## Wisconsin Underwater Archeology Association1998 Fall Meeting:
## History & Archeology Along (And In) Wisconsin's Rivers

Saturday, October 17, 1998

University of Wisconsin Memorial Union, Madison, WI

| | |
|---|---|
| 10:00–11:00 am | Business meeting |
| 11:00 am–noon | Cindy Stiles: Research on the *War Eagle*, wrecked in the Black River near LaCrosse, WI |
| noon–1:00 pm | Lunch |
| 1:00–2:00 pm | Andy Jalbert: River Valley Archeology—Transitions from Terrestrial to Submerged Cultural Resources |

*For more information contact Jeff Gray, 608-264-6493 or Tom Villand 608-221-1996.*

Wisconsin Underwater Archeological Association
P.O. Box 6081
Madison, WI 53716

*For those interested in the study and preservation of Wisconsin's underwater history and cultural resources.*

*Wisconsin's*

# UNDERWATER HERITAGE

Vol.8 No. 3 — *A publication of the Wisconsin Underwater Archeology Association* — September 1998

## Sturgeon Bay's Big Ditch

by Paul J. Creviere Jr.

The quiet shaded waters of the Sturgeon Bay Ship Canal roll peacefully through the "big cut". Just as quietly, the canal stands as a silent monument to the granite hard determination of many men to get it finished...and of one man's determination to get it started.

In the 1850s, Sturgeon Bay resident, Joseph Harris Sr. eyed the narrow isthmus at the far east end of Sturgeon Bay with the vision of a canal being cut through to the lake. Such a canal would bring the blossoming communities of northeastern Wisconsin 100 miles closer to Chicago. Such a canal would save countless sailors from the swirling currents of Death's Door. Such a canal would bring prosperity to Sturgeon Bay.

Harris started petitioning Congress in 1860 with the proposal and likewise sought the help of every capitalist and industrialist who would listen. Just when legislators were starting to give ear to Harris' sales talk, the United States erupted in Civil War.

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## Development and Disaster: Shipwrecks of the Northern Mississippi

by John Jensen

*This article first appeared in the Underwater Archeology Proceedings from the Society for Historical Archeology Conference 1993.*

Steamboat navigation came to the Northern River in 1823 with the voyage of the *Virginia*, a "glorified keelboat" contracted by the federal government to haul military supplies. (The Northern Mississippi River encompassed the River area between Guttenberg, Iowa and Minneapolis, Minnesota.) For the next thirty years government and, to a lessor extent fur trade, cargoes dominated river commerce in the sparsely populated region. It is difficult to estimate the number of steamboats visiting the Northern River during the first two decades of steamboat navigation, but the total was probably less than twenty different boats in any given year - often the number was much less.


In an untamed state, and the Northern River was assuredly untamed prior to the mid-19th century, rivers can offer many impediments to navigation, among them rocks, snags, rapids, shallows and deadheads - sap weighted logs that hang mostly below the water's surface. Water levels can rise or drop suddenly. Ice can break loose bringing tons of pressure against fragile wooden hulls. Channels can shift with no warning leaving heavily laden boats grinding on the river bottom. This being the case it is surprising to note that our research found no mention of steamboat losses for the first twenty-four years of steam navigation on the Northern River.

George Merrick, a former river pilot and the most important historian of the Upper Mississippi River, that is the river above St. Louis, Missouri noted:

The Upper Mississippi has always been, comparatively, a remarkably healthy stream for steamboats. A great

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*Wisconsin' s* **Underwater Heritage** is published quarterly by the Wisconsin Underwater Archeology Association, a nonprofit association of individuals and organizations interested in studying and preserving the underwater cultural resources and historical sites of Wisconsin.

In addition to publishing this newsletter, the Association also holds semiannual meetings and provides support to members' research and publication projects. Annual membership dues are $15. For membership information, contact the secretary or write to the address below.

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## Letter from the President

This has been an exciting summer for the Wisconsin Underwater Archeology Association and Wisconsin underwater archeology. The group has found itself around the state working on a variety of different projects.

The summer began with our return to Bull Head Point in Sturgeon Bay. For the past few years, WUAA has been documenting the wrecks *Empire State*, *Ida Corning* and *Oakleaf*. Several WUAA members met at the site in early May to continue documenting the remains of the three vessels. Despite poor weather, the team accomplished much mapping and photography on the wrecks in the three days. The conditions of shallow depth and proximity to shore also presented the opportunity to train new members. We are planning on returning next spring to complete our documentation, while this winter historic research and drafting will continue.

The SHSW installed two additional permanent dive mooring this year, and WUAA members played a large role in their installation. The Apostle Islands area received its second mooring in as many years. Last spring, SHSW placed a mooring on the *Noquebay*, and it was very well received by divers. This June, the 195-foot *Luceme* had a mooring placed on it. A few months later,the *Niagara* became first shipwreck on Lake Michigan to receive an official mooring. Next year promises to bring new mooring in both Lake Superior and Michigan. (Look in our next issue for a report on the SHSW's mooring program and a report on the new Lake Superior shipwreck guides).

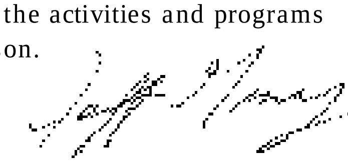
Working along with the State Historical Society, WUAA members also participated in a continuing survey of the lumber mills of the Bayfield and Washburn areas.

WUAA returned to Bailey's Harbor on July 19-26, 1998. The crew finished a detailed documentation of the *Christina Nilson*. The site plan and report are to be done this winter. Look for updates in future newsletters. The group also participated in a dive on the *Frank O'Conner*. Our thanks go to Hank Whipple for hosting the WUAA team in Door County. The project was discussed in an article in the *Door County Advocate*.

Our Fall meeting will return to Madison on October, 17. We will be meeting at the University of Wisconsin Memorial Union at 10 a.m. The meeting theme is History & Archaeology Along (And In) Wisconsin's Rivers. Andy Jalbert will be giving a slide show and talk titled, "River Valley Archeology- Transitions from Terrestrial to Submerged Cultural Resources" in which he will discuss archeological sites that have been altered or displaced as the result of river erosion and deposition. We will also have a presentation by Cindy Stiles on her research on the *War Eagle*. If you have any questions on about the meeting please call Jeff Gray or Tom Villand. To set the tone for the meeting see John Jensen's article.

If you are conducting or thinking about conducting a research, historical or archeological project please let us know. There are several members who are presently engaged in some interesting research, and we would like to update the membership on the various projects in a future issue of Underwater Heritage. If you are interested contact Danny Aerts.

Thanks to everyone that participated in the activities and programs this season.



# Shipwreck Diving With Mixed Gas: A Curse Or A Blessing

By Dr. Richard Boyd

Sport diving blossomed in the USA during the l950's, amplified by the publication of Capt. Cousteau's book *The Silent World* and by a burgeoning availability of the Aqualung. Over the past 40 year's, the sport steadily gained popularity to the point where divers now travel to the furthest corners of the globe to explore underwater. However, despite rapid developments and refinements in equipment, training and techniques vIrtually all sport diving has been conducted with simple compressed air as the breathing medium. This is because artifIcial, non-air blends of breathable gas, commonly called "mixed gas", always have been purported to be too expensive, complex and potentially dangerous for sport diving applications. Such mixture's have remained strictly the bailiwick of military, scientific and commercial diving practitioners. That purview is now beginning to change due to a new underwater discipline called "TEK-diving" which embraces deep diving with both air and mixed gas. Divers who explore underwater caves and shipwrecks are a major TEK-diving constituency.

The preceding statements beg certain questions: "Why use mixed gas? Of what actual benefit is it? These queries have no single, simple answer. One practical reason to use mixed gas is to increase the time that a diver can remain at depth and still surface directly without making decompression stops. A main drawback and danger associated with lengthy dives is that one's body absorbs whatever inert gas (e.g. nitrogen or helium) is present in the respired breathing medium. So much of this can be harbored within bodily tissues that during ascent the diver must make significant, defined stops to allow the dissolved gas tension to decrease. If this decompression is not properly done, the dissolved gas may form actual pathologic bubbles throughout the body when the diver surfaces. This malady is known as the Bends and can be fatal. Obviously, any gas mixture which safely reduces a diver's decompression obligation must be considered beneficial.

Longer underwater stays with an enhanced safety factor can be achieved by using Nitrox, a gas mixture which has more oxygen than normal air. For instance, two popular Nitrox preparations contain 32% and 36% oxygen respectively. Their use at depths of about 50-90 feet can significantly decrease a diver's decompression liability. This is because the elevated oxygen level lessens bodily uptake of nitrogen from the mixture, thereby lowering the decompression debt. The downside of Nitrox is that the increased oxygen level also restricts the depth of operation. Most common Nitrox media cannot be used much beyond 100 feet due to a heightened danger from high pressure oxygen poisoning, a potentially lethal metabolic malfunction manifested by convulsions and blackout.

Nitrox also finds special application in closed circuit scuba, often called "rebreathers". This type of diving unit recirculates the breathing gas with the unwanted carbon dioxide being removed chemically while the oxygen level is maintained by injection of fresh gas. Since the gas pathway within a rebreather prevents each exhalation from being expelled into the water, the efficiency of gas utilization is dramatically increased. With no exhalation loss, little or no oxygen is wasted and the molecules are recirculated until they are respired. Thus these devices can permit prolonged dives at moderate depths with minimal or no decompression. For obvious reasons. such efficient equipment should prove very useful for subaquatic archeology in the future. Also, since closed circuit scuba operates silently (no bubble-noise), sealife which is often unapproachable with noisy, effervescent sport diving gear can be studied at close range.

Nitrox advocates also claim that certain therapeutic values are derived from its use. As already mentioned, elevated oxygen in breathing mixtures lessens bodily uptake of inert gases such as nitrogen or helium. This, in turn, is thought to avert the formation of micro-bubbles which often form throughout a diver's tissues after dives. Continued exposure to micro-bubbles over many years of diving is suspected to have deleterious effects on small blood vessels, especially those which feed bone

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structures. Thus any bubble-suppressing effects produced by oxygen might reduce the incidence of muscular and bone dysfunctions known to afflict some longtime divers. If true, these medical speculations would be justification for the regular use of Nitrox. While this health hype may be warranted, many years of medical research will be needed to confirm such claims.

Other commonly used gas mixtures called Trimixes are blends of oxygen and nitrogen plus helium or other inert gas (neon or hydrogen are used rarely). From a practical standpoint, Trimix is usually made by mixing air with oxygen and helium or by simply adding helium to air; in this latter instance, the blend is called "Heliair". The chief benefit of such mixtures is mitigation of the toxic effects of nitrogen on a diver's nervous system during deep dives. This disorder is known as Nitrogen Narcosis, or Rapture of the Deep in Cousteau's terminology. Trimixes can extend the usual 150-foot depth limit for sport diving to well over 500 feet.

As with Nitrox, the utilization of Trimix presents certain operational complications including prodigious equipment configurations, capacious gas tanks and lengthy decompressions upon ascent. Also, since some nitrogen does remain in the breathing medium, narcosis is NOT eliminated entirely; thus the mixture must be engineered for an acceptable or tolerable level of toxicity. Successful production of such exacting mixtures demands very detailed dive planning, highly experienced personnel and meticulous gas handling. Despite these caveats, Trimixes open a totally new depth realm to those TEK divers possessing the expertise to prepare and use them.

Traditionally, various operational problems have prevented the use of mixed gas by sport divers. First, preparation of artificial breathing mixtures requires techniques and apparatus which are largely unfamiliar to both recreational divers and dive shops. For example, mixing pure oxygen with other gases necessitates specialized equipment of immaculate cleanliness. Even trace amounts of hydrocarbon materials contaminating a component gas or containment vessel can instigate an explosion when pressurized oxygen is injected. In addition, oxygen must be metered into tanks at a very slow, controlled rate since speedy transfers can likewise initiate explosive events even in highly cleaned systems. Lastly, prior to use, all completed mixtures must be analyzed several times, which requires the use of specific instrumentation and procedures.

*Artificial gas mixtures must be prepared with almost laboratory precision...a degree of mechanical exactness unknown to most members of the recreational diving community.*

The various component gases are usually mixed on the basis of partial pressure: for example, when a dive tank is pressurized to 3,000 psi with 32% Nitrox, 960 psi of the total pressure (32%) is due to the oxygen molecules present. Similarly, 2,040 psi (68%) must be due to the nitrogen fraction. When this mixture is actually made, the pressures of each component gas must be delivered and measured with great accuracy (about 10 psi), which demands very precise instrumentation. To produce Nitrox, highly purified air is usually mixed with pure oxygen to yield the desired blend. Consequently, the total oxygen concentration in the finished mix results from the amount of pure oxygen injected plus that present in the added air. Careful calculations must be made to achieve the correct oxygen level in the final mix. The point here is that creation of mixed gas presents certain possibilities for miscalculations or other technical mistakes which are unlikely or impossible when processing normal scuba air, undetected mistakes have already resulted in serious underwater accidents.

In summary, artificial gas mixtures must be prepared with almost laboratory precision...a degree of mechanical exactness unknown to most members of the recreational diving community. Nonetheless, the increasing popularity of Nitrox has produced a widespread demand for this commodity and many dive shops have learned to prepare it safely and routinely. Trimix has not yet achieved a popularity equal to that of Nitrox, but its devotees are strongly promoting it in many regions of the country.

Another drawback to mixed gas usage has always been its price tag. Media containing helium or other exotic gases have been historically costly to make and use. For decades. deep divers employed pure helium / oxygen mixtures called Heliox. Since

Heliox is often 80% or more helium, it was extremely expensive, and a single commercial dive could cost hundreds of dollars (or more) just for the gas! Modern Trimixes usually contain far less helium than does Heliox, so their cost is quite reasonable. However, Trimix was essentially unknown until the late 1980's, so acceptable cost for mixed gas is a relatively recent development.

Perhaps the greatest obstacles which have shrouded mixed gas are the complicated physiological aspects involved: The no-decompression limits for many preparations were poorly defined; off-gassing schedules for safe decompression and timely ascents were generally unavailable and unreliable. Divers wishing to use special blends had to secure decompression tables from military / commercial diving sources or purchase custom schedules from diving consultants...a very expensive proposition. Comprehensive understanding of diver susceptibility to oxygen poisoning was also generally lacking. These biomedical factors relegated mixed gas diving into the domain of high-risk undertakings!

To muddle matters even further, mixed gas was seldom used in sport diving scuba because an open-circuit was considered to be too wasteful for such expensive media. In classic open-circuit recreational scuba, a significant portion of the breathing medium is lost as exhalation bubbles since no rebreathing is permitted. Although closed or semi-closed scuba does not have this inherent deficiency, such advanced units have never been readily available to recreational divers. Their price tags alone discouraged even the most persistent mixed gas advocates. Recently, new closed circuit apparatus has been introduced onto the sport diving market, but these unit still cost several thousand dollars.

*Whereas many traditional objections to mix gas have been overcome or placated, certain equipment problems and operational dangers still remain.*

The simple truth is that for many decades the multifarious restrictions previously discussed have made mixed gas unfeasible for sport diving applications. Viewed from the standpoint of safety, practicality, economy or technical feasibility, mixed gas for recreational purposes remained unworkable. Subsequently, mixed gas diving has been practiced by only a insignificant few!

This bleak picture began to change rapidly in the late 1980's. Although the National Oceanic and Atmospheric Administration (NOAA) developed and published decompression tables for Nitrox, this achievement received scant attention from the diving public. In Florida, retired personnel from NOAA began to actively teach the practical use of Nitrox for local shipwreck exploration; they also offered a certification program in that discipline. Divers from across the country were soon journeying to Florida to become Nitrox-certified. By the mid-90's, practitioners of Nitrox diving had established certification courses around the world!

With diver interest in Nitrox rapidly escalating, many established manufacturers and certification agencies began to sense that a new market was emerging. Slowly, the equipment to mix, test, store and use Nitrox was introduced to this evolving market. Such items as Nitrox-compatible scuba gear, gas blending apparatus, portable oxygen analyzers, decompression software and precise mixing instrumentation became readily obtainable. Sanctioned courses on the preparation and use of Nitrox also became widely available and accepted by the diving community, including the national certification agencies.

Another giant step forward came as fallout from sweeping advances in computer technology during the last 15 years. With the introduction of submersible personal diving computers, the possibility for very complex mixed gas dives began to emerge! To perfect the first diving computers, detailed decompression algorithms for air had to be developed and tested. These are mathematical rules and formulas by which decompression profiles for a variety of dive scenarios can be derived. Although the algorithms for air and mixed gas are quite different, the foundations for creating dive profiles for a variety of gas mixtures had been laid. It only remained for researchers to develop the specific software to allow actual dives to be simulated in personal home computers. This task was undertaken in the 1980's by various TEK divers who were also professional computer software experts. Soon complete programs for mixed gas blending, uti-

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lization and decompression became available at very reasonable costs. Decompression schedules for complex deep dives could now be directly generated from personal computers and these have proved to be very reliable in actual field use.

*This situation cries out for expanded diver awareness programs on underwater archeology and for a strengthened alliance between the sport diving and archeological communities.*

With the advent of computer programs for mixed gas, routine definition and preparation of useful Trimixes became possible. In the matter of economy, modern Trimix, unlike Heliox, usually contains only 20 –50% helium; thus the high expense of the diluent gas can now be appreciably decreased. Although open-circuit scuba still does not allow very efficient gas utilization, the reduced cost of Trimixes allows their use in sport diving gear with affordable monetary outlays.

Whereas many traditional objections to mix gas have been overcome or placated, certain equipment problems and operational dangers still remain. For example, decompression from Trimix dives usually requires multiple deep stops, switching mixtures to hasten tissue outgassing and lengthy shallow stops on pure oxygen. Such complex procedures are fraught with possibilities for mistakes or mishaps which could prove deadly. Open circuit gear remains inefficient, so that breathing gases are used at accelerated rates at depth, leaving precious little in reserve for emergency purposes. Great Lakes diving exacerbates this situation since the possibility of cold-water regulator icing and subsequent gas loss is very real. In addition, prolonged decompression in icy water presents significant physical hazards. Equipment developments and biomedical research in the future may diminish these problems, but for now they compel valid concern.

At the present time, Nitrox usage has become worldwide in scope. Likewise, Trimix is enjoying scattered, but notable popularity across the globe. Here in the Great Lakes, even the venerable *Edmund Fitzgerald* in 530 feet of water has been reached by Trimix divers! Likewise in Lake Ontario, Trimix adventurers have visited the famous War of 1812 gunboats in 300 feet of water. The reality is that a significant group of deep shipwrecks previously unattainable by sport divers will soon be explored. It follows that these virgin wreck sites will be visited by recreational TEK divers long before they are seen and surveyed by archeologists.

Unfortunately, mixed gas technology has seen relatively little application within the archeological community. Its expense and complexity has stymied its use on archeological projects just as it has remained limited for recreational activities. However, with modern advancements, mixed gas procedures are likely to become highly developed and widely used in sport diving circles long before it enjoys significant application for archeological purposes. Presently it is estimated that less than 1 % of today's underwater archeological work involves mixed gas.

The bottom line here is that history is about to repeat itself. Just as most known shipwrecks were first located by non-archeologists using compressed air scuba, new deep-water wrecks will likewise be discovered and explored by TEK divers employing mixed gas apparatus. Depending upon the training, attitude and discipline of these modern explorers, these pristine wrecks may or may not undergo the same despoliation suffered by many of their shallow-water counterparts. Hopefully, the future breed of TEK diver will possess a heightened archeological appreciation molded by diver education programs, enhanced ecological/cultural consciousness and modern conservation ethics. Lastly, this situation cries out for expanded diver awareness programs on underwater archeology and for a strengthened alliance between the sport diving and archeological communities. Without such co-operative efforts, another class of unique submerged cultural resources will be altered or ruined for future generations!

## ...Northern Mississippi *continued from page 1*

proportion of the craft ending their days there have died of old age and have decorously consigned to the scrap pile instead of meeting the tragic end usually assigned them by writers.

Merrick's assessment applies particularly well to the Northern River which, beginning above the once dangerous Rock Island Rapids, was, in the absence of outside factors, apparently very safe.

The other factors I just mentioned were social and economic in nature and begun to manifest themselves in 1847. On 8 June 1847, the Minnesota Packet Company was organized and soon began advertising the first regularly scheduled steamboat service on the Northern River. Their first boat, the 41 ton *Argo* soon became the regions' first confirmed terminal steamboat wreck. Sunk in October 1847, the *Argo*, like almost every steamboat lost in the Northern River, was extensively salvaged with its machinery and cargo removed.

In 1847, when the Minnesota Packet Company began operating, traffic on the Northern River was still light with only 47 arrivals recorded at St. Paul. Despite this, the new venture soon had a competitor. In l848 the Harris brothers, prominent early steamboatmen from the lead mining center of Galena, Illinois, entered the Northern River trade. The region's population could not support both businesses and the hostility between them became pronounced. In a peace seeking arrangement, the Minnesota Packet Company bought out the Harris brothers who agreed to go out of the business. Larger events, however, soon promised a brighter future for steamboating on the Northern River. In 1849 Congress passed a bill to organize the Minnesota Territory. Envisioning future profits the Harris brothers reneged on their agreement and bought a new, much larger boat, to run in competition against the Minnesota Packet Company and the heated rivalry continued.

The increase in business portended by the organization of the Minnesota Territory was realized slowly at first. By 1850 arrivals at St. Paul had climbed to 104 and by 1852 to l71. At mid-decade the rush to settle Minnesota was on and, in 1855, 560 arrivals were recorded. In 1858, the peak year for traffic, a phenomenal 1,090 steamboats landed at the St. Paul levee. Competition and increased traffic led to accidents. Between 1847 and 1859 at least fourteen terminal wrecks occurred on the Northern River. Many more steamboats sank, but as river salvage techniques had been well developed by men such as James Eads in the 1840s, most were eventually refloated and returned to service. The problems posed by excessive competition were apparent to contemporary observes. A 1852 newspaper commented on the lamentable state of the steamboat business:

The *West Newton* and the *Nominee*, both crowded with passengers, arrived at St. Paul Tuesday night, at about the same minute, in a strife all the way up. The old *Nominee* tucked up her petticoats and tho she did leg through, kept the *West Newton* at the top of her speed. We regret that this competition is reaching such a pitch ... Let the lines both live and work at fair prices with out any such strife.

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# ...Northern Mississippi

Both of these boats came to bad ends, with the *West Newton* hitting a bar and breaking apart in 1853 and the *Nominee* striking a snag and sinking in 1854.

Races like the ones between the *West Newton* and *Nominee* were calculated business ventures rather than sporting events. The first boat arriving at a landing generally secured the available business. Steven B. Hanks, well known rivermen and cousin of Abraham Lincoln, mentions in his memoirs several races for this period including an April 1857 contest to be the first boat into St. Paul. Hanks writes:

With the ice out of the lake (Pepin) there was one grand rush by all of the boats for St. Paul, each wanting the honor of being the first boat in. This was not an empty honor for in those days each boat paid for the privilege of the use of the levee each trip ... This was a general charge by all cities and St. Paul gave free wharfage for the season to the first boat to arrive from below. This was a stimulus to each boat to get through the lake, the river above the lake always being free from ice ...

Two steamboats during this period, the *Arcola* and the *Hamburg*, were destroyed by ice in spring voyages. Several other steamboats were sunk in similar accidents but were later refloated. Clearly, the incentives for early season navigation prompted some considerable risks. Late season navigation with its low water levels was equally hazardous and contributed to many shipwrecks, including the October losses of the well known packets *West Newton* in 1853, *Nominee* in 1854 and *Lady Franklin* in 1856.

Passenger and freight traffic on the Northern River peaked in 1858 and thereafter declined as other modes of transportation, particularly the railroad, became available. Larger steamboat lines had distinct advantages in negotiating for railroad company business and the competing steamboat companies began to consolidate. By 1863 the Northwestern Packet Company, controlled by William F. Davidson of La Crosse, had absorbed all of the major lines. Ten years later Davidson controlled the packet business of the entire Upper Mississippi River above St. Louis. As competition and the possibility of quick profits declined so did the number of terminal accidents. Between 1860 and 1900 only 16 passenger / freight steamboats were lost or abandoned on the Northern River. Of those only 8 were lost in navigation related incidents.

Steam was applied to other uses besides packet service on the Northern River. Beginning after the Civil War and continuing until 1915 a fleet of steam "rafters", short, powerful boats designed to maneuver huge logging rafts plied the river. While log rafting cannot be discussed here, it is worth noting that ten "rafters" appear on the inventory, mostly as the result of fires. Only three were non-fire losses.

The final type of steamboat presented in the inventory are excursion boats, three of which were destroyed by fires in the first decade of this century on the Northern River.

Research revealed the identities of 47 steamboats sunk, burned, or abandoned along the Northern River. Although this may seem a small number for making generalizations, some clear patterns emerge when these steamboats are looked at as a group. Chronologically it can be seen that more terminal wrecks, 13, occurred in the 1850s than during any other decade. In the 1860s, nine terminal wrecks are known to have occurred. The number drops to 4 for the decades of the 1870s and l880s, 7 in the 1890s, the peak logging decade, 5 between 1900 and 1909, and 4 between 1910 and 1919. More telling than the raw number of casualties are the types of casualties claiming the steamboats. Prior to 1870, most steamboats were lost in some form of navigation related incident; this includes hitting snags, sandbars, other boats or ice. Two of the early vessels were destroyed in fires. After 1870 only 6 of the steamboats in the wreck inventory were lost in navigation related incidents, while 16 were terminated in fires. It is interesting to note that of the 23 steamboats lost in navigation related accidents that we have specific dates for, 9 occurred during the month of October, usually a month of low water and heavy traffic. Five others were destroyed in ice related incidents, again perhaps indicating the dangers of winter and spring navigation.

Like terrestrial roads, the safety and efficiency of rivers can be improved through human intervention. In 1866, Major G.K. Warren of the U.S Army Corps of Engineers surveyed the Mississippi River from St. Paul, Minnesota to the Rock Island Rapids; his mission was to determine the best method for creating and maintaining a 4 ft. navigation channel between St. Louis and the Falls of St. Anthony. The implementation of Warren's recommendations did not begin in earnest until 1878, but his mission signaled a new willingness on the part of the federal government to fund internal improvements. Many snags, shoals, sandbars, dangerous rocks and other obstructions to navigation were removed between 1866 and 1877. The pace of improvement picked up in 1878. Between 1878 and

1906 a 4.5 ft. navigation channel was created through dredging, wing dam construction and the building of lateral canals. In addition, the Corps during this period "removed" or more accurately, neutralized, many wrecks and other man made obstructions threatening safe navigation on the river. This drive for improvement continued well into the 20th century and culminated in transformation of the Upper Mississippi River into the giant slack water canal that it is today.

I will close with a brief summary of observation about steamboat navigation on the Northern River. In general, the river has an excellent safety record. Even in its most wild state few steamboats succumbed to terminal accidents. And no terminal wrecks appear to have occurred prior to the first attempt at maintaining regularly scheduled packet service in 1847. The most dangerous period in the steamboat history of the Northern River occurred during the 1850s and early l86Os when intense competition and, for a time, the possibility of high profits encouraged, or even demanded, that steamboatmen take risks in navigation. Risky practices like racing and pushing both ends of the navigation season were not warranted during the first thirty years of steamboating on the Northern River and were no longer necessary nor acceptable after the rise of the railroads and the business consolidations of the early 186Os. The Corps of Engineers' extensive river improvements that began after the Civil War undoubtedly contributed to lack of navigation related accidents among excursion boats and log rafting vessels, particularly after 1878, but by that time such casualties had already become very rare.

Despite the fact that comparatively few steamboats were lost in the region, the shipwreck inventory compiled through our study is representative of the history of the Northern Mississippi River. Important phases of regional development including the fur trade, early military occupation, mid-century immigration, farming, logging and even tourism are reflected in the potential archeological record of the Northern Mississippi River.

## Acknowledgments

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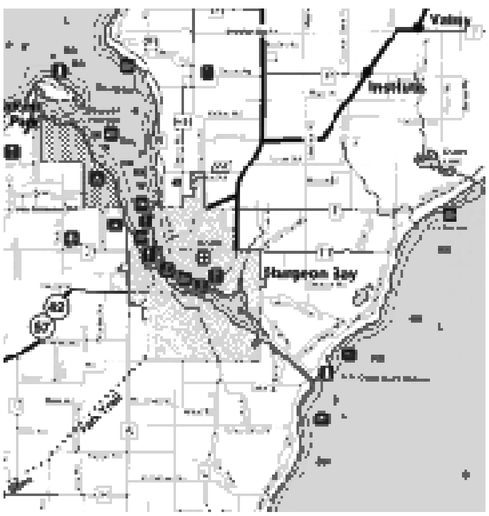
# Big Ditch... *continued from page 1*

At war's end efforts were renewed and finally, by 1866, legislation was passed endowing the Sturgeon Bay and Lake Michigan Ship Canal and Harbor Co. with 200,000 acres of pine forests along the Menominee, Peshtigo and Oconto Rivers. The arrangement was awkward. The agreement called for granting one quarter of the land to the Canal Co. for sale, only after one quarter of the project had been completed. There was no allowance for start up money.




Harris had enlisted the aid of industrialist, Isaac W. Stephenson and railroad financier William T. Ogden who also served on the company's board. Board members donated out of their own pockets hoping that ultimately they would be reimbursed. The project started slowly but by May of 1871, government engineers began surveying.

Harris was aided by thievery. The Canal Co. could not touch the pine lands until the project was partially completed. In the meantime timber pirates moved on to the allotted forests and cut down and spirited away almost 30 million feet of pine logs. At Harris' behest, the state sent in deputies, known locally as "woodrangers" to recapture the stolen timber. The Canal Co. was allowed to charge the thieves the standard rate and use the money to begin construction. Test borings began on July 3, 1871 and continued throughout the summer under the guidance of Lt. William Casgrain of the Army Corps of Engineers.

In October of 1871, the Canal project was dealt a double whammy. The Chicago fire destroyed all of the test results and figures when would be rescuers were stopped by a government clerk who proclaimed, "only an act of congress can move this office or its contents." The next day the Canal's pinery endowment went up in the Peshtigo fire.

Early estimates put the cost of building the canal at $727,000 for the removal of just under one million cubic yards of earth. And congress had ordered it finished by 1873. Due to the two disastrous fires, congress agreed to an extension. It would be the first of many.

Engineers were able to piece together their test results from figures out of foreman William Baby's diary. The construction suffered through numerous setbacks but finally on July 9, 1872 the first dipper of soil was lifted out of the bay. Bit by bit a hundred men cut a giant slice through the woods and scraped off the soil. *Door County Advocate* editor, Frank Long wrote, "As the work progresses, the magnitude of it becomes more apparent." He could never have known how prophetic that would be.

1873 brought more disasters. The Great Financial Panic hit the U.S. economy in 1873. Canal lands couldn't be sold until a quarter of the project had been completed. Board members tried to finance the effort by selling canal bonds. In such a depressed economy no one could afford to buy them. Then the Canal Board was slugged with a state investigation. It would be the first of three. When the Canal Co. certified that 25% of the work had been done, concerns were voiced about construction fraud. Only after state engineers surveyed the project, state accountants analyzed the books, and state legislators grilled board members and project supervisors, did the state release 50,000 acres of Menominee timberland. The Canal project was investigated again in 1879 and 1890.

Financial difficulties had haunted Harris' canal from the very beginning resulting in work slow downs and even stand stills. But in May of 1877 O.B. Green, a Chicago contractor and one of three original to the project, was given the bid to finish the canal and do so only with his company. Work on "big cut" took on a renewed vigor. A portable tram way was built to haul out dirt for the "dry work" as dredges dug their way in from the lake and the bay. A small town was virtually rising around the canal. Stables for 100 horses were built as were boarding houses for 200 men. A blacksmith shop and repair shop was added. Construction workers known as "Canalers" were quite proud that they had everything a project of the size needed. Then they decided what they really needed was a saloon.

Canalers, most of whom were brought up from Chicago, were a hearty, hard working lot. They gave that same effort to their drinking. The *Door County Advocate* reported, "Last Monday evening one of the canalers, who had filled his skin pretty full with poor whiskey during the day, made the grand rounds at some of the residences near the upper end of cedar street, by rapping and knocking at the doors. During his pilgrimage he blundered into a house occupied by a brawny blacksmith, to whom he made some insulting remarks. The knight of the anvil seized hold of the rowdy, and there was a grand display of ground and lofty tumbling in the street in front of the house." About the same time, fourteen canalers, headed for Chicago, stopped off in Foscoro where they "made themselves pretty free about the premises as well as getting pretty well 'set up'. Twenty-four hours, one fight and two arrests later, they had only made it as far as Algoma.

By May of 1878, a sandsucker, designed by a Madison engineer and financed by canal contractor O.B. Green, was set up. It had double the capacity of the current dredges and pushed the digging along so well that by mid-June the Canal Co. felt confident enough to plan a party for the 4th of July. Digging reached a fever pitch and on June 28, 1878 the waters of the Bay of Green Bay mixed with those of Lake Michigan. The "Meeting of the Waters" was celebrated with a big "blowout".

Work continued, inspite of set backs. There was another investigation. The state had asked for a canal dug to 13 feet. They never asked for revetments or retaining walls. Without them the canal would fill itself up. Indeed, when dredging ended for the season in 1878, a depth of 10 feet had been reached. When dredging resumed in May the next year depth was only 7 feet. The Canal Co. had promised a canal 100 feet wide and 13 feet deep. It wouldn't stay that way. On November 24, 1881, canal officers informed the state that the canal was finished as projected. The necessary revetments took another two years.

The canal was a great boon to area maritime commerce. But ship captains weren't satisfied. The canal was privately owned. Each vessel that came or went was charged 5 cents per ton. Vessel owners complained that when a slumped economy brought low shipping fees, they were losing money. Some vessel captains seeking the safety of the canal in a storm, couldn't afford to use it. Another push began, this time to make the canal public property. Congress ultimately agreed to buy the ditch, and on April 25, 1893, army engineers took possession of the property and the tolls stopped. The region exploded in jubilation.

Joseph Harris, who had spent over 20 years trying to make the canal a fact had also hoped to make some money from it. He had owned land that would have brought him a good price once the canal was completed. Completion took so long that Harris, to satisfy his creditors, had to sell it before its ultimate value was ever reached. He was left destitute.

While Harris did not profit from the canal, his efforts assured that everyone else would. Every yachtsman, every fisherman, every captain seeking refuge from a storm, every resort owner has profited by it.

In 1879, the *Door County Advocate* stated, once again prophetically, "Now that the ship canal is opened, we are brought twelve hours nearer Chicago than before. This fact should be remembered by those who are ambitious to have Sturgeon Bay profit by its advantages as a summer resort. No other locality offers so many attractions to the health, comfort, or pleasure-seeker, and it is only necessary to make these inducements known to bring a raft of tourists so our shores every summer."

The man who ended penniless started an entire industry.

## Bibliography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