LAKE ERIE

LAKEWIDE ACTION AND MANAGEMENT PLAN

2021 ANNUAL REPORT

The Buffalo Lightouse. Source: Getty Images.

In this Issue

What is the Lake Erie LAMP?

Under the Great Lakes Water Quality Agreement, the Governments of Canada and the United States have committed to restore and maintain the physical, biological, and chemical integrity of the waters of the Great Lakes.

The Lake Erie Lakewide Action and Management Plan (LAMP) is an ecosystem-based strategy for protecting and restoring the water quality of Lake Erie, the St. Clair River, Lake St. Clair, and the Detroit River. The LAMP is developed and implemented by the Lake Erie Partnership, which is led by the U.S. Environmental Protection Agency (EPA) and Environment and Climate Change Canada (ECCC) and includes other federal, state, provincial, tribal, First Nation, and local watershed management authorities.

The Partnership facilitates information sharing, sets priorities, and assists in coordinating environmental protection and restoration activities.

OVERVIEW

In 2021, the Lake Erie Partnership released an updated Lake Erie Lakewide Action and Management Plan. The plan includes 33 implementation actions to protect and restore water quality in Lake Erie and the St. Clair – Detroit River System. We encourage you to learn more at: 2019-2023 Lake Erie Lakewide Action and Management Plan.

The Partnership also collaborated with the International Association for Great Lakes Research to plan the 2022 State of Lake Erie Conference to facilitate interactions between researchers and managers on diverse topics related to the Lake Erie ecosystem and water quality, and will be participating in the Great Lakes Public Forum in Niagara Falls, Ontario, the week of September 26, 2022.

Lake Erie continues to be a good source of high-quality drinking water for millions of people in Canada and the United States. It supports the highest species diversity and fish production of any of the Great Lakes, and toxic chemical concentrations continue to decline. Despite this, harmful and nuisance algal blooms remain a problem, prey fish diversity and the proportion of native prey fish species have declined, and land-based stressors continue to impact nearshore water quality and critical habitat areas that support native species.

In the following sections of this Annual Report, the Lake Erie Partnership provides updates on activities to reduce chemical contamination, manage nutrients and algae, prevent and control invasive species, and restore and protect both habitat and species.

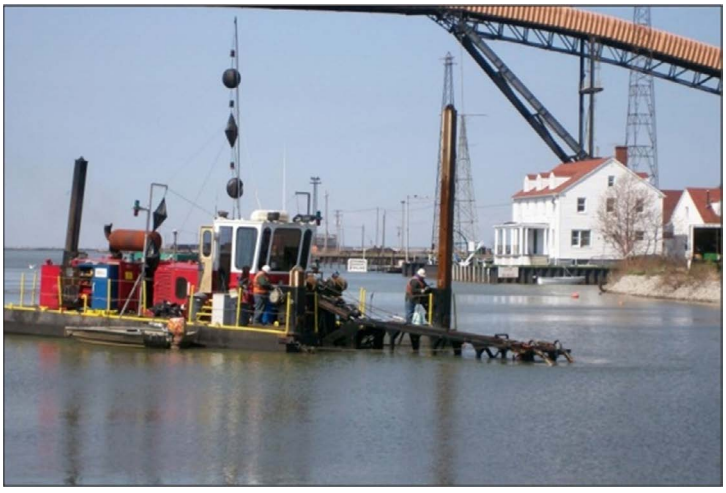
REDUCING CHEMICAL CONTAMINATION

Significant progress has been made in reducing toxic chemicals, including chemicals of mutual concern such as PCBs, mercury, and PDBEs, but some chemicals such as PAHs and PFAS continue to pose a threat to human health and the environment. Some of these chemicals accumulate in fish tissues and, as a result, fish consumption advisories remain in effect. Significant work continues in Lake Erie Areas of Concern (AOCs) to reduce legacy chemicals.

Sediment Remediation Efforts in Ohio

Sediment remediation has been completed or is underway at several locations in Ohio. The Otter Creek remediation project in the Maumee AOC, implemented with Great Lakes Restoration Initiative (GLRI) funds under the Great Lakes Legacy Act, was completed in August 2021. The project included removal of over 50,000 cubic yards of PAH–contaminated sediment and habitat improvements. The project was led by the United States Army Corps of Engineers (USACE) on behalf of EPA and is one of the Maumee AOC management actions required to achieving delisting. For more information, please see: http://www.greatlakesmud.org/uploads/4/0/0/1/40013937/final_otter_creek_fact_sheet_15_nov_2021.pdf.

In August 2021, the Ashtabula River became the first AOC to be delisted in Ohio. The delisting is a result of significant remediation and restoration activities accomplished by a series of projects from 2006 to 2013 under the Great Lakes Legacy Act and GLRI. Overall, the implementation of these projects resulted in the removal of over 750,000 cubic yards of contaminated sediment from the mainstem of the Ashtabula River. Six Beneficial Use Impairments (BUIs) were removed between 2014 and 2020, leading to the AOC's delisting in 2021. The restoration of the Ashtabula River AOC involved many individuals, organizations, and partnerships at the local, state and federal level. For more information, please see: https://www.epa.gov/great-lakes-aocs/ashtabula-river-aoc-delisted.



Dredging contaminated sediments in the lower Ashtabula River. Source: Ohio Lake Erie Commission

Addressing PFAS in the Great Lakes

Canada and the U.S. designated perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and long-chain perfluorocarboxylic acids (LC-PFCAs) as Chemicals of Mutual Concern under the GLWQA in 2016. These chemicals belong to the broader family of per- and polyfluoroalkyl substances (PFAS), which includes thousands of diverse chemicals. PFAS have been produced and widely used since the 1950s because of their ability to resist grease, water, and oil. The majority of PFAS are used in non-stick cookware, food packaging, textiles, cosmetics, paints, and firefighting foam and are ubiquitous in the environment. PFAS concentrations are generally higher in lakes with watersheds that are more urbanized, such as lakes Erie and Ontario.

Many efforts are underway to reduce the release of PFAS into the Great Lakes, including funding projects through Canada's Great Lakes Protection Initiative, and implementing the Canadian Great Lakes Strategy for PFOS, PFOA and LC-PFCAs Risk Management. In Canada, manufacture, use, sale or import of PFOS, PFOA, LC-PFCAs, and their salts and precursors, are prohibited through regulations. However, other PFAS used to replace these prohibited chemicals may also be associated with environmental and/or human health effects. Therefore, the Government of Canada is considering activities that would address PFAS as a class. In 2021, Canada released a Notice of Intent to address PFAS as a class and publish a "State of PFAS" report in 2023.

In 2021, EPA announced the PFAS Strategic Roadmap: EPA's Commitment to Action, 2021-2024, laying out a whole-of-agency approach to addressing PFAS. The actions described in the PFAS Roadmap each represent important and meaningful steps to safeguard communities from PFAS contamination. Cumulatively, these actions will build upon one another and lead to more enduring and protective solutions.

MANAGING NUTRIENTS AND ALGAE

Lake Erie beaches and nearshore areas continue to provide good opportunities for swimming and recreational use. However, nutrient issues continue to be a challenge. Harmful algal blooms (HABs) occur annually in Lake St. Clair and the western basin, and can extend into the central basin. Excessive growth of the nuisance algae, *Cladophora*, continues to be a problem in the eastern basin, and episodes of low dissolved oxygen, or hypoxia, are common in the bottom waters of the central basin.

Status of Lake Erie Phosphorus Loads and HABs

In 2016, the United States and Canada committed to reduce phosphorus loads to the western and central basins of Lake Erie by 40% to prevent HABs and hypoxia. Phosphorus loads are computed by the U.S. and Canada annually and posted to the ErieStat website in June of each year. In 2020, the total phosphorus load to the western and central basins was 8,288 metric tons, exceeding the target level of 6,000 metric tons annually (MTA) (*Figure 1*). It will likely be several years before changes in phosphorus concentrations or loads in response to management actions can be detected. This is due to multiple factors contributing to higher loads, including climate change, urban and agricultural intensification, and loss of wetlands. Despite significant on-the-ground efforts, the accelerating influence of these factors is challenging progress towards meeting targets.

The National Oceanic and Atmospheric Administration (NOAA) and its partners use remote sensing imagery, multiple models, and daily monitoring data of Maumee River water quality to predict and track the formation and movement of HABs in the western basin of Lake Erie during the summer months.

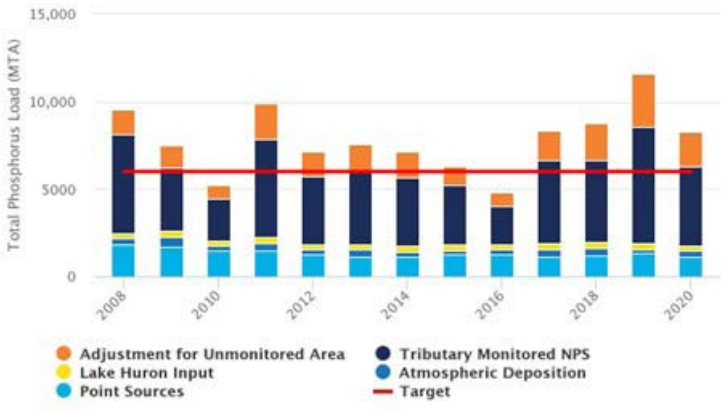


Figure 1. Total Phosphorus loading to the western and central basins of Lake Erie, 2008-2020. NPS = Non-Point Sources. Source: ErieStat.

The 2021 bloom had a severity index of 6.0, which is considered moderately severe (*Figure 2*). The severity index is based on the amount of bloom biomass over the peak 30 days of the bloom on a scale of 1 to 10. At its peak, the bloom covered 530 square miles (853 square kilometres). This large area may have resulted from the heavy rain and associated high river discharge in July which may have dispersed nutrients further into the western basin.

The 2021 bloom developed in late July and reached a peak from late August to early September, mostly in U.S. waters. The bloom weakened following several days of strong winds but then re-intensified at the end of September. The bloom lasted longer than those in recent years (through the end of October) likely due to persistent warm water temperatures.

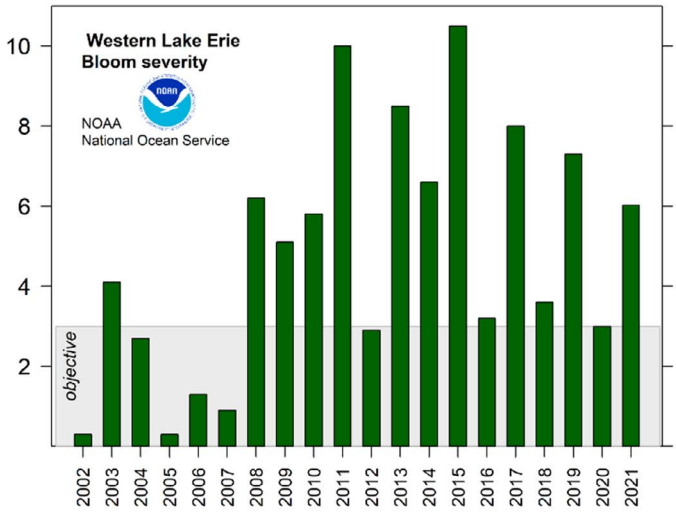


Figure 2: Western Lake Erie basin bloom severity index for 2002–2021. Source: NOAA.

H2Ohio Continues Significant Investment to Improve Water Quality

Ohio launched H2Ohio in November 2019 as a long-term, comprehensive water quality plan to reduce harmful algal blooms, improve water infrastructure, and address lead contamination in Ohio. The H2Ohio Initiative is a collaboration involving the Ohio Department of Agriculture, Ohio Department of Natural Resources, Ohio Environmental Protection Agency, Ohio Lake Erie Commission, and other environmental, agricultural, and educational partners.

H2Ohio has a significant role in Ohio's nutrient reduction strategy for Lake Erie. So far nearly 3,000 farmers have enrolled in the program, committing to implement proven, science-based conservation practices to help reduce nutrient runoff from 1.6 million acres (647,497 hectares), which accounts for over 40% of the cropland in Ohio's portion of the Lake Erie watershed. In addition, substantial investments are being made to create and restore wetlands to filter nutrients. Statewide, the program has supported over 80 wetland projects to date, filtering nutrients from over 100,000 acres (37,231 hectares). In 2021, the Lake Erie and Aquatic Research Network (LEARN) established baseline monitoring for a subset of these wetlands, which will be the focus of a long-term research program. H2Ohio also supports home sewage treatment repair and replacements through local health districts. Taken together, Ohio estimates that these efforts removed over 127 tonnes (280,000 pounds) of phosphorus from the Maumee River watershed through summer 2021—this is 28% of Ohio's annual reduction goal of 453.6 tonnes (1 million pounds).

A complete look at H2Ohio's progress is outlined in the newest annual report. Visit h2ohio.gov for more information.

Innovative Technology to Monitor *Cladophora* and Nearshore Health in the Eastern Basin

The Niagara Coastal Community Collaborative, Niagara College, and the Niagara Peninsula Conservation Authority, with funding from the Ontario Ministry of the Environment, Conservation and Parks and technical support from Environment and Climate Change Canada, developed the *Visual Assessment Survey Tool (VAST)*. This tool provides an innovative platform for the collection and mapping of community monitoring data including *Cladophora* wash-up, shoreline erosion, water level changes, and aesthetic beach quality along the Lake Erie beaches in the Niagara Region. Through near real-time surveys and areal imagery, areas under threat or in need of protection can be identified, with data and results available to the public in an open, readable format. The tool, originally developed for Lake Erie, is growing in popularity and is now also being used in lakes Huron and Ontario. For more information or to get involved, please see: http://niagaracoastal.ca/vast.

VAST photo station at Reebs Bay (left) and volunteers testing the VAST (right). Source: Swim Drink Fish

New Wetland Demonstration Site to Address Legacy Phosphorus

In 2020-2021, USACE constructed a 10-acre wetland in Defiance, Ohio, that will reduce non-point source runoff to western Lake Erie and serve as a long-term research and demonstration site to better understand how wetland restoration projects can maximize nutrient capture. The wetland is designed to capture high tributary flows and associated legacy phosphorus loads and filter them through a series of treatment cells. This project builds on several years of research on soil phosphorus storage capacity and field research will continue for five years. The innovative project is being coordinated with federal partners, including EPA, Natural Resources Conservation Service (NRCS), and United States Geological Survey (USGS), with funding from the GLRI and support from state and local partners. USACE and partners will expand outreach efforts in 2022 and beyond to share lessons learned and inform other wetland restoration project designs in the region.

GLRI Phosphorus Optimal Demonstration Wetland under construction in Defiance, Ohio, November 2020. Source: USACE

Canadian Agricultural Partnership Brings New Research and Monitoring Initiative to Region

The On-Farm Applied Research and Monitoring (ONFARM) program is a four-year, applied research initiative that began in 2019 which supports soil health and water quality research on farms across Ontario. The ONFARM project will advance a host of activities to evaluate soil best management practices and create opportunities for farmers and industry personnel to learn from each other. The program is funded by the Canadian and Ontario governments through the Canadian Agriculture Partnership. The Ontario Soil and Crop Improvement Association is delivering the programming for the governments through the end of 2023. ONFARM was developed by the Ontario Ministry of Agriculture, Food and Rural Affairs with support from various organizations including Agriculture and Agri-Food Canada, five Conservation Authorities and The Soil Resource Group. ONFARM will build on other environmental protection initiatives supported by the Partnership, such as the Environmental Farm Plan and the Lake Erie Agriculture Demonstrating Sustainability Initiative, and helps meet commitments under the Great Lakes Water Quality Agreement. ONFARM is supported by a network of farmer cooperators, who are essential to the success of this program. For more information, please see https://www.osciaresearch.org/onfarm-applied-research/.

A weir used at an ONFARM site to collect surface water and calculate volume during extreme runoff events. Source: Ontario Soil and Crop Improvement Association

PREVENTING AND CONTROLLING INVASIVE SPECIES

Invasive species have significantly altered the habitat and food web in Lake Erie. Lake Trout populations have shown improvement, due in part to successful control of invasive Sea Lamprey. Preventing additional invasive species from entering the Great Lakes is of high importance to resource management agencies in the Great Lakes.

Preventing the Spread of Invasive Carp through the Closure of Ohio's Great Lakes Mississippi River Inter-basin Connections

The USACE Great Lakes Mississippi River Interbasin Study analyzed hydraulic connections between the Mississippi River and Great Lakes watersheds to determine areas where there is a risk of aquatic invasive species (AIS), including invasive carp, crossing between these two major watersheds. In Ohio, four hydraulic connections were identified. Of these, three were determined to be a risk for AIS transfer, and are being addressed as follows:

1) The Ohio Erie Canal outside Akron, a medium-risk connection, consists of a low-lying area that floods, creating a direct connection and a water diversion structure that moves water from the Ohio River watershed and the Lake Erie watershed. This connection was closed by the USACE in early 2020.
2) Little Killbuck Creek near the village of Lodi, a medium-risk connection, forms a natural hydraulic connection between the watersheds during flooding conditions. To sever this connection, an earthen berm is being designed that will prevent AIS from moving between the watersheds.
3) Grand Lake St. Marys, a low-risk connection, is a manmade lake with outflows into both the Ohio River and Lake Erie watersheds and through the St. Marys State Fish Hatchery. To sever this connection, upgrades were made in 2020 so that operationally, the fish hatchery is in the Ohio River watershed and no longer moves water to the Lake Erie watershed. The final stage of the project will be to implement a screening structure to further prevent AIS movement into the Lake Erie watershed in 2023.

Major Declines of Invasive Sea Lamprey in Lake Erie

In 2019, the abundance of adult Sea Lamprey in Lake Erie met the annual target for the first time since the mid-1990s, and continued to decline in 2020 and 2021. The abundance estimate in 2021 was 450 adult Sea Lamprey, and the average over 2019-2021 was 1,100 adult Sea Lamprey – both well below the target of 3,300 adults (*Figure 3*). This is good news for native species such as Lake Trout, which have been impacted by Sea Lamprey predation.

The Great Lakes Fishery Commission works in partnership with the U.S. Fish and Wildlife Service (US FWS) and Fisheries and Oceans Canada continue to apply the Integrated Management of Sea Lamprey program in Lake Erie, including selection of streams for lampricide treatment and implementation of alternative control methods such as trapping and the use of barriers and pheromones.

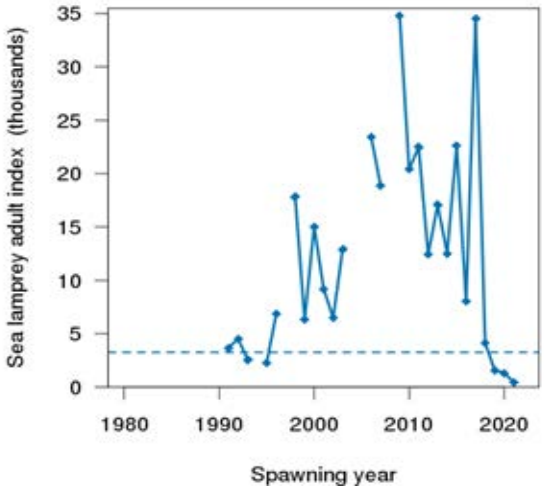


Figure 3: Adult Sea Lamprey abundance in Lake Erie. Source: Great Lakes Fishery Commission.

PROTECTING AND RESTORING HABITAT AND SPECIES

Coastal wetlands have been impacted by development, water levels and invasive species such as *Phragmites*. Reduced habitat connectivity between tributaries and Lake Erie is impacting some native species. However, some native fish species, such as Lake Sturgeon, are showing signs of recovery.

Canadian Lake Erie Baseline Habitat Survey

The GLWQA Habitat and Species Annex includes a commitment to conduct a baseline survey of existing habitat, against which to establish a Great Lakes basin target of net habitat gain, and measure future progress. ECCC conducted a baseline habitat survey of the Canadian waters of Lake Erie in 2020, from Sarnia to the Niagara River, beginning at the shoreline to approximately 2 kilometres (1.24 miles) inland. The survey was assessed using four ecologically significant habitat categories (wetlands, uplands, tributaries, and inland lakes and ponds), and analyzed across six components of net habitat gain (extent, biodiversity, condition, function, protection, restoration) (*Figure 4*). The results have been compiled into a technical report, a highlights report, and a geospatial framework comprised of three outputs (geodatabase, web mapping service, and KMZ file). The spatial data results are published on the Government of Canada Open Data Portal.

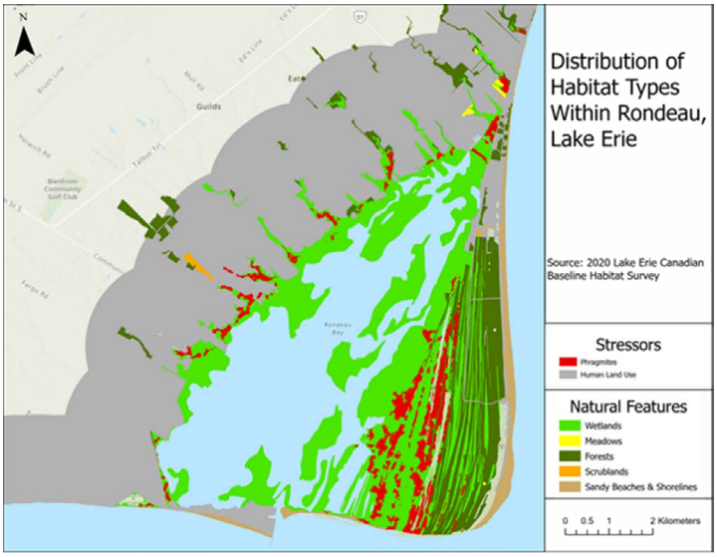


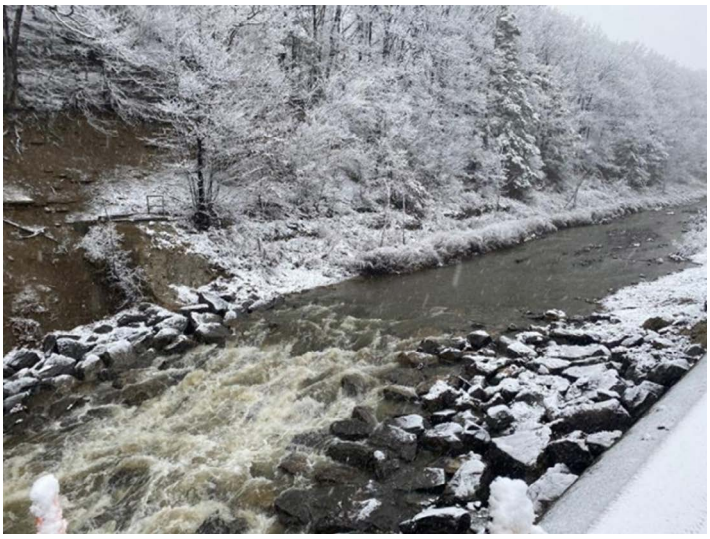
Figure 4: Distribution of habitat types within Rondeau Bay, Lake Erie. Source: 2020 Lake Erie Baseline Coastal Habitat Survey.

Removal of the Smith Mills Dam on Silver Creek

The Smith Mills Dam was constructed in 1905 to form a water supply reservoir that served the Village of Silver Creek in Chautauqua County, New York. In recent years, the reservoir was no longer used for this purpose, the dam was in a dilapidated condition and a risk to public safety, and it prevented fish and other aquatic organisms from accessing the Upper Silver Creek Watershed. New York State Department of Environmental Conservation, US FWS, and the Chautauqua County Soil and Water Conservation District led a multi-partner effort to remove the dam and restore connectivity to more than four miles (6.4 kilometres) of additional stream habitat within Silver Creek and its tributaries.

The dam was replaced with a large rock riffle area to account for changes in elevation. Below the riffle, a small channel was carved out from the bedrock to provide more depth for fish navigating upstream. Above the riffle, a new stream channel was cut, recreating a natural stretch of the creek. The remaining area of the old reservoir, surrounding the new stream channel, was transformed into wetland habitat, including the planting of a variety of native trees and shrubs and excavating several potholes (small ponds) that provide additional habitat for fish, frogs, birds, and other wildlife.

For more information, see: https://storymaps.arcgis.com/stories/ba01e3f8b50f443f817a3081ea5d7ef4.



The Smith Mills Dam wall before removal (Source: USFWS) and the riffle that replaced the main dam wall. Source: Chautauqua County Soil and Water Conservation District

OUTREACH AND ENGAGEMENT

GLWQA Engagement Opportunities

You can keep up to date on GLWQA engagement opportunities in the Engagement section of Binational.net. Information on many of our partner organizations' upcoming outreach and engagement opportunities can also be found at the Great Lakes Commission's "Great Lakes Calendar".

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