The Virginia Wetlands Program Wetlands Report

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Habitat Restoration is Focus of Newly Formed Bay Program Workgroup

Dr. Carl Hershner

When the old dams on the James River in Richmond were blown up, migratory fish were allowed access to the upper river for the first time in decades. Those who worked to breach the dams hoped that fish, such as shad and striped bass, would once again reach former spawning grounds. The unknown was whether the fish would still find the upstream area suitable as spawning and nursery areas.

This concern over the ability of the Chesapeake Bay watershed to provide suitable habitat for many of its living resources, led the Governor of Virginia and other members of the Chesapeake Bay Program Executive Committee to sign the 1987 Chesapeake Bay Agreement. Among other provisions, the signatories agreed to work to "provide for the restoration and protection of living resources, their habitats, and ecological relationships."

Protection can be accomplished by effective regulation of potential environmental impacts. While this is not a simple matter, all of the states and the federal government have numerous management programs in place to tackle this task. Virginia's tidal wetlands management program and Chesapeake Bay Preservation Act are two examples.

Restoration is another matter entirely. *Protection* implies preserving existing conditions from further degradation. *Restoration* entails actually reversing trends. Examples of restoration include replacing wetlands which were lost over centuries of development, or improving water quality to allow regrowth of lost submerged aquatic vegetation.

Habitat Trends in the Chesapeake Bay Watershed

- 1.8 million acres of wetlands lost since the 1780's
- at least 50% of riparian wetlands degraded or impacted
- 62% coverage of SAV in areas of historic (1971-91) occurrence
- 98% decline in oysters since 1870
- over 2,500 barriers in fish passage
- bay island erosion rates of 1.5 to 31 feet per year

Over the past decade, there have been numerous efforts to re-establish lost resources such as: wetlands, aquatic reefs, submerged aquatic vegetation, and streamside forests. As with breaching dams, the problem is that individually these actions cannot assure "restoration . . . of living resources, their habitats, and ecological relationships."

In response to the challenge posed by the 1987 Chesapeake Bay Agreement, the Chesapeake Bay Program has recently established a Habitat Objectives and Restoration Workgroup (HORW). This group is responsible for developing "habitat guidelines that are needed to support the Bay's living resources and . . . a strategy to integrate and focus on restoration activities." The group began its activities in the fall of 1993.

HORW has two primary tasks. The first is to develop a procedure to review and select proposals for habitat restoration projects which can be funded. The second, and more challenging task is to develop a long term strategy to guide restoration planning and implementation.

At its first meeting, the HORW recognized that success in restoration of habitat required an integrated view of the ecosystem. Rebuilding a marsh or a reef, or blowing up a dam are often crucial steps in a restoration process, but they are never the complete answer. The fish in the James River must find the right mix of water quality, water depth, water circulation, food supply, cover, and numerous other factors in order to survive and reproduce successfully. Providing the right conditions requires careful management of riparian forests and wetlands, shorelines, subaqueous areas, and even local landuse. Therefore, successful

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habitat restoration is a multifaceted and complex undertaking.

The HORW is currently working to develop a strategy which will provide the type of guidance necessary to meet the objective of the Chesapeake Bay Agreement. There is consensus among members that the task is difficult but essential. Funding is available for some habitat restoration efforts. The challenge is to develop an integrated strategy to ensure that project selection is guided by a long range plan rather than only current opportunity.

HORW plans to have a strategy ready for public review in the first half of 1994. Virginia representatives to the HORW include staff from the former Council on the Environment (now the Department of Environmental Quality), the Virginia Department of Game and Inland Fisheries, and the Virginia Institute of Marine Science.

Projects currently proposed or envisioned include more fish passage establishment, creation of wetlands and streamside forests, building more aquatic reefs including oyster bars, and beneficial uses of dredged materials. The objective will be to coordinate these types of activities to produce healthy and productive systems which can meet all the habitat requirements of the Bay's valued living resources.

State	Wetland Acres Lost	% of Wetlands Lost
Virginia	774,000	42%
Maryland	1,210,000	73%
Pennsylvania	628,000	56%
West Virginia	32,000	24%
Delaware	257,000	54%
New York	1,537,000	60%

Estimated long-term wetland losses, 1780-1980, in the six states comprised in the Chesapeake Bay watershed. Figures and percentages are state totals and include areas both inside and outside the watershed (from Dahl 1990).

The Virginia Wetlands Report

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Virginia Association of Wetlands Professionals

The newly established Virginia Association of Wetlands Professionals (Association) is a nonprofit organization designed to bring together wetland scientists, regulators, managers, design professionals, attorneys, and other wetland professionals in an independent forum that promotes discussion and exchange of ideas on wetland issues important in Virginia.

Stimulus for the formation of the Association is a growing awareness of the need to improve accuracy in wetland identification and delineations. Proper and consistent application of wetland delineation methods should reduce public uncertainty regarding wetland regulatory programs. We envision the Association improving the effectiveness and efficiency of wetland management through developing and operating certification programs and providing training and education in wetland delineation. Broad range goals include: encouraging improved public and private partnerships; planning and protecting wetlands based on best available science, technology and engineering practices; encouraging conservation and responsible use of wetland resources; and promoting continued research and public education regarding wetlands functions and values.

A Steering Committee, composed of representatives of regulatory and resource agencies, consultants, and the academic community, has taken initial steps by developing purposes and bylaws for the Association.

An initial meeting was held on the 22nd of February. Officers were elected and by-laws were approved. For more information, contact Jean Watts, Chesapeake Bay Foundation, at (804) 780-1392.

American Oystercatcher

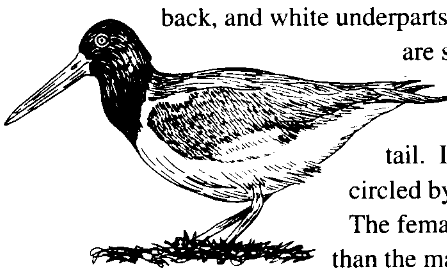
Haematopus palliatus

Julie Bradshaw

The American oystercatcher's large, bright, orange-red bill is the most distinctive feature of this stocky black and white shorebird. As its name suggests, the laterally compressed chisel-like bill of the oystercatcher is used to pry open oysters and other mollusks. Oystercatchers have been described as "birds which literally carry about with them each its oyster-knife" (Herbert K. Job in Pearson, 1936). Additional food (worms, crabs and other invertebrates) is obtained by using its bill to probe in the sand and mud. The oystercatcher's feeding techniques are not without hazard. There have been some reports of mollusks closing their shells on the bills of probing oystercatchers, trapping them and causing the birds to drown with the next rising tide.

Oystercatchers are year round residents of Virginia, and are most commonly found on the barrier islands. Often, they are seen on the islands of the Chesapeake Bay bridge-tunnel. American oystercatchers are found on the Atlantic and Gulf coasts and in Southern California. The other oystercatcher species found in the United States, the American black oystercatcher, occurs on the rocky Pacific coast.

The American oystercatcher has a black head, dark back, and white underparts. Its tail and neck are short and broad. It has white patches in its wings and tail. Its eyes are yellow, circled by red eye rings. The female is slightly larger than the male, but otherwise the sexes are similar. Oystercatchers are normally seen in scattered pairs or small flocks.



Females are thought to begin breeding in their fourth year. In Virginia, nesting occurs from April to July. Nests are small scrapes in the sand.

The American oystercatcher population was apparently affected somewhat by the hunting which decimated many shorebird populations, but oystercatchers are reportedly increasing in numbers and reoccupying former territory to the north along the Atlantic coast.

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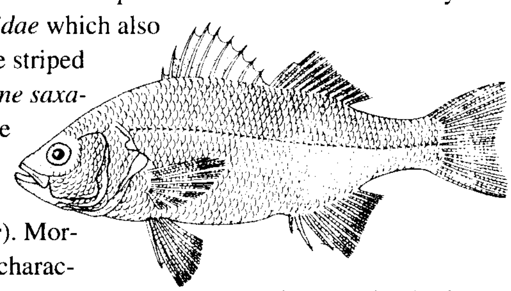
White Perch

Morone americana

Lyle Varnell

The white perch is a popular sport and pan fish in the Virginia portion of the Chesapeake Bay. It is of limited commercial value in Virginia but is an important commercial species in the Maryland waters of the upper Chesapeake Bay. The white perch is a member of the family *Percichthyidae* which also includes the striped bass (*Morone saxatilis*) and the wreckfish (*Polyprion americanus*). Morphological characteristics include a deeply compressed body which is silvery primarily in color, becoming gray or olive on the dorsal side. The caudal fin is shallowly forked. The gill cover contains two spines. *M. americana* ranges in size to 20 inches total length and to just under five pounds.



White perch are found in fresh, brackish and coastal waters from Nova Scotia to South Carolina. In the Chesapeake Bay area, white perch are restricted to the Bay's mainstem and tributaries year-round.

Adult and sub-adult white perch primarily inhabit the waters near river mouths and with a salinity generally less than 18 parts per thousand. They are classified as semi-anadromous, i.e., they move from estuarine waters to brackish and freshwater areas in the upper reaches of the Bay's tributaries to spawn. Unlike most sea basses, the sexes are separate for white perch. Maturity is reached at between two and four years old. Males mature earlier than females. Spawning occurs in waters generally less than four parts per thousand salinity. Eggs are demersal and attach to vegetation, rocks, debris or other static structures present near the bottom. Larvae may also attach to floating debris. After hatching, yolk sac larvae may settle to the bottom, occasionally lying on their sides, and frequently swim to the surface. Young white perch remain in the nursery area (which is the same as the spawning area for approximately one year.

A general downstream movement occurs with development. Young-of-the-year primarily inhabit low salinity (about three parts per thousand or less), shallow areas

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Natural Places to Visit

Dismal Swamp National Wildlife Refuge

(Part 1 of 2)

Pam Mason

Location: The refuge straddles the Virginia- North Carolina border in the cities of Suffolk and Chesapeake, Virginia and the counties of Gates, Camden and Pasquotank, North Carolina. There are many access points to the refuge. To reach the refuge office in Suffolk use U.S. 460. Take U.S. 13 and Route 32 south about 1.5 miles. The office is on the left. To reach the boardwalk, on the east side of the park, from Suffolk take Rt. 13 to Rt. 32 south for 4.5 miles to White Marsh Rd. Take White Marsh Rd. (Route 642) to Washington Ditch. Parking is about one mile down Washington Ditch Rd. Lake Drummond is a 4.5 mile hike along Washington Ditch Rd.

Details: The refuge is owned by the U.S. Fish and Wildlife Service and is open sunrise to sunset year round. Feeder ditch, approximately 14 miles south of Deep Creek on Route 17, provides canoe access to Lake Drummond. A private canoe company at the ditch rents canoes and offers tours of the lake. A small campground at the ditch provides free campsites on a first come- first served basis. For further information about the refuge, contact the Refuge Manager, P.O. Box 349, Suffolk, Virginia 23434, (804) 986-3705.

The Dismal Swamp is estimated to be 100,000 acres of swamp forest. It is believed that the swamp once covered 2,200 square miles. Logging, ditching, diking and burning have dramatically reduced the area of the swamp. Lake Drummond, located in the middle of the swamp, is unique as one of only two naturally occurring lakes in Virginia. Historically, the swamp was dominated by extensive stands of cypress and white cedar. Only a few remnant stands of the original forest along the shores of Lake Drummond have remained undisturbed.

Unlike most swamps in the coastal plain of Virginia, the Dismal Swamp does not border any major rivers. The Swamp still drains slowly into the Northwest and Pasquotank Rivers, but the rivers cannot be seen in the swamp itself.

The geologic history of the swamp provides clues as to why the Dismal Swamp exists and what makes it unique. About 80,000 to 100,000 years ago the swamp was part of the coastal ocean and the shoreline was west of the swamp. The location of the ancient shoreline is observable today as a ridge of higher ground known as the Suffolk scarp, which forms the western boundary of the swamp. Underlying the scarp is an impermeable layer of clay deposited during the Pleistocene, when the area was covered by the coastal sea. The younger deposits above the clay are composed mostly of sand. Rainwater drains through the sand, hits the impervious clay and drains into the swamp.

Peat, partially decayed vegetation, forms the substrate of the swamp. Peat can absorb great quantities of water and will stay wet even during long dry periods. When peat becomes water-logged, there is a decrease in the oxygen necessary to breakdown the vegetative material. Due to the slow decaying process, any new plant material falling to the swamp floor adds to the slow accumulation of peat.

American Oystercatcher
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White Perch
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during the summer and move down river between August and November to deeper water nearer the mouth of the river of their origin.

White perch depend upon tidal freshwater and oligohaline wetlands as spawning, nursery and feeding areas. They feed on benthic epifauna and infauna, zooplankton and small fish. Their principal food items include amphipods and shrimp. Many of these food items are also dependent upon wetlands as habitat and refuge areas.

Geographic Information Systems

Using Photography For Mapping

Marcia Berman

Previous articles in this column have discussed using aerial photography for mapping shoreline, wetlands, landuse patterns, etc. Little attention, however, has been given to the process which allows imagery to be used in mapping applications. Besides the obvious differences between maps and photographs, the principal distinction between the two is that maps are geographically oriented in space, whereas photographs are not. In other words, we can look at a map, and using simple tools, extract the precise location of any feature illustrated. The geographic coordinates of the map allow this to be possible. A number of different coordinate systems are used regularly, but the most common is the geodetic coordinate system which uses latitude and longitude for geographic positioning. Aerial photographs have no coordinates. Therefore, without additional effort, they are nothing more than pictures.

Modern mapping applications rely heavily on aerial photographs to update old maps and construct new ones. New mapping initiatives require that images be transformed or projected into a geographic coordinate system before they can be used to develop maps. The process is known as rectification.

Rectification accomplishes two tasks. First, it places the aerial photograph in geographic space by assigning coordinates to specific locations on the image. Second, because the earth's surface is curved rather than flat, rectification also stretches the image to represent a planar surface. The process assumes that the scale of the photograph is known, and the image is perfectly vertical. Because of radial lens distortion inherent in the camera, the latter assumption is often incorrect. The only true vertical place on an image is the center, which is directly under the lens when the photograph is taken. From the center, vertical distortion increases radially to the edge of the image; with the outer edge having the greatest distortion. For this reason, only the center forty (40) to sixty (60) percent is used for mapping, and photography is generally flown so images overlap by forty (40) percent to guarantee complete aerial coverage of a region.

Planning becomes an integral component of the rectification process. The photograph must be reviewed carefully to select the sites to be surveyed. These sites are referred to as photographic control points. Ideally, photo control points should be clearly defined, permanent markers on the image. Hard-top road intersections, corners of buildings, and the intersection of driveways with primary roads are all good examples.

A minimum of four photo control points should be selected for the rectification. The more points, the more accurate the rectification will be. Mapping programs at VIMS use as many as fifteen control points per photograph. The points should be dispersed throughout the section of the image being used for mapping (i.e. the center forty (40) or sixty (60) percent), and not clustered together. Once the sites have been selected their precise geographic location must be determined.

The most critical step in rectification is the collection of coordinate data in the field. This requires highly accurate survey instruments. Today, Global Positioning System (GPS) technology surpasses all other conventional survey tools available. GPS computes positions by triangulating with orbiting satellites; receiving signals every three tenths of a second. GPS equipment and software are developed and manufactured by private corporations, but the satellites are launched and maintained by government defense and research agencies. The combined efforts allow for positional accuracies of plus or minus two (2) centimeters.

Once the positions of the control points have been computed, the image can be rectified. Several mapping and image processing software packages have the capability to rectify an image. In simple terms, the locations of the photo control points on the image are identified through a medium like an electronic digitizer, the computed coordinate values are assigned to each site, and the scale of the photograph is defined. Computer time completes the rectification of the image. Once rectified, any spot on the photograph has a geographic position which can be determined using the photographic scale and reference to one of the photo control points.

Natural color, black and white, and color infra-red photography are used for mapping applications. Color infra-red is an excellent medium for mapping landuse and landcover patterns. Natural color is preferred for mapping shoreline position and shoreline stabilization structures. Black and white imagery can be used for all these applications; however, there are some limitations.

Choosing the proper photographic medium is first dependent on the element to be mapped; second, the altitude and scale of available imagery; and, third, the time of year that aerial photography flights were run. Since operational and contractual costs for aerial flyovers are high, low budget programs are almost always forced to utilize existing photographic sources. The limitations and specifications of these data sources must be researched to determine if they can meet the needs and objectives of the mapping initiative.

Analysis of Functional Assessment Accuracy for Constructed Wetlands

Michelle Fox, Julie Bradshaw, and Jim Perry

The efficacy of wetland creation as a management tool has been called into question early and often since being proposed as a form of wetland mitigation. Proponents have supported the concept as one approach to meeting "no net loss" goals while many others involved with resource conservation maintain it has little value in offsetting wetland losses. The primary reasons stated by detractors are the history of failure in establishing anthropogenic wetlands and the inability of the scientific community to measure what constitutes a "success" among created wetlands. Many are now proposing and studying the use of various wetland functional assessment techniques to look at the "success" question.

Functional assessment methods are designed so that a minimum amount of data must be collected. The techniques differ in the ease with which they can be used. The success of the techniques is dependent on how indicative qualitative judgements are of a system's functioning capacity. Functional assessment techniques, emphasizing different wetland functions and contributing components, are reflective of the variety of perspectives from which techniques can be written.

During the summer of 1993, we studied the application of two rapid assessment techniques—VIMS technique (Bradshaw, 1991) and WET 2 (Adamus, 1987)—with the results of a professional functional assessment. The study site, Wagner Road constructed wetland, is located in Petersburg, VA. The professional assessment was done on Wagner site by Dr. Robert Atkinson (Atkinson, 1992; personal communication, 1993). For the purposes of our work, the conclusions that Atkinson reached on the functioning capacity of the site were assumed to be more accurate than the conclusions of WET or the VIMS technique.

Constructed Site Assessment Results

Functions / Values	VIMS Technique	WET	Atkinson's Results*
Floodflow Alteration	Moderate	Moderate	Moderate
Sediment / Toxicant Retention	Moderate	(effect.) High (opport.) Low	Moderate
Nutrient Removal/ Transformation	Moderate	(effect.) Low (opport.) High	Low
Production/ Export	—	Moderate	Low
Wildlife Habitat	Moderate	—	Moderate

**Ratings extrapolated from data*

The VIMS wetland assessment technique incorporates both opportunity (the chance a wetland has to use its functional capabilities considering watershed characteristics) and effectiveness (the inherent structural capacity of the wetland to perform these functions). WET, on the other hand, separates opportunity and effectiveness. WET asks a variety of questions that indirectly measure biogeochemical processes contained in wetland systems and determine landscape characteristics. Detailed interpretation keys are provided to relate these processes to the functions and values being assessed. Depending on the presence of various wetland processes and landscape characteristics, each technique gives a high, moderate, or low rating to various functions.

A comparison of VIMS technique and WET results, yields some discrepancies (see table). The differing results indicate that present rapid assessment methods may not draw uniform conclusions. The various perspectives from which assessments are written may explain, in part, why the techniques conflict with each other as well as with the professional assessment.

Functions compared among assessments and Atkinson's evaluation include sediment/toxicant retention, nutrient removal/transformation, flood alteration, production export, and wildlife habitat. Atkinson's narrative assessments created a less positive picture of the site's functioning capacity than the ratings of WET or the VIMS technique. Results showed that ratings for functions given by WET and the VIMS technique tended to be higher than the ratings extrapolated from Atkinson's narrative assessment.

Because WET separated effectiveness from opportunity, the effectiveness rating it produced could be directly compared to Atkinson's assessment for effectiveness. The VIMS technique, on the other hand, does not separate effec-

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Structurally Speaking...

Bulkheading with Plastic

Walter I. Priest, III

If you need to protect your shoreline from erosion with a bulkhead, typically your choices have been creosoted wood, salt-treated wood, steel or perhaps concrete for construction materials. All of these have advantages and disadvantages with regard to cost, engineering, installation and life span. Another alternative has recently entered the marketplace—plastic bulkheading. At least two different types are available locally. One is a gray recycled composite plastic material with sheet-piles in the traditional tongue-and-groove configuration with square members for use as walers. Local installations have used salt-treated wood piles for support. The other type is a polyvinyl chloride (PVC) product which is available in both a white virgin material and brown recycled material formulations. The PVC product is corrugated with a channeled ball and socket joint between the sheet-piles that is reported to eliminate the need to use filter cloth. Salt-treated wood is generally used for walers on these structures.

The structural characteristics of these new plastic materials are different from wood and therefore require certain design modifications or considerations. These may necessitate limitations, for example, on the height of the structure, which will affect the number of suitable applications for the material. In other words, these materials are not interchangeable and require site specific evaluations.

In general, plastic structures cost more than similar wooden structures, but these costs are purportedly outweighed by a design life exceeding that of a wooden structure.

Additionally, neither of these plastic products depend on the use of chemical treatment to protect them from marine borers and decay.

It is the policy of the Wetlands Report to avoid either endorsing or recommending a particular commercial product. Consequently, we would suggest that you contact your agent or contractor if you are interested in using one of these new products.

Analysis of Functional Assessment Accuracy for Constructed Wetlands
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tiveness from opportunity, hence disallowing a direct comparison between assessments. The results of the three techniques reveal the different sets of evaluation objectives with which a single site can be approached. While each assessment method is seeking to define the resource, the characteristics chosen to determine the resource's importance vary across assessment techniques and evaluators. A single function can be classified throughout the range of ratings depending on the particular assessment used. The VIMS technique emphasizes the inseparableness of a wetland's effectiveness at performing a function and the opportunity the wetland has to function due to its position in the landscape. WET emphasizes effectiveness and opportunity but because it does not combine them, does not decide their relative importance within the wetland. The combining of effectiveness and opportunity by the VIMS technique, while simplifying the issue for the resource manager trying to define the resource, may be masking data that really should be viewed separately for good management decisionmaking. For example, a wetland may be reduced to a moderate or a low rating simply because it does not have the opportunity to perform functions that it is actually highly capable of performing.

All of the functions assessed were given a moderate rating by the VIMS technique, making the constructed wetland appear to have gained a moderate probability of opportunity and effectiveness for the assessed functions since the time of construction. Focusing solely on the wetland's functioning capacity, Atkinson gave low effectiveness ratings for Nutrient Removal/Transformation and Production Export. WET's effectiveness results, compared to Atkinson's, prove to be incongruous even though they were evaluating with the same objectives. While not disproving the reliability of WET, the discrepancy between results does warrant a closer look at the technique used to arrive at these results and the different factors that WET and Atkinson consider.

A final problem is the actual process of rating. The techniques only provide three possible categories in which to place the wetland being evaluated, when a wider range of categories may be more informative. Problems also arise from discrepancies in the way the assessment methods

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Analysis of Functional Assessment Accuracy for Constructed Wetlands
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define low, moderate, and high (e.g., one technique may rate a wetland as moderate for a certain level of production export while another technique considers that same level to warrant a low rating). Finally, an additional question bears consideration. How can a one-word rating be given without really knowing how that rating will be used in resource management decisions?

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Calendar of Upcoming Events

March 8-11, 1994	Marine and Estuarine Shallow Water Science and Management in the Mid-Atlantic Region Atlantic City, NJ Call Ralph Spagnolo at (215) 597-3642.
April 7 & 8	Environmental Policy and the Role of the University The College of William & Mary, Williamsburg, VA For more information, call Pam Mason at (804) 642-7158.
May 19 & 20	Wetlands Restoration and Creation Conference Hillsborough Community College, Tampa FL For information call (813) 757-2104
May 30 - June 3	Annual Meeting of the Society of Wetland Scientists Wetlands: Local Functions, Global Dependence Portland, OR Call Curtis Tanner at (206) 753-9440

Wetlands Program

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