otters play a prominent role in enhancing the visitor experience. Other large tanks display recreated marine environments, such as a kelp forest.

In 1985, the Monterey Aquarium experienced an attendance of over 2,000,000 visitors. It is located on Cannery Row, an area with a high number of tourists. A relatively large part of the total visits results from the fact that this facility, whose construction was financed by a wealthy philanthropist, is a very expensive showplace. It also is popular with the community as a place for banquets, receptions, etc. This usage, however, has been criticized as detrimental to the creatures displayed there, through disruption of their "day/night" cycles.

While classed as a traditional aquarium in the initial review, this facility--with its focused interpretive approach, and its emphasis on education, environmental awareness, and understanding--offers many design and creative interpretation features which could be incorporated into a proposed Michigan facility.

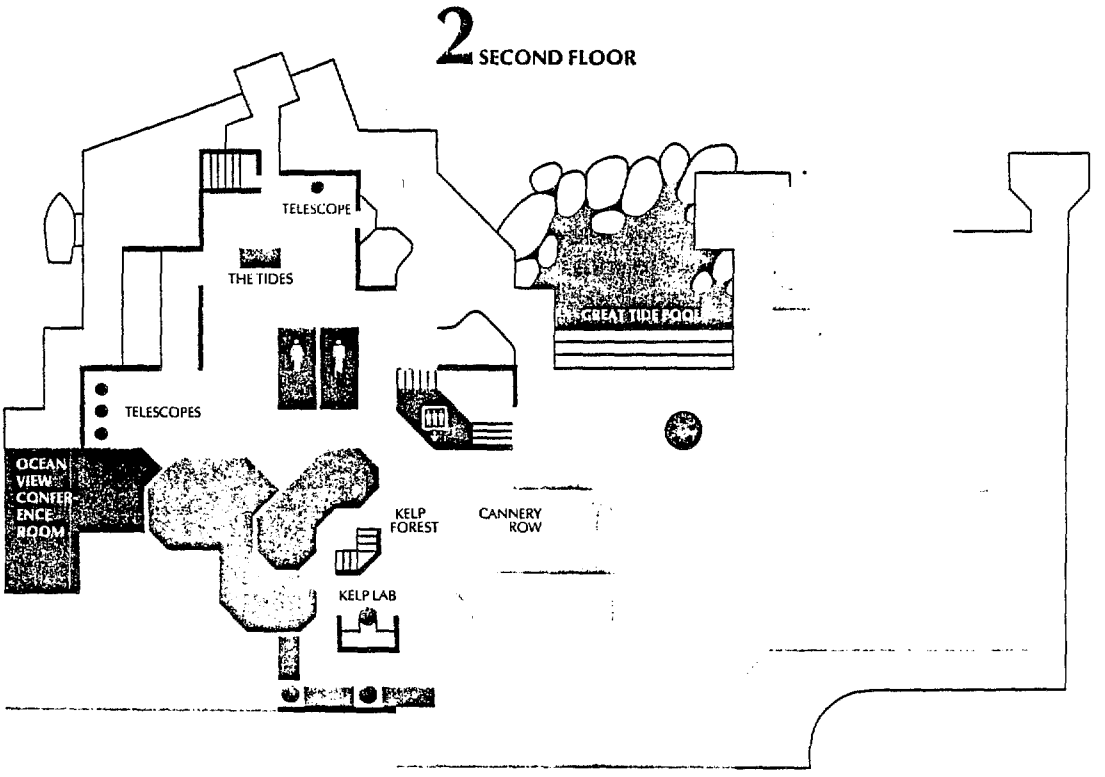
However, in that the $300 per square foot construction cost for this facility far exceeds costs for the other facilities examined in this report, the Monterey Aquarium cannot be used as an exact model for physical planning of a public Fisheries Center.

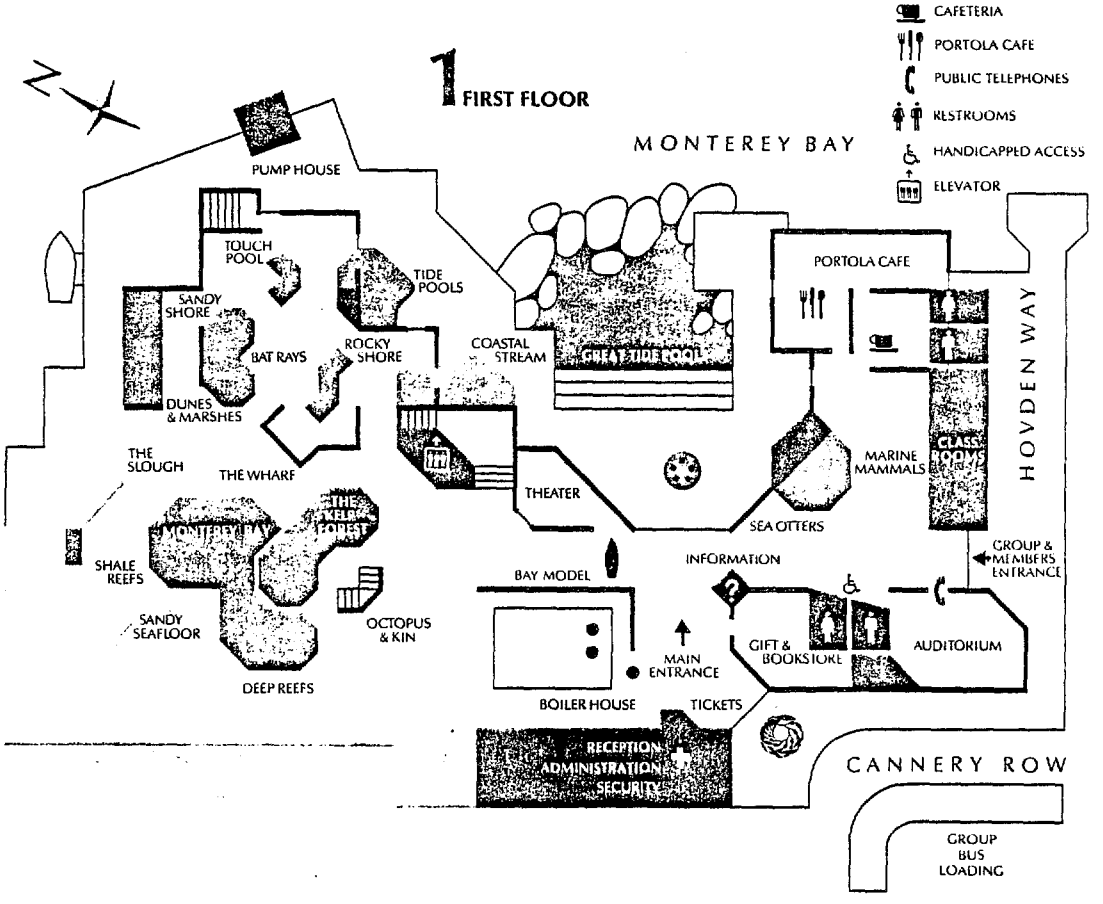
Mystic Marinelife Aquarium

The Mystic Marinelife Aquarium is located very near the well known Connecticut attractions of Mystic Seaport and Olde Mystic Village. In 1985, it had an attendance of 654,000 visitors. Although the area population is low, this aquarium out-performs every other major aquarium from a resident market-penetration point of view. The experience of this facility shows that there is a great advantage in locating near other successful attractions.

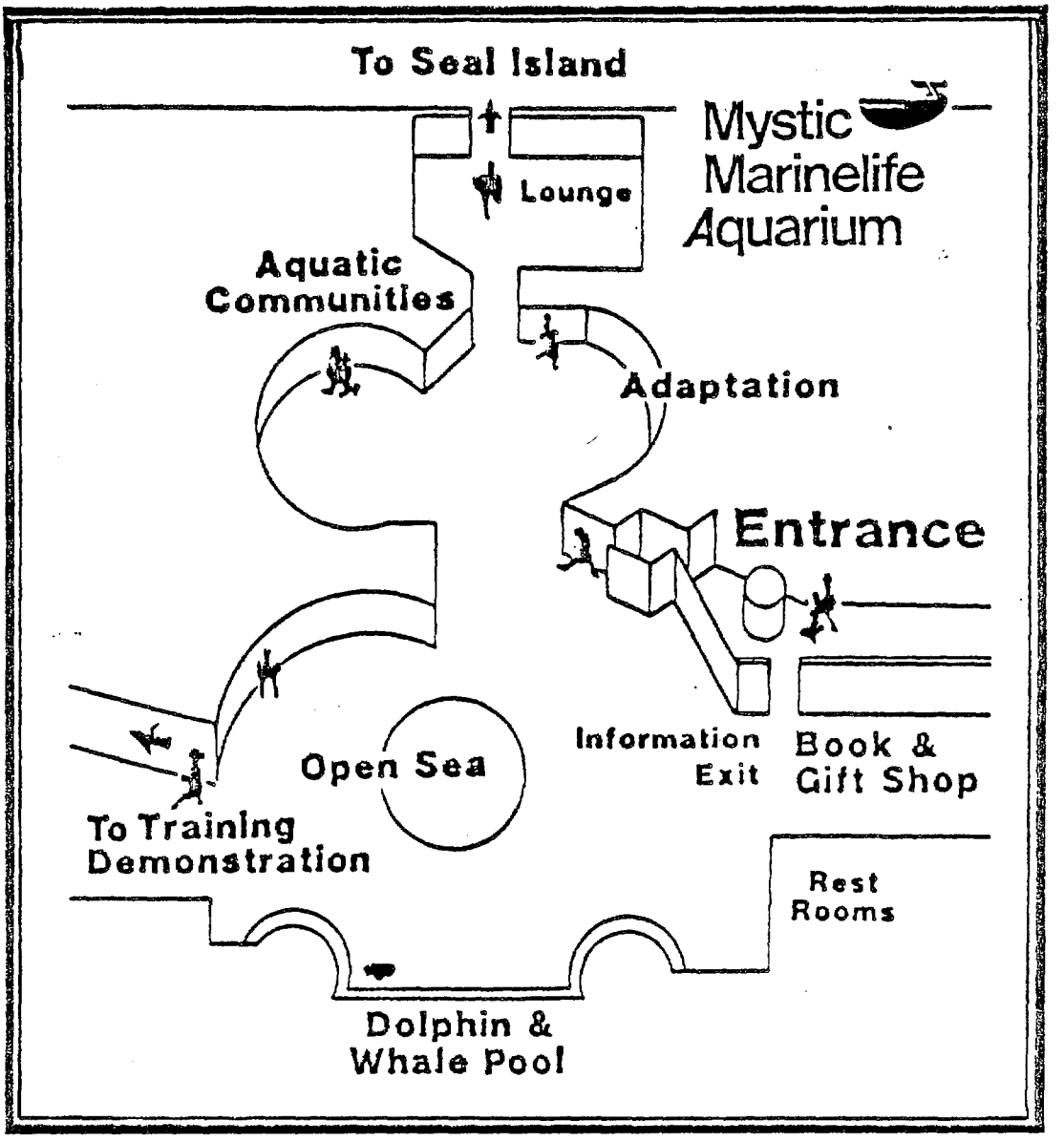
Just over 60% of the annual attendance is comprised of regular individual admissions. The balance includes student groups, scheduled tour and package groups, special discount admissions, and free admissions. (Members and children under five are admitted free.) There is an active membership program which contributes more than 100,000 visitors per year, or 15% of the total annual visitation.

In addition to its outdoor dolphin and whale programs, and a "seal island," the aquarium has 30 indoor displays which interpret aquatic communities, adaptation, and the open sea.





MONTEREY BAY AQUARIUM


To Seal Island
Mystic Marinelife Aquarium
Lounge
Aquatic Communities
Adaptation
Entrance
Information Exit
Book & Gift Shop
Open Sea
To Training Demonstration
Rest Rooms
Dolphin & Whale Pool

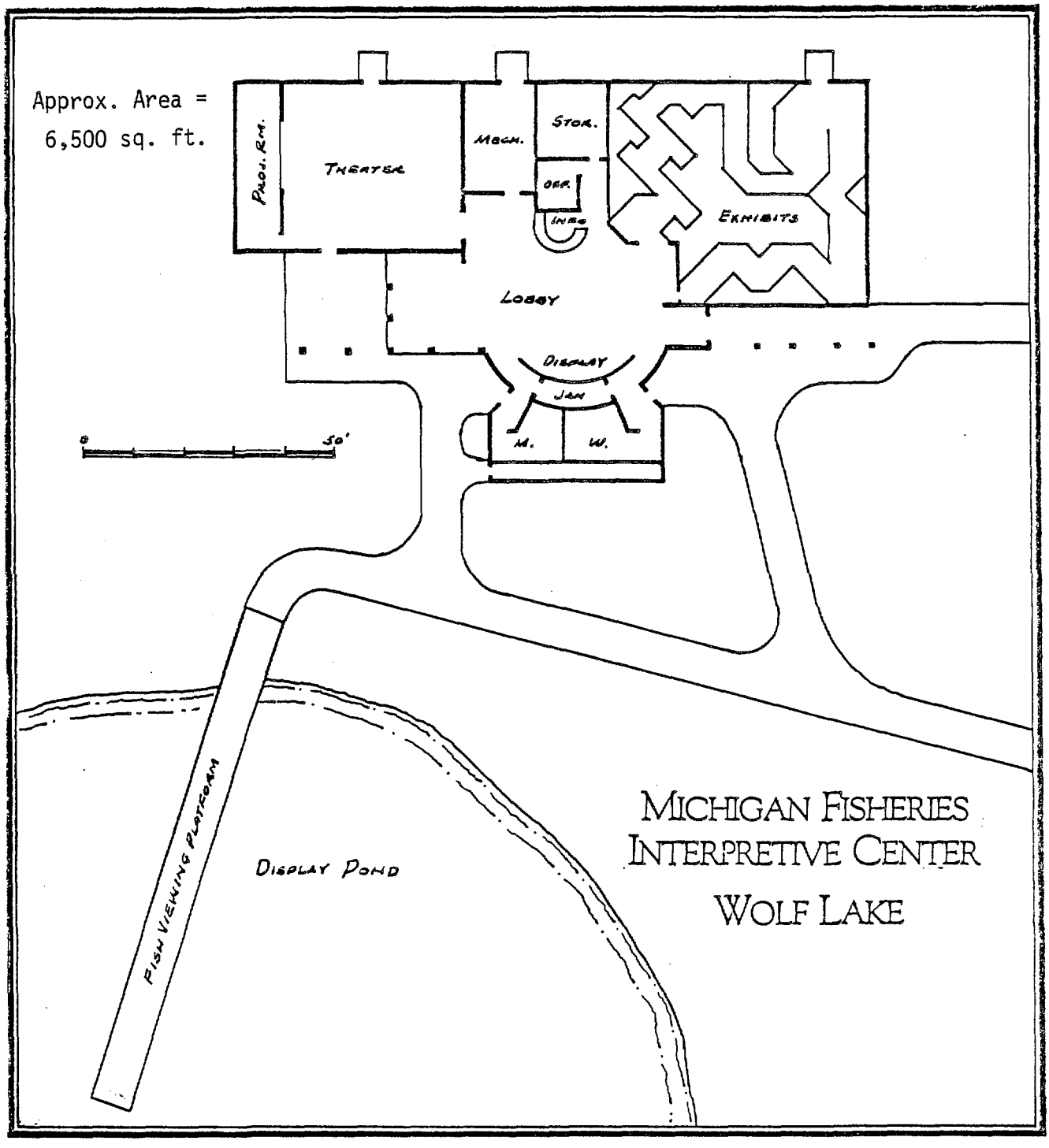
Michigan Fisheries Interpretive Center

An excellent but little known interpretive facility, recently built in Michigan, is located at the Wolf Lake Fish Hatchery, six miles west of Exit 38B on US 131. The exit is four miles north of the US 131/I-94 junction. While the center is situated near major traffic routes, at its current scale of development, the requirement that a visitor depart from the main route serves as a major deterrent to attendance.

The center features an auditorium, where audio-visual programs are presented, and a small walk-through museum related to fish and fishing in Michigan. In the lobby, record fish catches and other aspects of Michigan fish and fishing are displayed. A large outdoor pond, used to house brood stock of Atlantic salmon, has walkways which permit visitors to view these large fish in their natural environment. Depending on the availability of staff, tours of the hatchery itself may be arranged. Outside of the interpretive center, there is little other self-guiding interpretation.

While the interpretive center itself is housed in a modest structure, its location in conjunction with the recently expanded hatchery facility greatly enhances the interpretive experience. By drawing on the resources, the staff, the support systems, and the research activities of the fish production facility, it also reduces costs for development and operation.

Considering that the facility is not on a primary tourist route, and there is as yet a deliberately low level of product marketing efforts, the annual visitation level of about 30,000 people is quite good. The visitor count undoubtedly could be increased through better signage on the major highways, and other forms of promotion.


Approx. Area =
6,500 sq. ft.
PROJ. RM.
THEATER
MECH.
STOR.
OFF.
INFO
EXHIBITS
LOBBY
DISPLAY
JAM
M.
W.
0
50'
FISH VIEWING PLATFORM
DISPLAY POND
MICHIGAN FISHERIES
INTERPRETIVE CENTER
WOLF LAKE

CHAPTER III
PLANNING GUIDELINES

In the previous chapter, we discussed various facilities which appear to indicate a viable scale and complexity for a Michigan Fisheries Center, or system of centers. This section provides planning guidelines in terms of physical sizing and development costs.

The guidelines set forth below are to be considered only as potential scenarios. They are subject to substantial variation, depending on final decisions regarding development concepts, location, and design. Nonetheless, it is considered useful to provide an approximate quantitative picture for a generic aquatic interpretive center, within a typical range of attendance experiences for Michigan tourism facilities.

Attendance

The analysis below covers, in sketch form, size and cost implications for three levels of yearly attendance at a single center. The selected levels of attendance are 100,000, 300,000, and 500,000 visitors annually. In the following paragraphs, the 300,000 level of attendance is discussed. Information on the other attendance levels, proportional to that of the 300,000 level, is shown in a summary table.

Starting with an assumed annual attendance of 300,000 visitors, a calculation is made to estimate the "design-day" level of attendance. Design-day attendance is the daily attendance value to which physical facilities are designed. It usually is calculated as the average of the top 10-15 days during July or August. This level of attendance is not the peak daily level of attendance, as it is considered to be uneconomic to build for absolute peak conditions.

To derive the design-day attendance, the first step is to estimate peak monthly attendance. This is estimated by investigating seasonality patterns of other attractions in the area where the center is to be located, and/or of comparable attractions with similar climatic conditions. Precise estimation of seasonality is the subject of a later phase of overall project planning. Most attractions draw between 15 and 20 percent of their annual attendance as their peak monthly attendance. For purposes of this report, 20 percent of the annual attendance is taken as a judgment of peak monthly attendance. Hence, 60,000 visitors (300,000 annual visitors times 20 percent) is deemed to be a reasonable value of projected peak monthly attendance.

Peak monthly attendance is expected to occur in July or August, each having 4.43 weeks. The peak weekly attendance (ignoring special holiday weeks) is expected to be about 13,500 people (60,000 divided by 4.43). To derive the design-day attendance in the absence of daily attendance data from comparable attraction experience suggests that about 20 percent of the attendees will visit the facility on a Saturday or Sunday, and this will be the highest attended day. During the summer, daily attendance shows a greater degree of evenness than during non-summer months. However, there usually is a higher concentration during the weekend days. Using the 20 percent value, the

design-day level of attendance is then calculated to be 2,700 visitors (13,500 visitors times 20 percent).

While the term "design-day attendance" is used to refer to the daily attendance for which the facility should be designed, a facility actually must be designed for the maximum number of people who would be expected to be on the grounds at one time during the design-day. To estimate this number of persons, two pieces of information are required:

- average length of stay of visitors (which is a function of the entertainment content and capacity of the facility)
- arrival distribution of visitors throughout the day

For purposes of conceptual planning, it is assumed that the average length of stay will be between 1 and 2 hours. That range, coupled with a typical arrival distribution, will result in, say, 25 percent of the day's crowd being on the grounds at any one time. Thus, the peak in-facility crowd would be on the order of 675 visitors.

DESIGN-DAY ATTENDANCE AND OVERALL SPACE NEEDS

	Low	Moderate	High
A. Annual Attendance (people)	100,000	300,000	500,000
B. Peak Monthly Attendance (A. x 20%)	20,000	60,000	100,000
C. Peak Weekly Attendance (B./4.43)	4,500	13,500	22,500
D. Design-Day Attendance (C. x 20%)	900	2,700	4,500
E. Peak In-Facility Crowd (D. x 25%)	225	675	1,125
F. Indoor Space Needs (sq. ft.) (70% of crowd; 40 sq. ft./person)	6,300	19,000	31,700
G. Outdoor Space Needs (sq. ft.) (30% of crowd; 90 sq. ft./person, excluding parking)	6,000	18,000	30,000

Space

As the busiest days would occur in the summer months, when the Michigan climate is most favorable for outdoor activities, a significant portion of the facilities experience can be situated outdoors; say, 30 percent. Outdoor attractions could include stocked fish ponds, casting ponds, nature trails, and heavily landscaped areas with rockwork falls and foliage. Using a minimal planning factor of 90 square feet per person, at least 18,000 square feet of outdoor space should be developed for the projected 200 people there (675 visitors times 30 percent). If extensive trails or water bodies are included, as they likely would be, additional space must be allocated for these purposes. Some of these components, of course, also could attract visitors in winter.

For the projected indoor load of about 475 visitors, a planning factor of 30-50 square feet per person is a range found in modern facilities, with a strong leaning in the direction of 50 square feet per person. This planning factor is a gross area figure, including visitor access, support services, and administrative areas. Conservatively using 40 square feet per person yields an indoor facility of about 19,000 square feet.

How would the projected 19,000 square feet be used? On the order of 40 percent, or 7,600 square feet, would be dedicated to administrative, research, training, educational, and conference uses. Substantially more area could be targeted for these functions, depending on ultimate desires and demands for such space.

For the visitor access area, 60 percent--or roughly 11,400 square feet--would be required. A breakdown of this space utilization is provided in the table below. As shown, the visitor-related area appropriately could include an orientation theater. This audio-visual experience might last 10-15 minutes, thereby permitting the theater to be cycled three to four times per hour during the busiest times. If it is agreed that the theater accommodate virtually all visitors, then it should seat about 180 people. At a planning factor of 11 square feet per person, about 2,000 square feet should be allocated for this purpose. The theater should double for use as a lecture or conference auditorium.

Exhibit area needs will be a function of the final design. For the purposes of this report, 5,600 square feet is allocated for aquarium tanks, passive exhibits, participatory exhibits, and an area for revolving or temporary exhibits. Some of the area could be used for a photo gallery and for an awards gallery. While the exhibit space includes an allowance for circulation, an additional 1,000 square feet should be allowed for other circulation needs. (Wall exhibits could be included in this area).

Gift shop space, including some storage area, should be at least 1,200 square feet. Based on per capita spending of $1.00, this space has an annual productivity factor of about $275 per square foot. An area for food service is optional, but it is recommended that 1,000 square feet be dedicated for minor food preparation and some seating. At a minimum, the facility should be able to handle reception-like catering. Restrooms should require about 600 square feet (60% for women). In all, about 11,400 square feet should be allocated for the visitor access area.

If it is assumed that everyone would arrive in an auto (rather than a tour bus), at an average of three persons per car, and with some allowance for recreational vehicles and trailers, visitor parking requirements should be on the order of two acres. Official or employee parking area needs would be about a quarter of an acre.

Altogether, at a minimum, on the order of three acres would be required for intensive use at a 300,000 visitor per year facility. In practice, of course, it is desirable for immediate visitor enjoyment and for contingency purposes, to have considerably more acreage on-site. The Wolf Lake facility, for example, is on a 350 acre wooded tract.

PHYSICAL SPACE SCENARIO
(Annual Attendance of 300,000)

Indoor Visitor Area (60%)	
Orientation Theater (180 Seats)	2,000 sq. ft.
Exhibit Area	5,600 sq. ft.
Circulation (extra)	1,000 sq. ft.
Gift Shop	1,200 sq. ft.
Food Facility (optional)	1,000 sq. ft.
Restrooms	600 sq. ft.
Total Visitor Access Area	11,400 sq. ft.
Indoor Non-Visitor Area (40%	7,600 sq. ft.
Total Indoor Area (minimum)	19,000 sq. ft.
Outdoor Visitor Area	
Total Outdoor Area	18,000 sq. ft.
Parking	
Visitor	2.0 acres
Official	0.2 acres
Total Parking Area	2.2 acres

Costs

What might a center of the type sketched above cost to develop? Gross costs for indoor aquatic facility space vary greatly, from a low of $40 per square foot, to a high of $300 per square foot. It appears that the lower figure most probably includes only the basic shell of a building, and the higher represents the costs for the spectacularly expensive Monterey Bay Aquarium. For such facilities as conceived here, a current range of $75 to $125 per square foot (including equipment) should suffice. Using $100 per square foot (midpoint), the indoor space would cost about $1,900,000. Outdoor space can be developed at a lesser unit cost. At $38 per square foot, the outdoor space would cost about $680,000. Miscellaneous development costs would include such items as parking ($150,000), fish collection ($45,000), and contingency ($220,000), for a total of about $415,000.

In summary, a facility capable of accommodating 300,000 visitors per year would cost on the order of $3 million, as shown below:

Indoor Development Cost:	$1,900,000
Outdoor Development Cost:	680,000
Miscellaneous and Contingency:	415,000
Total Cost: (exclusive of land cost)	$2,995;000

Assuming that the costs would be proportional to that of a 300,000 visitor facility, projected costs for facilities capable of accommodating higher and lower ranges of attendance would be on the order of:

100,000 visitors per year.	$1 million
300,000 visitors per year.	3 million
500,000 visitors per year.	5 million

CHAPTER IV
DEVELOPMENT OPTIONS

Facilities

In the development of a Michigan Fisheries Center, analysis of the selected facilities in Chapter II indicates that three basic options should be considered:

- A single facility, as a major tourism attraction, which interprets all aspects of Michigan fish, fisheries, and related resource management
- A facility which serves the goals of the Fisheries Division as an adjunct of an enhanced aquarium developed by others
- A system of several interpretive facilities, at various locations which focus more closely on respective aspects of the Michigan aquatic environment

Each of these options has certain requirements which must be met if the development is to be successful.

Single

A single facility would be housed in a large structure capable of accommodating up to several hundred thousand visitors. It would be located in an area with a large resident population and/or heavy tourist flow. Interpretive offerings would cover a broad range of aspects of fish, fishing, and aquatic resource management in the Great Lakes, and on inland lakes and streams in Michigan.

A center of this type would be recognized as a cultural asset and tourist attraction for the community where it is located. It would, however, have initial development costs in the range of several million dollars.

The facility would require significant numbers and sizes of tanks and simulated aquatic environments, with an emphasis on educational/entertainment programs. At best, the center would serve primarily a Michigan and Midwest market.

Adjunct

Based on the experience and success of a number of new enhanced aquariums in other states, some Michigan communities are studying the feasibility of creating an aquarium as a focal point for community development. A facility of this type conceivably could become a reality, in Detroit, Lansing or elsewhere. Therefore, another option for development could be for the State to become involved in designing and operating a "wing" devoted to Michigan fish and fishing, to assure that programs would be offered to meet the goals of the Fisheries Division.

The facility conceptualized here assumes that a community would proceed with the development of an enhanced aquarium which might feature exotic marine fishes and marine mammals, based on successful facilities of this type in revitalized downtown harbors such as Baltimore and Boston. The Fisheries Division could participate in the project through the development of a "Michigan Aquarium Wing," as an adjunct to a more commercially-oriented facility.

Experience to date indicates that a facility of this type would have to be located in an area of high population and high tourism activity, where annual attendance could be in the millions.

To the extent that part of the development costs would be assumed by the State, there would be reduced risk for local government and commercial developers. There might also be greater freedom, in the total facility, from a limitation to regional species of fish.

Problems might arise, however, stemming from shared responsibilities for development, operations, or maintenance.

System

The concept of presenting the Fisheries Division story through the development of more focused interpretations, at a number of locations around the state, is intriguing. Development of this type could be staged over a number of years, using properties presently owned by the State, or appropriate sites which could be acquired in the future.

The most appropriate types of facilities could be termed "enhanced interpretive centers." They would feature at least one large aquatic environment simulation tank, or perhaps use an existing aquatic environment, through the construction of underwater viewing stations, and feature active participatory programs typical of those offered by interpretive centers. Each center could focus on a different aspect of Fisheries Division activities. There could be an Inland Lake Center, a Trout Stream Center, a Great Lakes Center, a Wetlands Center, etc. In addition to such centers, the program could be expanded to include programs such as fishing camps, which could be promoted at various state parks or at private camps throughout the state.

Benefits associated with this option include:

- Phased development would not only be possible, but desirable.
- The system would not compete with a major "salt water/marine mammal" aquarium developed by municipal or private interests.
- It would best be located in areas with relatively high tourist activity, but could function as a seasonal operation.
- In interpretation and programming, various centers could build on various local natural environments.

- If promoted as a single entity with several parts in appropriate aquatic environments, a "Michigan Fishing Center" could be recognized as a major tourist attraction. (As the best known example, see the discussion of the North Carolina Aquarium in Chapter II.)

- A regionally dispersed system could conveniently serve school groups and local anglers.

- A modest prototype for such a system already exists at Wolf Lake.

Exhibits and Programs

While it is not the intent in this preliminary planning phase to define the content or scope of a proposed Fisheries facility, the process of looking at existing facilities has resulted in assembly of a "menu" of ideas worth considering for exhibits and programs.

The "menu" is included in this report to give some indication of the current "state of the art" in aquatic interpretive facilities. Also included are ideas which have occurred to the consultants in the process of reviewing the information, or which have been suggested by others.

Exhibits

- Aquatic environments can be used in or close to their natural state; a stream, or the breeding stock pond at Wolf Lake, for example.

- Natural environments can be modified to enhance their interpretive potential; such as providing an underwater viewing chamber.

- Environments can be recreated in indoor tanks; such as the recreated kelp forests of the Monterey Bay Aquarium.

- Environments can be simulated by the use of dioramas to illustrate processes which otherwise would be difficult to show; spawning lamprey, for example.

- An interpretive center or aquarium facility need not be confined to a single building. A proposed center in Oregon, for example, is planned as a series of separate structures in a park-like setting.

- Auditorium space utilized as an orientation center for visitors can accommodate classes, seminars, and workshops during "off-peak" tourist periods. Other public space can be designed with movable partitions. When combined with various set-up options (banquet, theater, classroom, and conference), different potential user groups can be accommodated, sequentially or simultaneously.

- Our "high-tech" era offers creative opportunities for innovative interpretation, such as providing visitor access to a computerized data base with text and graphic information about aspects of fish and fishing.

- The appeal of living mammals can be gained by incorporating otters, beaver, muskrats, etc., which have some links to Michigan aquatic environments.

- Visitors are interested in things which are "the biggest." A facility could utilize mounted specimens or models to illustrate record catches, for example.

- It is possible to "stretch" the interpretation to include elements with a high level of visitor interest. Since whales are known to have lived in the glacial lakes of Michigan, for instance, a full-sized model of a whale could be included.

- Interactive displays, such as touch tanks, are very interesting and educational, but do require staff time for maintenance.

Programs

- Participatory activities could be very interesting. For instance, a visitor could catch a trout, watch it be cleaned and cooked, and eat it for lunch. Or specially arranged "sportfishing days" could allow visitors to learn fly tying fishing techniques from experts.

- To maintain a high level of return visits, there is a growing interest among museums and planetariums in the exchange of programs and exhibits as a means of providing new exhibits and fresh material. Chicago's Shedd Aquarium, for example, has borrowed an exhibit, "Anglers All," from Vermont's American Museum of Fly Fishing.

- Educational programs can be extended beyond traditional in-house workshops, lectures, etc., by innovations such as fishing classes at public or private camps, or field trips as a part of a workshop. At present, such camps typically are operated as non-government enterprises. There may be new forms of highly desirable relationships for the Fisheries Division to consider.

- The use of docents or volunteers can assist in delivering informative and entertaining experiences at minimal cost.

- Professional improvement programs can be designed to assist teachers in planning and carrying out special fisheries-related studies, using their school facilities, an interpretive center's facilities, or various habitats for field trips.

- Special events such as science fairs, art festivals, fishing contests, etc., provide a means of increasing interest and awareness, and can enhance attendance during the "shoulder season."

- Supporting membership organizations can serve as a vital source of revenues, and encourage multiple visits, particularly among nearby resident populations. Membership benefits may include unlimited admission to the facility, a newsletter, and discounts on programs and merchandise items.

- There are numerous opportunities for revenue producing activities to help cover operational costs. These include: admission fees, gift/souvenir sales, fees for workshops and conferences, film and video rentals, food concessions, receptions for social events, and publication sales. (At Michigan's recently developed Mill Creek Sawmill restoration near Mackinac Island, for example, 75,000 visitors a year provide approximately $150,000 by means of $2 per adult admission tickets and related revenues.)

CHAPTER V
NEXT STEPS

Decisions

The intent of this preliminary study has been to examine the current "state of the art" in aquariums and related facilities, and to establish a framework which will allow decision-makers to knowledgeably set the scope and direction for possible next steps in the development of a Michigan Fisheries Center. The following comments are intended to define a logical progression of steps which would constitute the next stage in the planning process leading to the development of a center or, conceivably, a system of centers.

At this stage of the planning process, the critical need to define a basic concept for any proposed development suggests that a recommendation relating to the facilities options presented in Chapter IV is appropriate at this time.

It is the opinion of the consultants that the third option--the multiple facilities or system approach--offers the greatest potentials for meeting the goals of the Fisheries Division.

It should be pointed out that adoption of this option could result in facilities of more modest proportions, and much less visual impact, than would a development at one location. There is a hazard that reduction of the scope of individual facilities could reduce the richness of exhibits to the point where they could lose in effectiveness. To minimize such problems, and to maximize the probabilities of covering at least operating costs, "state of the art" professional planning and implementation are in order.

Development of a multiple facilities system could being with the existing Wolf Lake facility as a nucleus and go on to generate a series of environmentally or historically focused themes at carefully selected sites throughout the state. Although facilities development can be carried out over many years, it is important that a long-range development plan be produced as the next step in achieving desired goals.

Analysis

The development steps outlined below are shaped around the multi-facility system approach. If the Division were to elect another option, these steps obviously should be reconsidered.

Assuming that the ultimate Michigan Fisheries Center complex may include several separate facilities, to determine the optimum number of such developments, it is important to define the interpretive content for all prospective facilities. It may be best not to attempt to determine the most appropriate location or design of all the proposed facilities at this time. There may be a great advantage in maintaining flexibility for taking advantage of serendipitous events--such as private tourism development--which may work to the advantage of the Division and its goals.

The following tasks are proposed as a means for accomplishing the next steps in a potential development process:

- Detail programmatic and interpretive goals of the Fisheries Division, and develop a concept plan for assigning interpretive themes to an initial system of centers.

- Examine current interpretive features of the Wolf Lake facility to determine how it fits into a master plan and to ascertain changes or improvements which would be desirable.

- As a means for gaining insight into planning and developing Michigan facilities, evaluate, on-site and in consultation with local staff, operating experience at several of the facilities examined in this study.

- Establish criteria and an order of priority, for development of future facilities, and select one or more with the highest priority for detailed analysis under the first phase of a master plan.

- Detailed facility studies should include:

  - Site Planning - Analyze alternative sites, development options, facilities configurations, and interpretive program components in terms of construction or renovation costs, and operating and maintenance costs. Develop schematic designs.

  - Market Estimation - Specify prospective clienteles (general tourism, angler, and other special-interest groups, and local area residents). Estimate annual and seasonal attendance by clienteles and functions. Project potential revenues from admissions, special events, gifts, refreshments, etc.

  - Economic Feasibility Analysis - Estimate returns on public and private investments, including potentials for covering operating costs. Project probable economic and environmental impacts in the facility service area.

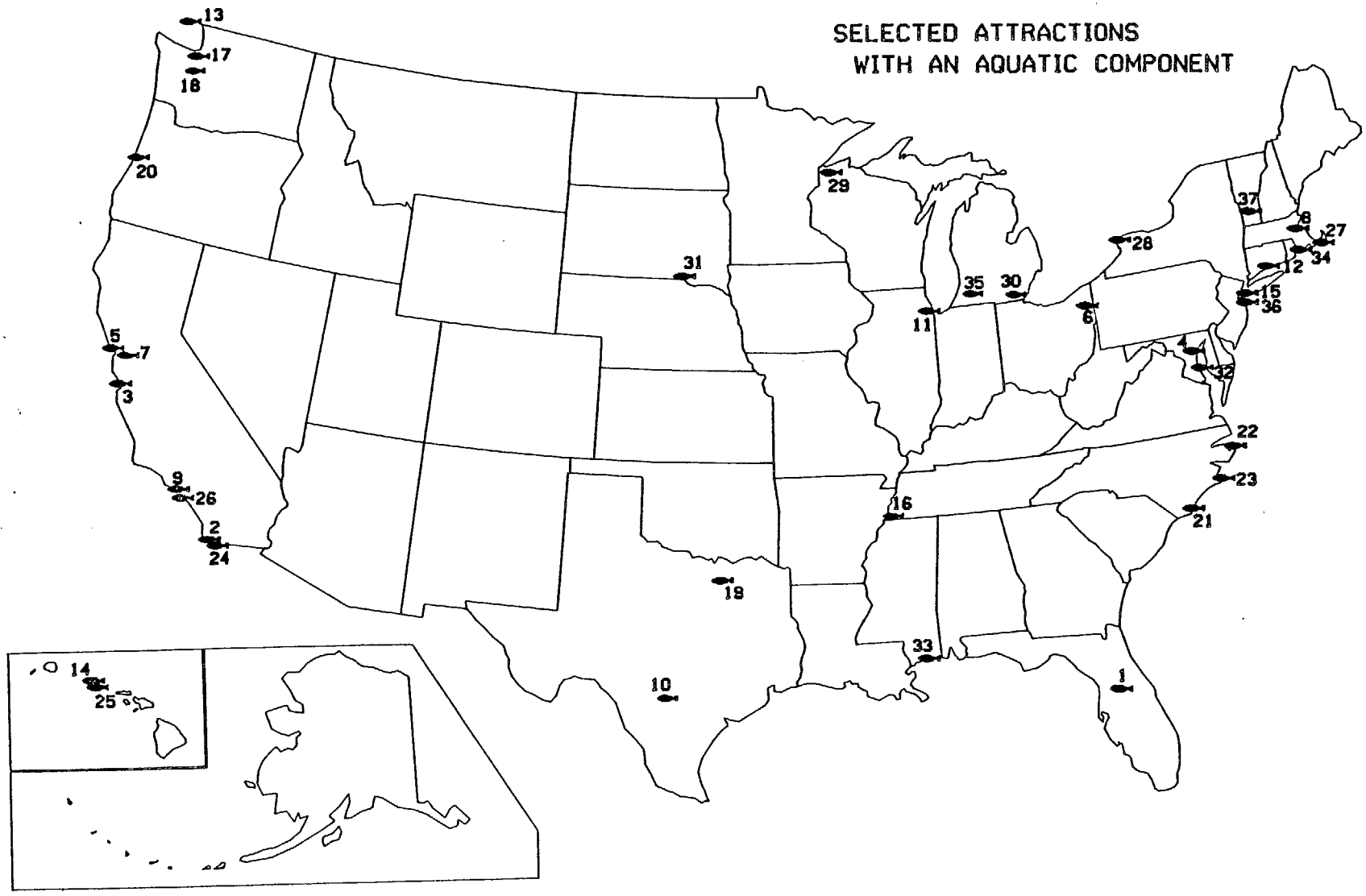
APPENDICES

A. Selected Attractions with an Aquatic Component (Map and Table)

B. Organizations and Persons Contacted

APPENDIX A

SELECTED ATTRACTIONS
WITH AN AQUATIC COMPONENT



SELECTED ATTRACTIONS WITH AN AQUATIC COMPONENT
(Ranked by Estimated 1985 Attendance)

Name/ Location	1985 Attendance (000's)	Metro. Population (000's)	Date of Opening	Ownership/ Management	Open Year Round	Size (Acres)	Admission Fees (Adult)	Annual Budget (Millions)	Peak Employment	Educ.* Programs
1. Sea World of Florida Orlando, Florida	3,500	800	1973	Corporation/ Board	yes	135.0	$16.00	$22.0	1,800	1,2,3
2. Sea World of California San Diego, California	3,100	2,100	1964	Corporation/ Corporation	yes	135.0	$15.00	$34.9	1,500	2,3,4
3. Monterey Bay Aquarium Monterey, California	2,000	29	1984	Foundation/ Foundation	yes	2.0	$ 7.00	$ 7.6	250	1
4. National Aquarium in Baltimore, Inc. Baltimore, Maryland	1,240	2,100	1981	City/ Corporation	yes	3.3	$ 6.00	$ 5.7	175	1,2,3
5. Marine World Africa USA Vallejo, California	1,200	96	1968	Foundation/ Corporation	yes	145.0	$13.00	$19.0	1,100	1,2,3
6. Sea World of Ohio Aurora, Ohio	1,200	9	1970	Corporation/ Board	no	80.0	$14.00	$16.0	1,200	1,2,3
7. Steinhart Aquarium San Francisco, California	1,200	5,520	1923	Academy/ Corporation	yes	2.0	$ 3.00	N.A.	27	1,2,3
8. New England Aquarium Boston, Massachusetts	1,110	3,800	1969	Corporation/ Board	yes	3.2	$ 6.00	$ 5.7	140	1,2,3
9. Marineland Rancho Palos Verdes, California	1,000	14,000	1953	Corporation/ Corporation	yes	105.0	$10.00	$12.0	550	1,2,3
10. San Antonio Zoological Gardens and Aquarium San Antonio, Texas	1,000	1,070	1914	City/ Society	yes	50.0	$ 4.00	$ 3.8	210	1,3
11. John G. Shedd Aquarium Chicago, Illinois	900	7,745	1930	Society/ Society	yes	N.A.	$ 2.00	$ 4.3	95	1,2,3
12. Mystic Marinelife Aquar. Mystic, Connecticut	654	240	1973	Foundation/ Board	yes	19.2	$ 6.00	$ 2.8	130	1,2,3
13. Vancouver Public Aquar. Vancouver, British Columbia, Canada	652	1,356	1956	City/ Association	yes	2.1	$ 5.00	$ 2.1	120	1,2
14. Sea Life Park Waimanalo, Hawaii	638	860	1964	Corporation/ Corporation	yes	22.0	$ 8.00	$ 3.2	110	1,2,3

Name/ Location	1985 Attendance (000's)	Metro. Population (000's)	Date of Opening	Ownership/ Management	Open Year Round	Size (Acres)	Admission Fees (Adult)	Annual Budget (Millions)	Peak Employment	Educ.* Programs
15. New York Aquarium Brooklyn, New York	600	9,000	1896	Society/ Society	yes	14.0	$ 3.00	$ 3.2	60	1,2,3
16. Memphis Zoological Garden and Aquarium Memphis, Tennessee	576	913	1906	City/ Commission	yes	36.0	$ .25 (Aquar.)	$ 2.2	75	1,2
17. Seattle Aquarium Seattle, Washington	540	1,720	1977	City/ City	yes	3.7	$ 3.00	$ 1.6	55	1,2,3
18. Point Defiance Zoo and Aquarium Tacoma, Washington	372	507	1905	City/ Commission	yes	27.0	$ 3.00	$ 1.9	40	1,2,3
19. Dallas Aquarium Dallas, Texas	350	1,700	1936	City/ Board	yes	2.0	Free	$ 0.3	10	1
20. Hatfield Marine Science Center Newport, Oregon	350	8	1965	University/ University	yes	0.2	Free	$ 0.8	10	1,2,3
21. North Carolina Aquarium at Fort Fisher Kure Beach, North Carolina	350	44	1976	State/ State	yes	1.0	Free	$ 0.3	9	1,2,3,4
22. North Carolina Aquarium at Roanoke Island Manteo, North Carolina	336	N.A.	1976	State/ State	yes	1.0	Free	$ 0.3	9	1,2,3,4
23. North Carolina Aquarium at Pine Knolls Shores Atlantic Beach, North Carolina	335	4	1976	State/ State	yes	1.0	Free	$ 0.3	9	1,2,3,4
24. Scripps Aquarium/Museum La Jolla, California	320	2,100	1951	University/ University	yes	0.3	Free	$ 0.7	14	1,2,3
25. Waikiki Aquarium Honolulu, Hawaii	300	805	1904	University/ University	yes	2.3	$ 1.50	$ 0.6	25	1,2,3
26. Cabrillo Marine Museum San Pedro, California	275	14,000	1982	City/ City	yes	1.0	Free	$ 0.3	11	1,2,3
27. National Marine Fisheries Service Woods Hole, Massachusetts	200	26	1963	Federal/ Federal	yes	0.5	Free	$ 0.1	4	1,2,3

Name/ Location	1985 Attendance (000's)	Metro. Population (000's)	Date of Opening	Ownership/ Management	Open Year Round	Size (Acres)	Admission Fees (Adult)	Annual Budget (Millions)	Peak Employment	Educ.* Programs
28. Niagara Falls Aquarium Buffalo, New York	156	338	1965	Foundation/ Board	yes	3.6	$ 4.00	$ 0.8	15	1,2
29. Freshwater Fishing Hall of Fame Hayward, Wisconsin	160	N.A.	1960	Private/ Private	no	7.0	$ 3.00	$ 0.3	9	1
30. Belle Isle Zoo and Aquarium Detroit, Michigan	150 (zoo)	4,500	1904 (Aquar.)	City/ Commission	yes	13.0	Free (Aquar.)	$ 0.9	25	1,2
31. Gavin's Point National Fish Hatchery Yankton, South Dakota	108	12	1960	Federal/ Federal	yes	234	Free	N.A	2	1
32. Calvert Marine Museum Solomons Island, Maryland	100	N.A.	1970	County/ County	yes	N.A.	Free	$ 0.4	27	1,2
33. J. L. Scott Marine Education Center Biloxi, Mississippi	80	30	1984	State/ State	yes	N.A.	$ 2.00	$ 0.4	5	1,2
34. New Bedford Whaling Museum New Bedford, Massachusetts	62	155	1903	Society/ Society	yes	1.5	$ 2.50	$ 0.7	24	1,2
35. Michigan Fisheries Interpretive Center Mattawan, Michigan	30	N.A	1983	State/ State	yes	320	Free	$ .8	2	1
36. Alley Pond Environmental Center Douglaston, New York	15	200	1976	City/ Board	yes	618.0	Free	$ 0.3	7	1,2,3
37. American Museum of Fly Fishing Manchester, Vermont	2	N.A.	1968	Foundation/ Board	yes	1.0	Free	$ 0.3	4	1

*Educational Program Codes

1 = Speakers, Tours, Classes, Publications
2 = Outreach/Special Program
3 = Internship/Summer Camp
4 = Other

Sources: Boyd, Linda (editor), Official Museum Directory, 1985, (Wilimett, Illinois: National Register Publishing Company, 1985).
1985 Funparks Directory, (Nashville, Tennessee: Amusement Business, 1985.)
Zoological Parks & Aquariums in the Americas 1986-87, (Wheeling, West Virginia: American Association of Zoological Parks and Aquariums, 1986.)
Correspondence and phone contact with selected institutions.

APPENDIX B
Organizations and Persons Contacted

Alley Pond Environmental Center, Inc., Douglaston, New York

American Museum of Fly Fishing, Manchester, Vermont

American Association of Museums, Washington, D.C. (Pat Williams)

American Association of Zoological Parks and Aquariums, Wheeling, West Virginia

Arizona-Sonora Desert Museum, Tucson, Arizona

Belle Isle Aquarium, Detroit, Michigan (Michelle Roming)

Cabrillo Marine Museum, San Pedro, California (John Olguin)

Calvert Marine Museum, Solomon's Island, Maryland (Alice Vivaret)

City of Detroit, Community and Economic Development Department (Thomas Walters)

Clinch Park, Zoo and Con Foster Museum, Traverse City, Michigan (Ray Plamondon)

Coyote Point Museum, San Mateo, California (Kathy Heffernan)

FishAmerica Foundation, Tulsa, Oklahoma (James Hubbard)

Freshwater Fishing Center, Hayward, Wisconsin (Robert Kutz)

Gavin's Point National Fish Hatchery, Yankton, South Dakota

Hatfield Marine Science Center, Newport, Oregon

International Fly Fishing Center, West Yellowstone, Montana (Beth Halladay)

Kentucky Horse Park, Lexington, Kentucky (John Sears)

Louisiana Nature Center, New Orleans, Louisiana (Jim Whalen)

Marine Advisory Service, Narraganset, Rhode Island (Ed Richardson)

Michigan Department of Natural Resources, Fisheries Division, Lansing, Michigan (Douglas Jester)

Michigan Department of Natural Resources, Fisheries Division, Lansing, Michigan (John Scott)

Michigan Department of Natural Resources, McMullen Conference Center, Higgins Lake, Michigan (Betty Mansfield)

Michigan Department of Natural Resources, Parks Division, Lansing, Michigan, (Neil LaCasse)

Michigan Department of Natural Resources, Wolf Lake Fish Hatchery, Mattawan, Michigan (James Copeland)

Michigan Department of State, Museums Administration, Lansing, Michigan (Ruby Rogers)

Michigan Fisherman Magazine, East Lansing, Michigan

Michigan Museum Association, Flint, Michigan (Phil Kwitowsky)

Michigan State University, Department of Park and Recreation Resources, East Lansing, Michigan (Professor Edward Mahoney)

Michigan State University, Department of Park and Recreation Resources, East Lansing, Michigan (Daniel Spotts)

National Fisheries Center, Leetown, West Virginia (Dave McDaniels)

National Marine Fisheries Service, Woods Hole, Massachusetts

New Bedford Whaling Museum, New Bedford, Massachusetts (Mrs. Lund)

Niagara Falls Aquarium, Buffalo, New York (Al Clifton)

North Carolina Department of Administration, Office of Marine Affairs, Raleigh, North Carolina (Mark Joyner)

J. L. Scott Marine Education Center, Biloxi, Mississippi

Scripps Aquarium-Museum, La Jolla, California

South Lake Tahoe Visitor Center, Lake Tahoe, California (Mike St. Michelle)

Steinhart Aquarium, San Francisco, California (John McCosker)