

DRY STACK BOAT STORAGE: POTENTIAL ENERGY SAVINGS

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by Kenneth A. Wenne





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Dry Stack Boat Storage:
Potential Energy Savings

by

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INTRODUCTION



What is dry stack storage? How can it increase boating opportunities? And, can it be considered a potential energy saver? These questions, which are being asked by recreational boat and marina owners seeking a solution to the high cost of gasoline and to the recognized shortage of dock space on Lake Erie and on many of Ohio's inland lakes, are answered in this report.

The information presented here should aid boaters, marina owners, community planners and developers, investors and energy planners. It will help boaters determine if there are economic advantages to dry stack storage. It will also help them determine if this savings offsets the disadvantage of lost mobility; the boater who wants to travel to a number of different lakes each season may feel restricted by dry stack

storage. If boat owners find dry stack storage to be to their advantage, marina owners and financial investors may want to provide for the new demand. In addition, local planning and zoning boards may wish to use this information to determine the need for sufficient waterfront areas to serve the recreational boater.

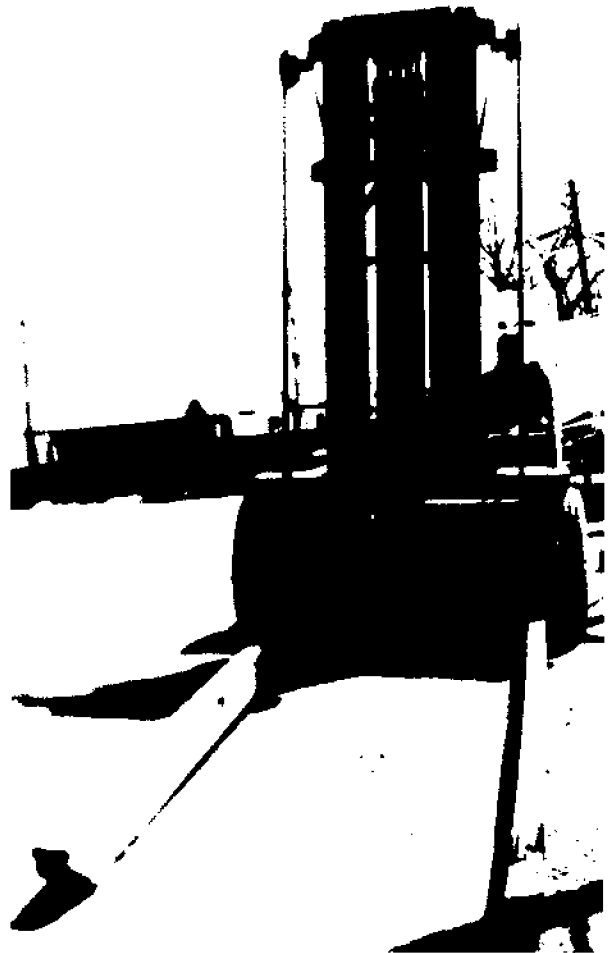
Recreational boating is important in Ohio. It is big business and it satisfies a need and a desire for outdoor recreational pursuits. The number of registered boats in Ohio increased from 212,405 in 1970 to 260,226 in 1979. This increase indicates a rising interest and participation in recreational boating and has contributed to the increased difficulty that boaters are encountering in meeting their boating needs.

Short of creating new lakes, boating areas in Ohio are limited to existing inland lakes, rivers and Lake Erie. In 1975, the Great Lakes Basin Commission (GLB) reported that boating in Ohio had essentially reached the capacity limit on inland lakes and that the obvious and only practical outlet remaining for recreational boating was on Lake Erie. The same study concluded that Lake Erie waters were being utilized at only 30 percent capacity and that "a high priority should be placed on marina and harbor development."

At the same time that the GLB was saying the only logical boating area to develop was Lake Erie, boaters wanting to use Lake Erie were reporting that they were having increased difficulty finding suitable facilities. They complained of having to wait in lines to launch their boats from existing ramps and of being told that all dock space at commercial marinas was rented. In 1978, there were approximately 18,459 open-well dock spaces and 400 to 500 broadside mooring spaces (Wenner, 1978) and marina owners confirmed that all spaces for rent or lease were usually full for the entire season.

The apparent shortage of facilities caused such increased frustration levels among boaters that some began asking for more publicly owned facilities. At the same time, others contacted boating associations hoping to encourage more development of privately owned facilities. To date this development has not occurred and existing facilities, both private and commercial, are strained to the breaking point.

Space and cost of waterfront development are the two major problems which limit the expansion and/or development of new boating facilities. The protected harbors and bays along the Lake Erie waterfront are already developed to near capacity. For the most part, all other areas remaining for waterfront development require off-shore breakwaters, extensive land drainage or filling, or channel dredging. Marina owners are reluctant to invest the capital necessary for such developments because return rates are questionable.



Dry stack or rack storage is one alternative to increased waterfront development. Dry stack storage facilities are large warehouse-type buildings where boats are stacked two or three high in racks. Boat owners using these facilities have ready access to their boats. At the request of the facility manager a negative-type forklift is used to transport their boat from the storage rack to the water and, at the completion of each outing, the boat is returned to the rack.

Dry stack storage may increase the boating potential by 14 percent while reducing gasoline consumption up to an average of 100 gallons per boater per year. Indeed, some boaters who have switched to more economical vehicles since they no longer tow their boats to



and from the lake have reduced their gasoline consumption by an additional 425 gallons per year. (This is based on average travel of 12,000 miles per year.) This equals a total savings of 525 gallons of gasoline per boater, representing a positive potential energy savings. When the price of gasoline is calculated at \$1.30 per gallon, this represents a savings of \$682.50 per year.

Advantages to dry stack storage include:

1. a reduced waterfront space requirement for permanent docks;
2. the storage of boats in a dry, secure area;
3. the reduction of storm damage to boats;
4. an increase in the number of boats that can be stored in a small area;

5. a reduction in the number of boats and the number of times boats are trailered over the highway; and,
6. a reduction in the amount of gasoline needed to transport the boat from the residence to the lake.

The implementation of more dry stack storage could strengthen the Lake Erie marina industry. Presently it is relatively new to the Lake Erie area, but supporters believe it has the potential to provide an orderly increase in the number of boat storage units while only minimally increasing the development of the waterfront. This would be a welcome expansion mechanism for marinas that have a limited waterfront area in which to build additional boat wells.

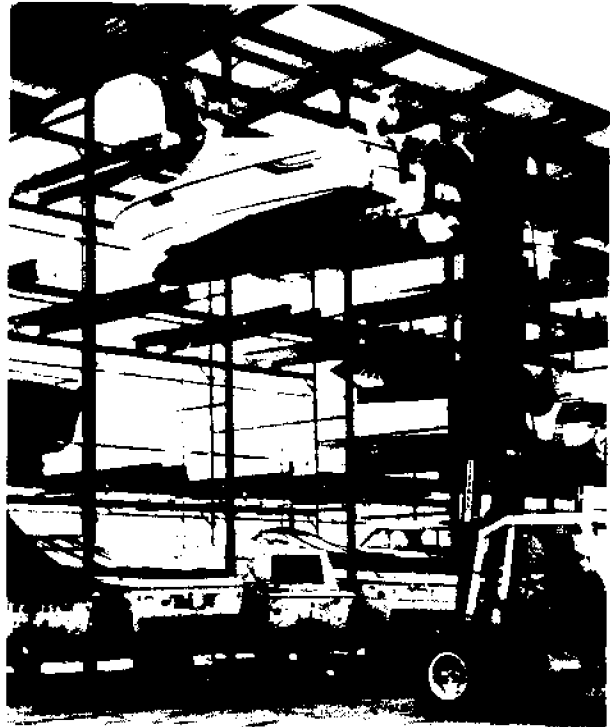
Most boaters either rent on-the-water dock space or trailer their boats on every boating occasion and need some incentive before they will break from this tradition to participate in a boating service innovation. One incentive would be the long-run economic advantage of dry stack storage. Another incentive could be classified as coercion; prohibiting the installation of any additional boat wells, leaving boaters with the option of either dry stack storage near the launching area or trailering their boats.

A positive economic incentive would appear to be more widely accepted by boaters. In computing this, one factor to consider is the energy needed to transport a boat from the storage area to the water. In the case of dry stack storage, the facility owner owns the forklift and moves the boat only a short distance. In the case of trailering, the calculation of energy expenditures is more complex. These boaters usually own the car or truck with which they tow their boat, and the type of vehicle they own is dictated by the size and weight of that boat. Furthermore, a vehicle generally consumes more gas when towing a boat. If boaters did not trailer their boats they would conserve energy and save money. Not only would there be no need for large vehicles, enabling boaters to travel to the lake in economy cars, but extra amounts of gasoline required for towing would be eliminated.

RESEARCH PROCEDURE

All of the dry stack storage facilities known to exist on the Ohio segment of the Lake Erie shoreline were identified and located. The total number of dry stacks or boat racks available at these facilities in 1979 was 826. That same year storage facility owners and/or operators were solicited for their assistance and support in contacting the boaters using these facilities.

The several different methods of boater contact included: mailing a



survey instrument to the boater; placing the survey instrument in the boat; and, having the forklift operator hand the instrument to the boater when the boat was placed in the water.

The survey instrument was developed by researchers in the Division of Parks and Recreation Administration, The Ohio State University. It consisted of both open- and closed-ended questions. One hundred and fifty-three (153) questionnaires were returned by dry-stack storage users for an 18 percent return rate. The information from the questionnaires was compiled and descriptive tables were obtained using the programs on the computer system located at the Ohio Agricultural Research and Development Center, Wooster.

RESIDENTS AND FACILITY LOCATION

What is the average distance a boat owner travels to use dry stack storage on Lake Erie?

The average distance boat owners traveled to and from the lake was 130 miles. However approximately 15 percent drove more than 200 miles round trip.

Survey respondents were from 37 of the 88 Ohio counties (See Figure 1.). This represents approximately the northern quarter of the state exclusive of the far northwestern and northeastern corners. Though the northeastern area of the state borders Lake Erie, there were no dry stack facilities located in that area.

The frequency table in Figure 2 indicates that only 34 percent of the respondents lived within a 50-mile radius of the dry stack storage facility,

while 66 percent lived over 50 miles from the facility. The average distance driven one-way was 65.3 miles (standard deviation of 39).

The distance driven and the counties represented by the home location of the respondents is a rough indication of the current market area for dry stack storage. There are no data available in Ohio to indicate the maximum distance boaters would travel to use a dry stack facility. However, the number of respondents who traveled over 100 miles indicates a potentially large market for the use of dry stack facilities.

BOAT CHARACTERISTICS

What type of boat is best adapted to dry stack storage?

Medium-sized (16-24 foot) powerboats are best adapted to dry stack storage. Sailboats, because of their design, are not well suited to this form of storage; their deep drafts require so much vertical space that stacking is impossible and floor space for a single boat is too costly.

All respondents owned powerboats with an average overall length of 21.5 feet, (range of 16 to 27 feet -- standard deviation of 2.5 feet). Lake Erie, because

of its size, depth and weather conditions, is relatively unsafe for most boats under 16 feet in length. The majority of dry stack facilities had a maximum boat length limit of 24 feet for placement in stack storage. From this information it was determined that dry stack storage is most attractive and available for medium-sized (16-24 foot) powerboats.

STORAGE BEFORE DRY STACK

What type of storage or launching facilities were used prior to the implementation of dry stack storage?

Prior to switching to dry stack storage, approximately 36 percent of the respondents trailered their boats on each outing and 34 percent used on-the-water dock space. The remainder of the respondents used a combination of storage and trailering, or represented

new boaters. This indicates that dry stack storage is as appealing to the boater currently trailering a boat as it is to the boater using dock space. When these two groups are combined, they represent a relatively large potential market for dry stack storage.

BOAT OUTINGS AND TRIPS PER YEAR

Will a boater use the boat more frequently after switching to dry stack storage?

After the switch to dry stack storage, the average number of boat outings per year increased from 25.7 to 29.2. Part of this increased usage may be explained by boaters who switched from trailering to dry stack storage. Previous Lake Erie studies substantiate the fact that boats trailered to Lake Erie are used less frequently on the lake than those boats docked on or stored close to it. There were no indications that boaters who previously used docks either increased or decreased their number of boat outings after switching to dry stack storage.

Personal conversations with several respondents revealed that many who previously used docks continued to use their boats approximately the same number of times per year but traveled to the lake less often. These boaters indicated that they frequently traveled to the dock or marina to do general maintenance, to make sure all mooring lines were securely fastened regardless of the weather, and to check on the condition of their boats after a storm. Trips to check out the condition of the boat were eliminated after switching to dry stack storage.

MAINTENANCE AND STORAGE

Do maintenance, storage and insurance costs change with dry stack storage?

The average storage cost for all respondents increased from \$230 to \$500 per year. Average figures for the per-day storage included those boaters who trailered their boats and used their own backyards for storage. Costs entered for this group of boaters were \$0. Costs for boaters who switched from seasonal docking to dry stack storage were minimal.

After switching to dry stack storage, average yearly maintenance costs decreased from \$141 to \$100 per year. A large percentage of this difference was attributed to fewer repairs of structural damage caused by bumping and scraping along docks during storms or during loading and unloading from a

trailer. Additionally, boaters who used dry stack storage indicated that they painted the bottoms of their boats less frequently.

The reduced maintenance costs more than compensated for the increase in storage costs for boaters who previously used docks. However, this was not the case for boaters who previously trailered their boats. The increased storage cost for this latter group of boaters must be justified in some other manner.

While no exact figures were collected on insurance costs, 6.6 percent of the respondents indicated their insurance rates did decrease after switching to dry rack storage.

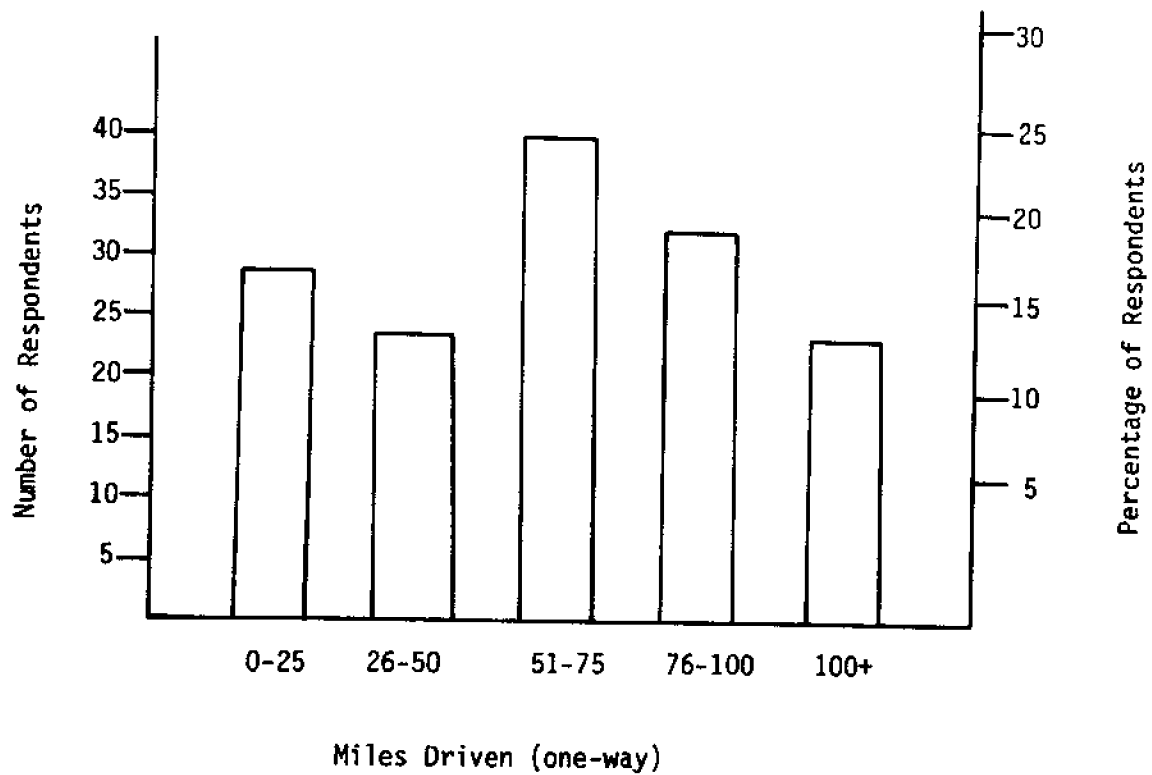
FIGURE 1

County Map of Ohio Showing Location of Dry Stack Facilities and Home Residence of Respondents



FIGURE 2

Frequency Distribution Graph Showing Miles Driven (one-way) by Respondents between Home Residence and Dry Stack Storage Facility



GASOLINE CONSUMPTION

Does dry stack storage have the potential for helping boaters conserve energy?

Yes, boaters who previously trailered their boats save gasoline and money by not towing it, and can even trade their large vehicle for one more energy efficient. Boaters who previously docked their boats along the lake will save gasoline and money by not making as many trips to the lake to check on the boat.

One of the issues facing many boaters is the high cost of gasoline used when traveling to and from the Lake Erie boating area. This cost is even higher for those boaters towing a boat behind a van, truck or large car. The limited availability of seasonal docks may make

dry stack storage a viable and attractive alternative to trailering.

Table 1 indicates the average gasoline consumption for a vehicle drops from 16.9 miles per gallon to 10.3 miles per gallon when towing a boat and trailer. Expanding and combining these figures with the number of trips per year and the distance traveled indicates the boater who switched from trailering to dry stack storage saved an average of 100 gallons of gasoline per year. These actual savings will be more for the person trailering a longer distance and less for the boater who lives close to the lake.

TABLE 1

COMPARISON OF GASOLINE CONSUMPTION BY BOATERS
SWITCHING FROM TRAILERING BOATS TO DRY STACK STORAGE

	Boaters Using Trailers	Boaters Using Dry Stack Storage
Number of Boating Trips Per Year	25.7	29.2
Round Trip Distance	<u>x130.6</u>	x130.6
Miles Traveled/Year	=3,356	=3,814
Average Miles Per Gallon of Gasoline	10.3	16.9
Gallons of Gasoline Consumed	=325.9	=225.7
Gallons of Gasoline Saved		100.2



LARGE VEHICLE VS. ECONOMY VEHICLE

Do boat owners maintain a large vehicle for the primary purpose of trailering their boats?

Approximately one-third of the respondents said they owned and maintained a large vehicle in order to tow their boat to the lake. Other boaters indicated they owned a large vehicle for other purposes as well.

A total of 30.6 percent of the respondents indicated they had changed or were going to change vehicles since they were now using dry stack storage. The average miles per gallon of gasoline had risen from 13 to 24 for those boaters who had already made the switch. Twenty-

two percent of the boaters indicated they personally preferred a large car and when they traded cars would purchase another large one. The remainder of the respondents indicated a variety of reasons ranging from cost factors to family size for not considering changing vehicles at this time. The boater who was trailering a boat and purchased a more economical storage vehicle after switching to dry stack storage might be saving an average of 425 gallons of fuel per year, assuming the vehicle is driven an average of 12,000 miles per year.

CONCLUSION

Each boat owner using dry stack storage on Lake Erie saves an average of 100 gallons of gasoline per year by not trailering his or her boat over the highway for each outing and enjoys approximately 14 percent more outings per year. This average savings is based on traveling approximately 130 miles round trip between the lake and the home residence. The exact amount of savings depends upon the distance driven and the type of vehicle used to tow the boat.

Boaters who use Lake Erie as their regular boating area and maintain a large vehicle for the primary purpose of towing the boat would be the greatest beneficiaries of dry stack storage. The overall cost for trailering is about the same as dry stack storage. Gasoline savings plus reduced maintenance and insurance costs more than cover half the cost of dry stack storage. The value and

upkeep on the trailer and the added wear on the vehicle as a result of towing will probably more than compensate for the remainder of the cost. The real bonus, in terms of savings, is realized when the boat owner is relieved of the need for a larger car, switches to an economical, energy-efficient vehicle and thereby reduces his or her yearly gasoline consumption by as much as 425 gallons. (This is based on an average of 12,000/year.) One of the major drawbacks of dry stack storage is the boater's reduced mobility. The boater who wants to travel to a number of different lakes each season may feel overly restricted by being confined to one lake. This loss of mobility must be weighed against the potential energy savings and the peace of mind that comes from knowing the boat is stored in a dry, secure area.



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Dr. Kenneth A. Wenner is an Associate Professor of Parks and Recreation in the School of Natural Resources at The Ohio State University and the Ohio Agricultural Research and Development Center, Columbus, Ohio. In 1979 he began research on a project entitled "Lake Erie Marina Business Analysis," and in 1981 he began a second project entitled "Lake Erie Recreational Boating and Boating Facilities Utilization: A Forecast for the Future" as a Sea Grant investigator. Both these projects were supported in part by discretionary funds administered through the Ohio Sea Grant Program and by the Center for Lake Erie Area Research (CLEAR), The Ohio State University. Cooperating with the projects were the School of Natural Resources, the Ohio Agricultural Research and Development Center, Wooster, Ohio, and the Lake Erie Marine Trades Association, Cleveland, Ohio. John McKinney and Gail McConnon, graduate research associates in the School of Natural Resources, worked with Dr. Wenner and assisted in the data collection phase of these investigations.

The purpose of the first investigation was to study the internal profitability structure of the privately owned recreational marina business. The results of that study were to be used to establish a range of costs associated with a given recreational boating service or facility. The purpose of the second research project was to determine the marine-based recreational vehicle carrying capacity of the waters within a five mile limit of the Lake Erie shoreline and to project the need for future marina expansion/building projects. Field research on the first project was completed in 1980 and on the second in 1981 and data has been analyzed and conclusions drawn.

As a result of these investigations several presentations and a publication have been made, i.e., "Guide to Lake Erie Boating Facilities." Presently a series of technical bulletins is being published. The first in the series is "Dry Stack Storage: A Potential Energy Saver." At least two other publications will follow: "The Economic Value of Recreational Boating of Lake Erie" and "Expenditure Patterns of Lake Erie Area Boaters."

For further information concerning Dr. Wenner's work please contact the Ohio Sea Grant Office, The Ohio State University, 484 West 12th Avenue, Columbus, Ohio 43210 (614) 422-8949 or your nearest Ohio Sea Grant Area Extension Agent.

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