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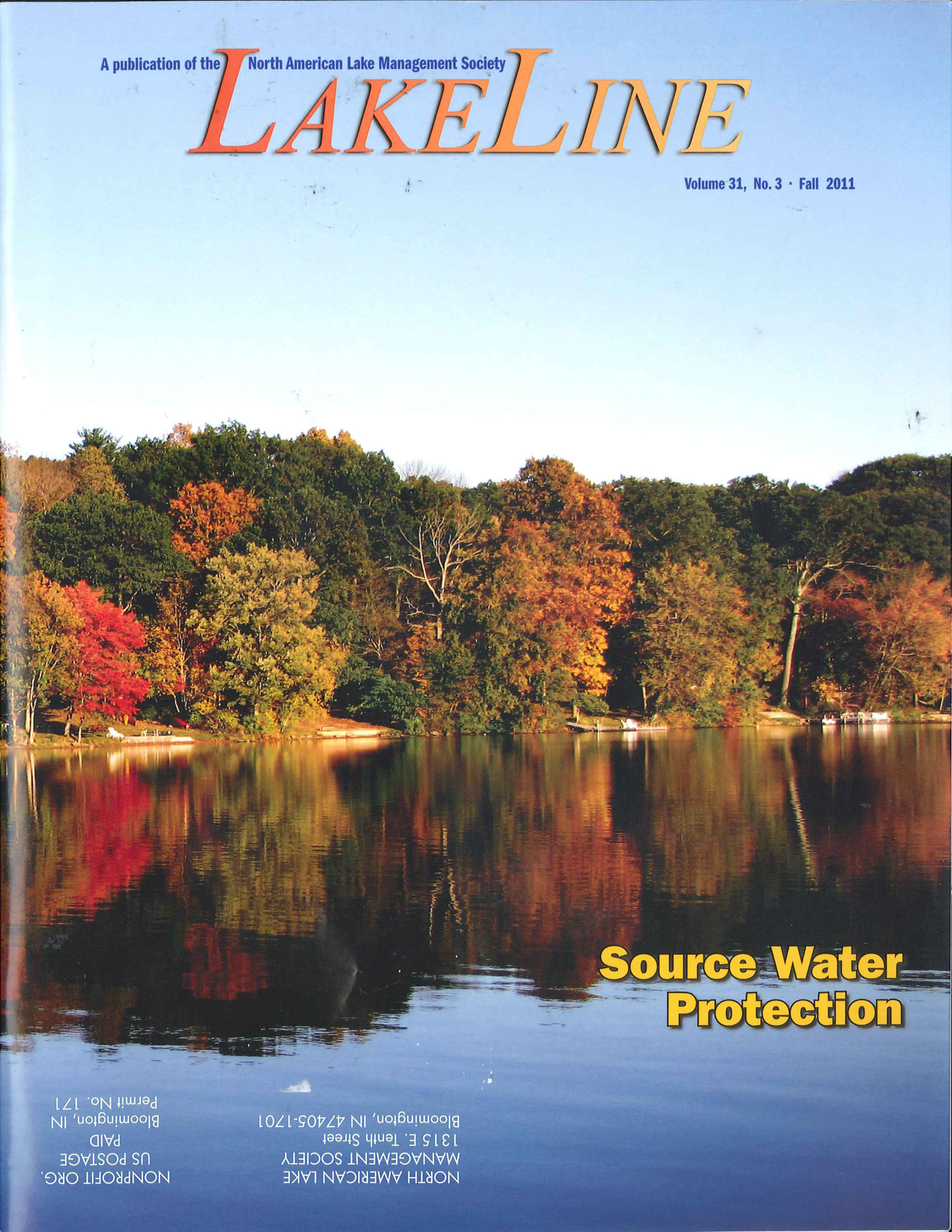

Source Water Protection

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Figure 6. Algae bloom on Grand Lake St. Marys West Beach on June 23, 2010.

Figure 7. Wildlife navigating algal blooms in Grand Lake St. Marys.

figures and other materials. Jim Sullivan (Indiana Department of Environmental Management) and Anthony Dulka, Joe Konczyk, and Wade Boring (Illinois Environmental Protection Agency) provided source water information for surface PWSs in their states.

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Tom Davenport is a U.S. EPA environmental scientist and stationed in Chicago. He is involved with the assessment and management of watersheds in the Midwest.

Wendy Drake works for the U.S. EPA Region 5's Ground Water and Drinking Water Branch in Chicago and is involved in source water protection program issues in the region.

Student Corner

Sarah Kalinoski and Julie Terrell

Watershed-Scale Source Water Protection in the Choctawhatchee Basin

All the drinking water that comes from our public utilities or from individual wells ultimately comes from ground water, streams, rivers, springs, or lakes in a watershed (U.S. Environmental Protection Agency 2011). As a watershed organization, the Choctawhatchee Basin Alliance of Northwest Florida State College (CBA) aims to study and protect these sources on a landscape scale. The U.S. Environmental Protection Agency (2011) recognizes that source water protection "usually requires the combined efforts of many partners such as public water systems, communities, resource managers and the public." CBA is one such partner in northwest Florida striving to protect water resources by working directly with the local community, including citizens, schools, city and county governments, as well as state and federal agencies.

CBA's mission is to sustain and provide optimum utilization of the Choctawhatchee Basin watershed. CBA programs in monitoring, restoration, research, and education focus to conserve our resources for their sustainable use rather than restricting them from human activity. CBA recognizes that the economy of our region is strongly dependent upon the utilization of Choctawhatchee Bay in addition to other activities within the basin. We know that drinking water must be available for human consumption, but our surface waters must be available for other uses as well (such as fishing, shrimping, recreational boating, swimming, etc.). Consequently, CBA is dedicated to promoting "optimum utilization" of water resources in order to preserve the environmental quality of our natural resources and the quality of public life, while ultimately ensuring the future utilization of those resources.

To fulfill CBA's mission and vision, staff members coordinate four key program areas throughout the watershed: monitoring, restoration, education, and research. Each of these comprehensive programs contributes to the health and protection of our community's source water.

Monitoring

CBA oversees monthly water quality monitoring at over 100 sampling stations located within the Choctawhatchee Bay, its tributaries, Choctawhatchee River, the coastal dune lakes of South Walton County, and offshore in the Gulf of Mexico. The monitoring itself is conducted almost entirely by a large group of dedicated volunteers. Volunteers are trained by CBA staff to collect (1) real-time data using Quanta Hydrolabs and (2) water samples that are analyzed by the University of Florida's Florida LAKEWATCH program for eutrophication parameters (total phosphorus, total nitrogen, chlorophyll, and Secchi depth). As a result of this long-term program, CBA has over 15 years of consistent water quality data, which are available to the public. CBA's monitoring program also includes annual surveys of sea grass in Choctawhatchee Bay, plant surveys on the coastal dune lakes, and periodic evaluations of oyster reefs built as part of our restoration work. CBA's ongoing monitoring of our surface waters supplements the work of state agencies and municipal health departments. It provides an effective mechanism for identifying potential threats to our community's source water.

Restoration

As problems are identified, CBA conducts restoration work to protect and enhance our surface water ecosystems. With our "Living Shorelines" initiative, CBA has created hundreds of feet of enhanced natural shoreline as an alternative to armoring. With the help of volunteers, we build oyster reefs and plant shoreline grasses to (1) prevent and correct erosion, (2) provide habitat for fish, oysters, and other marine life, (3) improve water quality via the filtering capacity of an increased oyster population and the nutrient uptake of healthy shoreline plants, and (4) buffer adjacent lands against the effects of hurricanes and tropical storms. CBA also restores native plant communities throughout the watershed by chemically treating and/or removing invasive exotic plant species. When erosion could result from this work, native vegetation is planted in place of the exotics.

CBA has administered several major stormwater projects in the Choctawhatchee watershed to alleviate the effects of land development on our water resources. In terms of pollution, the Source Water Collaborative (2010) notes that "Decision makers should consider clearly visible point sources such as wastewater pipes, but also more diffuse origins of water pollution, such as runoff from farms, lawns and roadways." CBA has worked with local municipalities to improve stormwater treatment with construction projects that directly address runoff (for example, re-meandering a tidal creek that had been channelized). CBA also educates policy makers and the public about stormwater and related best management practices, since a watershed

approach to source water protection appreciates the significance of land stewardship and planning decisions.

Education

Source water protection begins with education. CBA's education efforts extend from the public schools to private industry, from local public works departments to the county commission, Girl Scouts and garden clubs to environmental science internships. CBA's school curriculum covers the following topics: Grasses-In-Classes, Dune-In-Schools, Water Conservation, Water Supply, Water Quality, Composting, Exotic/Invasive Plants, and Rain Gardens. CBA also hosts community-based educational workshops, attends various community events and festivals, and supports local municipalities in making scientifically based management decisions.

Research

CBA cooperates with various universities and water resource managers to support and assist with research projects that further our understanding of aquatic resources in the Choctawhatchee watershed. CBA has contributed to nearly a dozen research projects ranging from Gulf Sturgeon monitoring and habitat utilization (Delaware State University) to a nutrient budget and flow regime on Choctawhatchee Bay (University of Florida).

One such research project, commissioned by CBA and undertaken by Dr. Jawitz from the University of Florida, studied the hydrology of the coastal dune lakes in South Walton County. The coastal dune lakes are unique ecosystems situated within about two miles of the coast of the Gulf of Mexico and composed of dark tannic water. The lake-water is brackish, coming from tributaries, groundwater seepage (in both directions, from uplands to the lakes and from the Gulf to the lakes), rainfall, exchange with the Gulf, and coastal storm surges (Hoyer 2008). They are permanent water bodies, but their water levels fluctuate dramatically as they create transitory interchanges with the Gulf. When a dune lake reaches flood level, water breaks through the dune system and the beach sand, forming a channel to the Gulf of Mexico known as an *outfall* (See Figure 1). Freshwater empties into the Gulf, and depending on tides and weather conditions, saltwater and its associated flora and fauna may enter the lake. Drainage of the lake and potential exchange with the Gulf continues until equilibrium is reached and the outfall closes with sand again.

One of the primary objectives of the hydrology study conducted on the coastal dune lakes was to determine whether or not groundwater feeding the lakes was subject to eutrophication as a result of development. Three lakes surrounded by varying degrees of development were chosen for the study: Campbell (in a state park), Draper, and Camp Creek. In 2007, three wells were installed on each lake, and a water level recorder was also placed in each lake. Groundwater samples were collected from the wells monthly and analyzed by Florida LAKEWATCH for total phosphorus (TP), total nitrogen (TN), and color.

Following a year of data collection, Dr. Jawitz (2009) determined that TP and TN could not be predicted according to surrounding land use. Furthermore, "Changes in groundwater quality were unrelated to changes in lake hydrology (i.e., spikes in nutrient concentration did not coincide with notable lake events," such as outfall openings (Jawitz 2009). Jawitz (2009) suggests that local events, such as construction projects and fertilizer applications, are the most likely controlling factors affecting groundwater TP and TN.

In May 2008, Dr. Jawitz and his team replaced the original water level recorders in each lake with units measuring water level, temperature, and conductivity. This determinate change combined with the fate of an active tropical storm season produced some very interesting results. Figure 2 demonstrates the cyclical changes in Draper Lake's water level and conductivity following an outfall opening, or a "blow-out" in July 2008. The relationship between the tidal cycle in the Gulf and the water level and conductivity in Draper Lake is remarkable. Figure 3 illustrates the opposite phenomenon – a "blow-in." The data show dramatic increases in water level and spikes in conductivity occurring in Camp Creek Lake during or just after Tropical Storm Fay and Hurricanes Gustav and Ike in 2008 as water from the Gulf breached the beach and the dunes to flow into the lake.

It quickly becomes apparent that several factors (i.e., diurnal tide cycles, stochastic annual weather cycles, decadal climate cycles, increasing mean sea-level) complicate the study of coastal dune lakes hydrology (Badha and Jawitz 2008). Continued study is essential to the understanding and protection of these ecosystems, deemed globally rare and imperiled by the Florida Natural Areas Inventory (FNAI) in 1990. CBA's research program strives to advance scientific knowledge related to the coastal dune lakes and the entire Choctawhatchee watershed. CBA actively promotes stewardship, pursues community collaboration, and encourages scientifically sound policy decisions based on the most current information. It is only by working together toward our common goals of Monitoring, Restoration, Education, and Research that we can secure a sustainable future for our water resources.

Figure 1. Draper Lake in Santa Rosa Beach, FL as its outfall reaches toward the Gulf of Mexico.

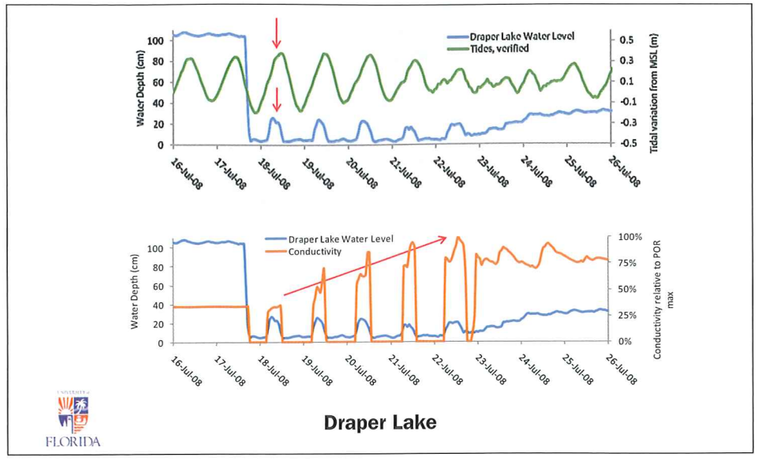

Figure 2. Anatomy of a blow-out, Jawitz 2009, demonstrating the relationship between the tidal cycle in the Gulf of Mexico and the water level and conductivity in Draper Lake.

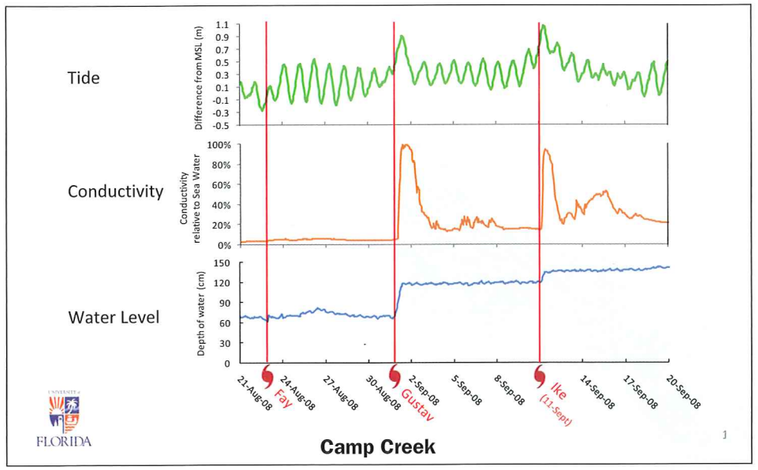

Figure 3. Blow-in at Camp Creek, Jawitz 2009, illustrating dramatic increases in water level and spikes in conductivity in Camp Creek Lake associated with tropical storm events in 2008 whereby Gulf water breached the beach and dunes to flow into the lake.

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Sarah Kalinoski is currently pursuing her doctorate in education from the University of West Florida, where she is studying servant leadership among spiritual leaders in NW Florida as it pertains to the human-Earth relationship. Sarah is a grant coordinator for the Choctawhatchee Basin Alliance (CBA) of Northwest Florida State College. She received her MA in Environmental Conservation Education from New York University in 2004.

Julie Terrell is the Director of the Choctawhatchee Basin Alliance (CBA), a program of Northwest Florida State College (NWFSC), and Director of NWFSC's newest location – the South Walton Center in Santa Rosa Beach. In her current role, she is responsible for coordinating programs within the community that promote CBA's mission to sustain and provide optimum utilization of the Choctawhatchee Basin watershed and develop programs that meet the educational needs of the South Walton Community.