Lake Restoration Program 2025 Report and 2026 Plan

Alum treatments at Prairie Rose Lake and Green Valley Lake help neutralize excess nutrients being recycled in the lake and reduce algae blooms

With the project complete at Casey Lake, (Black Hawk) the lake is ready for the next generation of users

Ongoing construction at Lake Keomah (Mahaska) will revitalize the lake and provide new recreational opportunities

Submitted To

Joint Appropriations Subcommittee on Transportation Infrastructure, and Capitals and Legislative Services Agency

Kayla Lyon, Director
December 2025

Executive Summary

Turquoise water at Prairie Rose Lake (Shelby) during the spring 2025 alum treatment to inactivate phosphorus in the lake

The State Fiscal Year (SFY) 2025 Iowa Lake Restoration Report and 2026 Plan summarizes projects utilizing legislatively appropriated funding and prioritizes a group of public lakes for restoration in Iowa.

- Created in 2006, the Lake Restoration Program (LRP) funds water quality and infrastructure improvement projects at publicly owned lakes in Iowa and is administered by the Iowa Department of Natural Resources (DNR).
- DNR, in partnership with stakeholders, maintains a five-year plan prioritizing 35 lakes and 5 shallow lake/wetlands for developing and implementing restoration efforts.
- Iowa is national leader for lake restoration - the LRP is the only statewide legislatively funded program that addresses water quality, aging infrastructure, ecological health, and public recreation.
- $176 Million allocated to the program over its history, with investments made at 72 lakes in 55 counties.
- The program averaged a 37% cost share to match LRP funds by other project partners (local, federal, other state funds) in FY25.

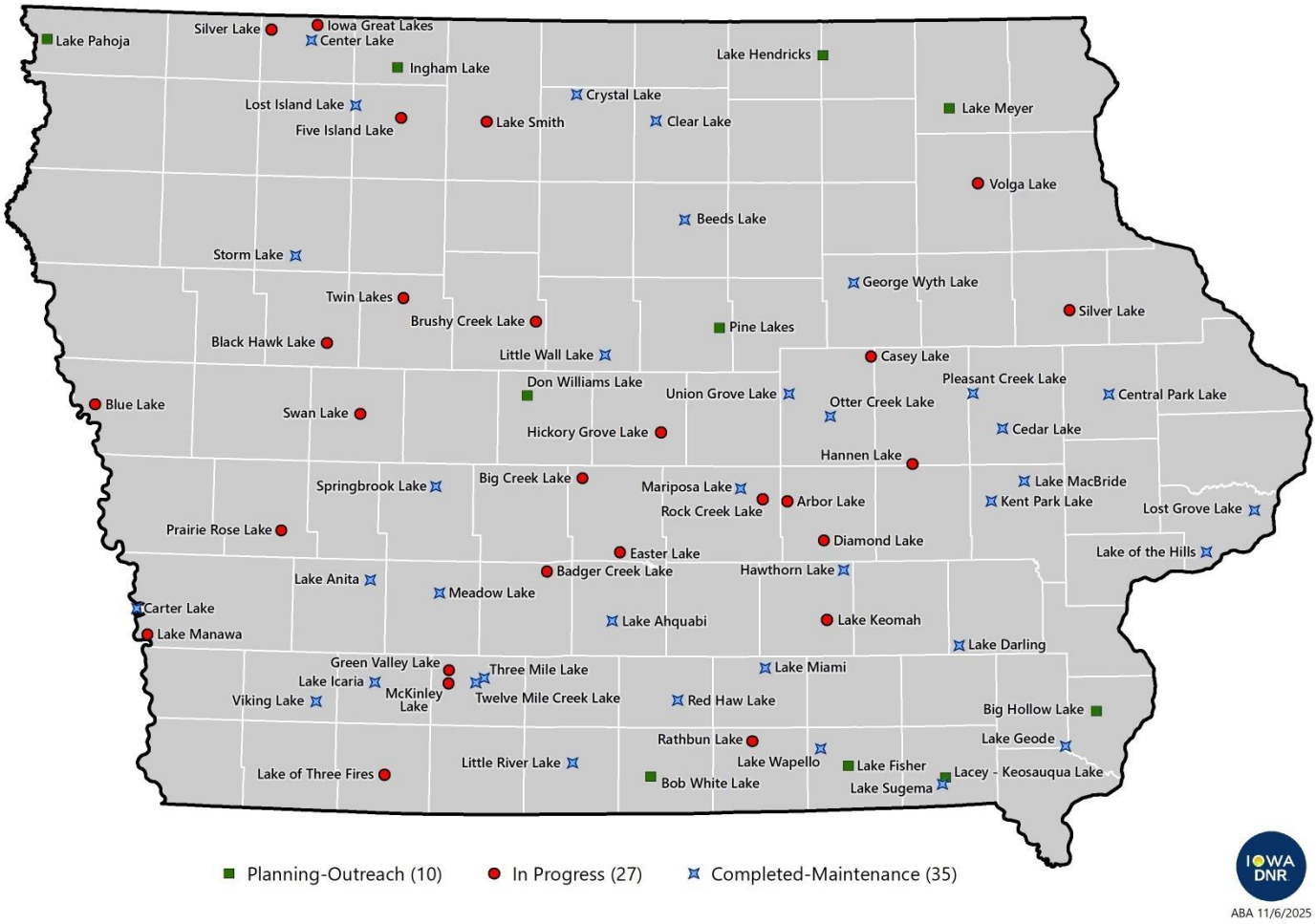
Iowans value water quality and desire safe healthy lakes that provide a full complement of aesthetic, ecological and recreational benefits. **In 2024, Iowa's lakes had over 13.7 million visits statewide** (Lake Visitation Study with Citydata), with over 12 million of those visits coming from Iowa residents. **Over 60% of Iowans visit a lake multiple times each year, accounting for $1.32 Billion in annual spending**. On average, visitors spend $36.34 per trip on single day trips and consistently rank proximity to their work or home, quality of facilities, and water quality as their top reasons when choosing a lake to visit (Krogman & Preheim, 2024). Many lakes where restoration projects have been completed see considerably higher visitation post restoration. Visitation at Easter Lake (Polk County) went from under 500,000 visitors annual before the project and over 1.4 million visitors annually post project.

Accomplishments over the past 18 years:

Restoration projects are only possible with strong local support

- 40 miles of shoreline protection to minimize erosion
- 7.7 million cubic yards of excess sediment removed (equivalent to over 513,000 dump trucks of material)
- 44 projects enhancing 14,000 acres of wetlands and shallow lakes
- Over 250 watershed best management practices (BMPs; e.g. ponds, grade stabilization structures, urban stormwater BMPs, and upland/stream restoration) implemented with program funds on public lands
- Over 700 BMPs constructed in priority watershed in concert with project partners (e.g. NRCS, SWCDs, US EPA Section 319, IDALS, Municipalities) to protect downstream lakes
- 60 infrastructure improvement projects (e.g. dam/spillway repairs, lake outlet water control structures, fish barriers) to preserve Iowa's lakes for the next generation

Status of Lake Restoration Projects, State Fiscal Year 2026



Legislative Action and Program Goals

Many of Iowa's lakes, similar to our nation's lakes, are impaired and suffer from excessive algae growth and sedimentation due to nutrient loading and soil loss. In the 81st General Assembly, with HF 2782, the legislature responded to Iowa's need for improving our lakes by creating the Lake Restoration Plan and Report, known as the Lake Restoration Program (LRP). Appendix A (456A.33B Lake restoration plan and report) provides a summary of directives to the department regarding Project Goals, Process and Criteria, and Restoration Plan Guidelines for the Lake Restoration Program. Program goals include:

- Ensure significant improvement in water clarity, safety, and quality of Iowa's lakes
- Provide for a sustainable, healthy, functioning lake ecosystem
- Ensure a cost-effective positive return on investment for the citizens of Iowa
- Ensure a local community commitment to lake and watershed protection

DNR reports its plans and recommendations for lake restoration funding annually and documents progress and results for projects funded through this legislation. This report has been prepared in accordance with the requirements in Iowa Code Chapter 456A.33b. This report also describes some of the important work completed by local, state and federal partners. ***These partnerships, along with sound scientific information, are the foundation of current and future successful lake restoration projects.***

Funding for the Lake Restoration Program (LRP) is currently appropriated on an annual basis. We anticipate that at the current annual level of $9.6 million per year, DNR can stay on schedule with implementing restoration efforts at the significant publicly-owned lakes and publicly-owned shallow lakes/wetlands currently prioritized in the five-year plan and presented within this report.

The program invests in projects with multiple benefits, such as improved water quality and increased public use, while considering feasibility of restoration. Science based prioritization has been our most effective tool for targeting high value projects. **Potential projects are viewed in terms of their potential for meeting program goals. This assessment incorporates information on the public benefit of an individual lake, feasibility of restoration, and the current status of the water quality. Additionally, project development and implementation rely on the ability of the department being able to work cooperatively with stakeholders and representatives of each community to develop a joint lake restoration action plan.**

FY25 Major Restoration Projects:

THREE MILE LAKE, UNION COUNTY

- Renovation and construction of seven nutrient/sediment control ponds
- Timber stand improvement and grade stabilization structures on publicly owned property to help protect the lake
- Excess sediment removal and creation of two in-lake silt basins
- New fish habitat and lake access amenities
- Project was completed in the fall of 2024

$3.52 Million invested by all project partners; $2.0M LRP; $500k MFT; $500k Water Infrastructure Fund Grant; $492k REAP and Habitat Grants; $30k local partner contributions

CASEY LAKE, TAMA COUNTY

- Located with Hickory Hills Park, owned and operated by Black Hawk County Conservation Board
- Renovation and construction of seven nutrient/sediment control ponds in the park to reduce runoff to the lake
- Timber stand improvement and grade stabilization structures throughout the park

- 3,400 LF of shoreline stabilization
- 140,000 CY of excess sediment removal and creation of two in-lake silt basins
- Upgrade old dam infrastructure components
- Fish habitat and lake access amenities like a stone terrace and fishing nodes
- Major construction was completed in the spring of 2025

$2.92 Million invested by all project partners; $2.19M LRP; $740k Black Hawk CCB

CEDAR LAKE, LINN COUNTY

- Located in the heart of downtown Cedar Rapids, historically the lake was a backwater of the Cedar River that was modified in the early 1900s to provide cooling water for a local utilities plant
- The lake was deeded to the City in the 2010s, and project partners began meeting to develop a long-term vison for the lake that would improve water quality and attract visitors

- Before additional restoration work could be completed at the lake; however, it needed to be protected from flood events that bring large influxes of sediment and nutrients to the lake
- An extensive levee project was started in 2022, with the first phase of construction completed in 2025. These flood protection improvements also included modifying the outfall channel to the lake, extensive multi-use trail construction, and a concrete floodwall spanning over 1,055 long and 8 feet tall

- Project partners also developed a watershed plan to address stormwater runoff watershed ($203k; $35k LRP; $168k City) with the goal of moving forward with additional restoration work in the coming years

$525,000k LRP funds invested in a new outfall channel for the lake in FY2025; Over $16.5 Million invested by the City and the USACE to construct a new levee along the lake and improve access to McCloud run, protecting the lake from future flooding and improving recreational access to Iowa's only urban trout stream.

FLOOD RESPONSE AT THE IOWA GREAT LAKES, DICKINSON COUNTY

- Severe flooding in June 2024 caused the collapse of over 90 shoreline segments around the Iowa Great Lakes (see photo right)
- These bank collapses caused extensive erosion at West Okoboji Lake, East Okoboji Lake, Big Spirit Lake, and Silver Lake
- DNR hired Bolton and Menk in the fall of 2024 to assess over 60 miles of shoreline and develop plans for restoring the slopes of these collapsed shorelines
- While many private shoreline owners worked to stabilize the shore independent, assistance was needed to stabilize the toe of the slope to stop additional shoreline erosion
- Work began in 2025 to repair the toe of the slope near the ordinary high-water mark at 33 sites around IGL, and along the public shoreline at Triboji
- Bolton and Menk is also developing a long-term stabilization plan for Pilsbury Point, located on West Okoboji Lake to stabilize collapsed banks planned for 2026

$987k invested in engineering assessments and design to stabilize the toe of slope for all damaged shorelines; Ongoing construction includes 34 sites at 4 lakes ($600k) Additional work is planned for at Pilsbury Point (Estimated cost $2.6 Million; FY26 & FY27)

Before, during, and after construction (photos left to right) to stabilize the slope at Triboji, located on West Okoboji Lake

PHOSPHORUS INACTIVATION TREATMENTS AT GREEN VALLEY LAKE, UNION COUNTY, & PRAIRIE ROSE LAKE, SHELBY COUNTY

- Treated both lakes in the spring of 2025 to reduce phosphorus concentrations in the lakes
- Phosphorus is being released from the lake sediments through a process known as internal loading
- Binding phosphorus with alum creates a thin floc on the bottom of the lake and helps reduce internal loading
- Phosphorus is the principal limiting nutrient in many Iowa lakes, thus, binding phosphorus will help reduce algae blooms
- These treatments were the first in a series of treatments to help reduce phosphorus concentrations in a suite of high priority lakes
- These treatments led to excellent water clarity for most of the 2025 recreation season, with water clarity of up to 20ft observed following the applications.

$1M invested for Spring 2025 treatments; additional treatments are planned for FY26 and beyond at priority lakes

LAKE KEOMAH, MAHASKA COUNTY

- Targeted removal of 351,000 CY of excess sediment from the arms of the lake and the large debris basin south of the eastern arm
- 11,000 LF of shoreline stabilization to stabilize eroding shorelines
- New underwater fish habitat reefs near shoreline-accessible fishing areas
- Upgrade old dam infrastructure components and repair the spillway
- A new gravel trail on the east side of the lake to connect the two boat ramps
- New south boat ramp parking lot, pit toilets, and boater access amenities
- Most of the dredging for the project was completed in FY25, with shoreline and dam/spillway improvements to be completed in FY26

$4.3 Million invested; $3.14 Million LRP; $226k REAP; $75k Parks Infrastructure; $ 830k Marine Fuel Tax

FEATURED SHALLOW LAKE PROJECT: LITTLE STORM LAKE, BUENA VISTA COUNTY

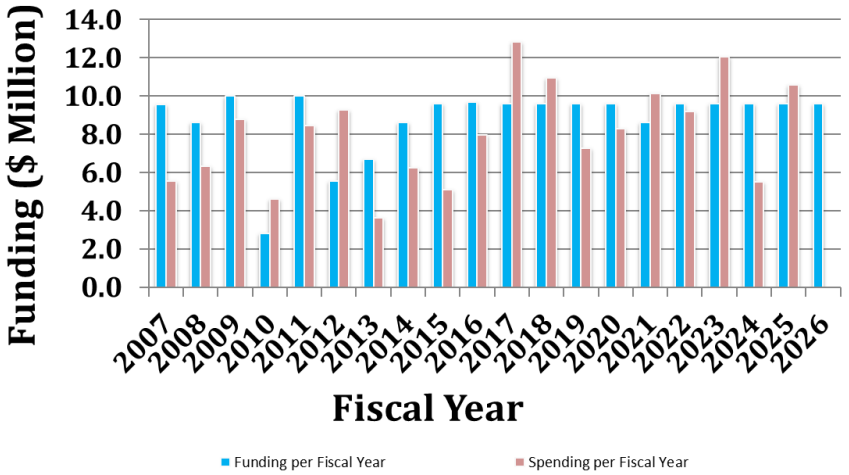
- Storm Lake is large shallow natural lake that attracts numerous visitors each year and is a vital part of the state's economy
- Little Storm Lake is located immediately northwest of the main lake and is an important wetland habitat, attracting migratory waterfowl and serving as a watershed filter - removing sediment and nutrient runoff before it enters the main lake.
- Approximately 70% of the water from the watershed flows through Little Storm Lake. Therefore, when in a healthy vegetated state, it serves as a vital component for maintaining good water quality in Storm Lake
- A dike system, water control structure, pump and fish barrier were added in 2011 to create the ability to manipulate water levels to maintain healthy vegetation. However, the infrastructure eventually failed and needed major capital reinvestment.

- The upgraded pump system, installed in 2025, includes a new precast water control structure, replacement of the existing pump system with one that is more robust and can handle large fish and vegetation, and retrofitting the fish screen on the outlet.

$336k invested to improve shallow lake habitat in Little Storm Lake and prevent nutrients and sediment from entering Storm Lake from the watershed.

Program Funding History and Spending:

FY2026 funding for the Lake Restoration Program was appropriated from the Rebuild Iowa Infrastructure Fund, which provided $9.6 million dollars for program activities. Annual funding of approximately $8.8 million from FY2007 through FY2026 has enabled DNR to make investments at 72 publicly owned lakes and over 20 shallow lakes in Iowa. Project summaries for individual projects are provided in the supplemental information of this report for many of the program's restoration efforts. The Lake Restoration Program has now matured to the point where a number of multi-step projects are concurrently at the implementation phase.



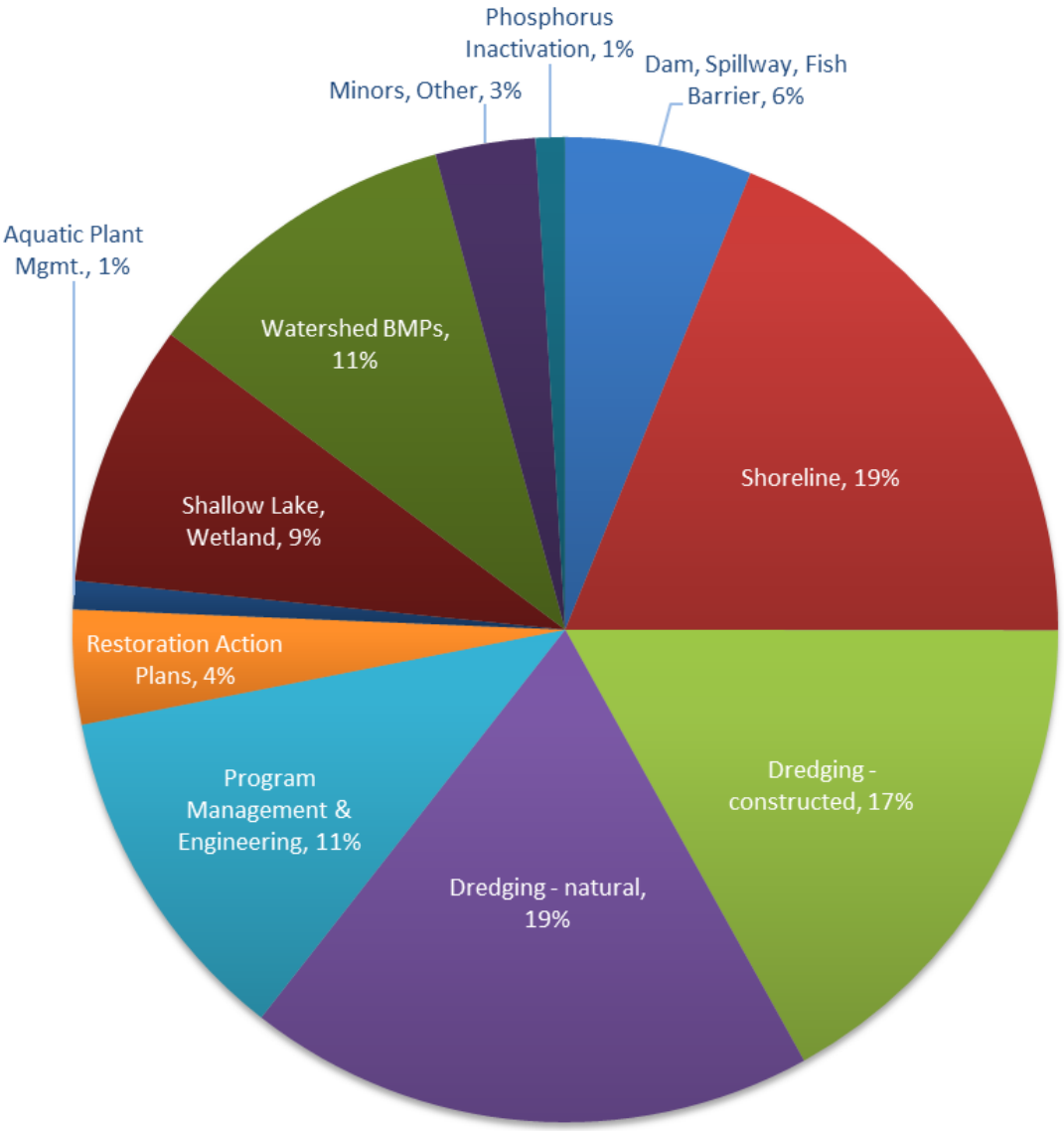
Major expenses for the program over the last ten fiscal years include shoreline stabilization and deepening to reduce erosion, targeted dredging on both constructed and natural lakes, shallow lake and wetland enhancement, and costs associated with program management and engineering design and construction oversight (see pie chart).

Maintaining flexibility in when the Lake Restoration Program can allocate funding and consistent annual funding is critical for implementing multi-year projects and developing new projects. Most projects take between five to ten years to complete and are multi-phased. Current and future appropriations will be critical to complete current projects and initiate new projects during FY27-FY31. The LRP currently has $5.1 million under contract, almost exclusively to Iowa firms, to assist with implementing projects.

The majority of projects involve construction phases of watershed and/or in-lake implementation. A typical construction project includes the following phases: project scoping and assessment, engineering design, work bid letting, contract development, construction, and inspection. All work adheres to the standards and requirements of doing business as a public agency. Many projects require approvals and permits such as archeological investigations, environmental reviews for threatened or endangered species, and permits from federal, state, and local agencies.

The program updates priorities on an annual basis to reflect the timeline and potential budget needs for active lake restoration projects. This includes a five-year capital plan for on-going projects and a long-term commitment to projects in the assessment/planning stage.

FY14 - FY25 Expenditures



State Fiscal Year 2025 Spending and Five-Year Capital Plan

Table 1. Program spending for State Fiscal Year 2025 (July 1, 2024 - June 30, 2025).

Project Name	Project Description	County	LRP Spent	Fed	Other	Total Spent
Administration	Program Management, engineering		$697,555			$697,555
	Aquatic vegetation control; herbicide for Clear Lake Eurasian Watermilfoil treatment		$464,027			$464,027
Arbor Lake	Engineering design	Poweshiek	$6,032			$6,032
Black Hawk Lake	Carp management	Sac	$53,549		$2,000	$55,549
Blue Lake	Water level study and management	Monona	$32,646			$32,646
Casey Lake	Engineering design, lake restoration, watershed	Black Hawk	$1,040,762		$221,669	$1,262,431
Cedar Lake	Watershed improvement	Linn	$525,000			$525,000
Diamond Lake	Engineering design, watershed	Poweshiek	$292,925		$75,107	$368,032
Feasibility Studies	Restoration action plans, monitoring, lake visitation survey, alum dosing plans, archaeological surveys		$424,391		$2,527	$426,918
Green Valley Lake	Phosphorus inactivation (alum)	Union	$649,620			$649,620
IA Great Lakes	Watershed improvement, monitoring, engineering design	Dickinson	$999,295			$999,295
Lake Keomah	Engineering design, spillway/outlet repair, lake restoration	Mahaska	$1,498,947			$1,498,947
Lake Manawa	Engineering design, Mosquito Creek diversion structure repair	Pottawattamie	$45,303			$45,303
McKinley Lake	Engineering design, lake restoration, dam/spillway repair	Union	$503,191			$503,191
Pleasant Creek Lake	Watershed BMPs	Linn	$32,260			$32,260
Prairie Rose Lake	Phosphorus inactivation (alum)	Shelby	$349,795			$349,795
Rock Creek Lake	Shoreline	Jasper	$834,765			$834,765
Silver Lake	Engineering design	Delaware	$11,400			$11,400
Silver Lake	Shoreline	Dickinson	$356,017	$159,469		$515,486
Three Mile Lake	Engineering design, watershed BMPs, shoreline	Union	$1,246,406	$479,706		$1,726,112
Minor Projects	Lake of the Hills valve repair, Green Valley boat access for alum application		$3,448			$3,448
	Shallow Lakes					
Shallow Lakes	Engineering, monitoring		$98,035			$98,035
	Wetland / Marsh Restoration					
Garlock Slough	Habitat enhancement, restoration	Dickinson	$18,572			$18,572
Goose Lake	Habitat enhancement, restoration	Clinton	$34,176			$34,176
Little Storm Lake	Pump for water level control	Buena Vista	$242,162			$242,162
Pleasant and Lily Lakes	Outlet, water control structure	Dickinson	$82,106			$82,106
West Swan Lake/Jack Creek	Fishery renovation, survey	Emmett	$18,217			$18,217
	FY25 Total Spent (7/1/2024-6/30/2025)		**$10,560,600**	**$639,175**	**$301,303**	**$11,501,078**

DNR Lake Restoration Program (LRP) funding status at the start of fiscal year 2026

$15,453,918	cash balance close of FY25
$5,130,101	less contracted obligations
$10,323,817	carryforward to be budgeted in FY26
$9,600,000	FY26 new appropriation
$19,923,817	total amount to budget for FY26

Table 2. Lake Restoration Funds under contract as of July 1, 2025 (start of fiscal year 2026) - $5,130,101

Project Name	Project Description	County	LRP Contracted	Fed	Other	Under Contract	Contractor
Casey Lake	Eng. services, watershed and in-lake	Black Hawk	$28,875		$9,498	$38,372	Black Hawk County
Diamond Lake	In-lake Engineering Assessment, watershed BMPs & construction oversight	Poweshiek	$184,578	$0	$50,831	$210,333	Poweshiek County Conservation Board, Delong Construction Inc
East Twin Lake	Water control structure replacement	Hancock	$198,375		$198,375	$396,750	A1 EXCAVATING & DRAINAGE INC
Green Valley Lake	Alum treatments	Union	$490,011			$490,011	Solitude Lake Management LLC
Iowa Great Lakes	Engineering design for shoreline	Dickinson	$111,483			$111,483	Bolton & Menk Inc
Lake Keomah	Dredging, shoreline, fish habitat	Mahaska	$1,347,913		$1,002,113	$2,350,026	JB Holland Const Inc
Lake Manawa	Mosquito Creek diversion pipe improvements	Pottawattamie	$101,994		$71,102	$173,096	Jones Contractors & Associates LLC
McKinley Lake	Dredging, shoreline, fish habitat, dam/spillway upgrades, engineering oversight	Union	$1,340,828		$1,340,828	$2,681,656	Creston City of
Pleasant Creek Lake	Watershed BMPs	Linn	$287,670			$287,670	Boomerang Corp
Prairie Rose Lake	Alum treatments	Shelby	$299,949			$299,949	Solitude Lake Management LLC
Restrn. Action Plans	Alum dosing study, lake visitation survey, statewide lake monitoring projects		$426,260			$426,260	University of Iowa, Citydata Inc., Barr Engineering Co.
Shallow Lakes	Engineering design, oversight		$92,915		$92,915	$185,831	Ducks Unlimited Inc
Silver Lake	Alum dosing study and Engineering assessment	Delaware	$97,200			$97,200	Shive-Hattery Inc
Storm Lake	Little Storm Lake pump and structure	Buena Vista	$94,151			$94,151	Midwest Concrete & Excavating LLC
Three Mile Lake	Engineering oversight, mitigation reports, timber stand improvement	Union	$27,901	$0	$19,800	$47,701	Houston Engineering Inc, Jason Brewer
	Total Under Contract		**$5,130,101**	**$0**	**$0**	**$0**	

Table 3. Lake Restoration Program Five Year Capital Plan

Project Name	County	LRP Obligated	LRP FY26	LRP FY27	LRP FY28	LRP FY29	LRP FY30	Description
Arbor Lake	Poweshiek	$5,100,300	$1,792,800	$3,307,500				Engineering design, watershed and in-lake restoration
Badger Creek Lake	Madison	$1,170,000	$10,000	$1,160,000				Outlet Evaluation and Shoreline armoring
Big Creek Lake	Polk	$359,500	$29,500	$330,000				Beach improvements
Brushy Creek		$150,000	$150,000					Beach improvements
Center Lake		$500,000		$500,000				Shoreline and watershed BMPs

Project Name	County	LRP Obligated	LRP FY26	LRP FY27	LRP FY28	LRP FY29	LRP FY30	Description
Diamond Lake	Poweshiek	$4,326,250	$4,326,250					Engineering design, in-lake restoration
Easter Lake	Polk	$821,500	$821,500					shoreline restoration, fish barrier extension
Hannen Lake	Benton	$200,000	$200,000					Diagnostic and feasibility study
Hickory Grove	Story	$900,128	$75,128	$825,000				Beach improvements
Ingham Lake	Emmet	$300,000		$300,000				Shoreline; outlet/fish barrier
Lake Ahquabi	Warren	$15,000		$15,000				Hooper vegetation management
Lake Keomah	Mahaska	$318,000	$318,000					Spillway repairs, valve replacement
Springbrook Lake	Guthrie	$148,500		$148,500				Spillway repairs
Swan Lake	Carroll	$75,000	$75,000					Water level management at outlet
Volga Lake	Fayette	$50,000	$50,000					Sediment/water control structures
Black Hawk Lake	Sac	$225,000	$75,000	$75,000	$75,000			Carp management
Blue Lake	Monona	$289,750	$265,000			$24,750		Well and pump assessment, fish renovation, containment site rehab, water control structure replacement
Beeds Lake	Franklin	$148,500			$148,500			Dam wingwall repair
Clear Lake	Cerro Gordo	$356,950	$183,700		$173,250			Outlet replacement, whole lake vegetation treatment
Five Island Lake	Palo Alto	$1,015,000	$15,000		$500,000	$500,000		Shoreline; outlet/fish barrier
Green Valley Lake	Union	$1,452,350	$151,100		$866,250		$435,000	Phosphorus inactivation treatments
IA Great Lakes	Dickinson	$4,798,000	$4,198,000	$150,000	$150,000	$150,000	$150,000	Triboji and shoreline toe stabilization, Pilsbury Point, WQC - water quality improvement projects
Lake Anita	Cass	$59,400			$59,400			Shoreline stabilization
Lake Darling	Washington	$52,668				$52,668		Jetty maintenance and shoreline repair
Lake Manawa	Pottawattamie	$5,700,000				$3,350,000	$2,350,000	Dredging, alum treatment
Lake of Three Fires	Taylor	$875,520	$525,520		$350,000			dam/spillway repair, alum treatments
Lake Pahoja	Lyon	$2,137,500		$167,500	$370,000	$800,000	$800,000	engineering design, dredging, shoreline, habitat
Lake Rathbun	Appanoose	$400,000		$100,000	$100,000	$100,000	$100,000	Watershed practices
Lost Grove Lake	Scott	$14,373					$14,373	Jetty repair
Meadow Lake	Adair	$90,228		$79,200			$11,028	Shoreline stabilization
Lake Icaria		$11,028					$11,028	Timber stand improvement, shoreline stabilization
Three Mile Lake	Union	$11,028					$11,028	Timber stand improvement

Project Name	County	LRP Obligated	LRP FY26	LRP FY27	LRP FY28	LRP FY29	LRP FY30	Description
Prairie Rose Lake	Shelby	$985,142	$55,142		$620,000		$310,000	Phosphorus inactivation treatments
Rock Creek	Jasper	$800,000					$800,000	In-lake and upper end wetland
Silver Lake	Delaware	$3,727,500	$352,500		$75,000	$1,650,000	$1,650,000	Engineering services, alum treatment, watershed and in-lake restoration
Silver Lake	Dickinson	$1,050,000			$1,050,000			Eng. design, watershed, shoreline
Silver Lake	Worth	$148,500				$148,500		Water control structure replacement
Smith Lake	Kossuth	$5,951,850	$586,250	$100,000	$2,632,800	$1,316,400	$1,316,400	Engineering assessment, design, and permitting, lake and watershed restoration
Twin Lakes	Calhoun	$224,800	$50,000	$50,000	$124,800			Carp management and fish barrier, shoreline stabilization
Program Mgmt., Eng.		$4,570,000	$914,000	$914,000	$914,000	$914,000	$914,000	Program management, engineering
Aquatic Plant Mgmt.		$640,000	$120,000	$120,000	$120,000	$140,000	$140,000	Aquatic Plant Management
Project Development, Implementation and Minors		$3,463,380	$1,378,145	$633,300	$1,021,000	$93,792	$337,143	Beaver, Big Creek, Big Hollow, Bob White, Brushy Creek, Cedar (Linn), Don Williams, Fisher, Five Island, Hannen, Hendricks, Ingham, Lacey Keosauqua, Meyer, Pahoja, Pine-Upper/Lower, Rock Creek, Twin-North/South and Vegetation Mgmt.
Restoration Action Plans		$2,227,657	$1,627,657	$150,000	$150,000	$150,000	$150,000	Ambient Lake monitoring 2026-2028; Oxythermal study of Iowa Reservoirs, Carp management

Shallow Lakes / Wetland / Marsh Restoration

Project Name	County	LRP Obligated	LRP FY26	LRP FY27	LRP FY28	LRP FY29	LRP FY30	Description
Shallow Lake Projects		$635,000	$235,000	$100,000	$100,000	$100,000	$100,000	Project development, engineering design of restoration components, monitoring
Myre Slough	Winnebago	$97,500	$97,500					New water control structure
East Twin	Hancock	$198,375	$198,375					New water control structure
Twelve Mile	Emmet	$113,000	$113,000					New water control structure and fish barrier
Bays Branch	Guthrie	$275,000	$275,000					Water control structures
Hendrickson Marsh	Story	$115,000	$115,000					New water control structure
Iowa Lake	Emmet	$25,000	$25,000					Marsh fish barrier
Elm Lake	Wright	$85,000	$85,000					Velocity tube fish barrier
East Slough	Emmet	$260,000	$260,000					

Project Name	County	LRP Obligated	LRP FY26	LRP FY27	LRP FY28	LRP FY29	LRP FY30	Description
Lake Rathbun	Wayne	$24,750	$24,750					Woodpecker Marsh water control structure upgrade
Reeds Farm	Dickinson	$150,000	$150,000					Wetland restoration
Mitchell Marsh	Union	$24,750				$24,750		Wisconsin tube replacement
Elk Creek	Worth	$375,000		$375,000				
Perkins Marsh	Palo Alto	$85,140				$85,140		Wetland restoration

- DNR expects to complete on-going restoration efforts at lakes highlighted in orange from FY26 through FY27.
- Lakes highlighted in green are active projects undergoing implementation of watershed or in-lake restoration efforts. Completion between FY27-FY30.
- Program activities that maintain a budget line item, highlighted in blue, include items such as continued statewide lake economic and water quality assessments used to guide our investments in lake improvement, program oversight and engineering services, planning and initial watershed efforts at prioritized lakes.

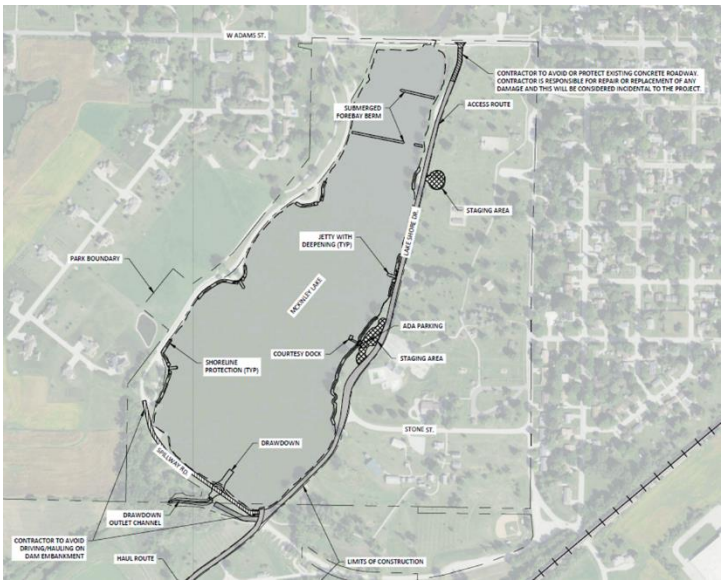
Major Projects Planned for State Fiscal Years 2026 and 2027:

LAKE KEOMAH, MAHASKA COUNTY

- Targeted removal of 351,000 CY of excess sediment from the arms of the lake and the large debris basin south of the eastern arm
- 11,000 LF of shoreline stabilization to stabilize eroding shorelines
- New underwater fish habitat reefs near shoreline-accessible fishing areas
- Upgrade old dam infrastructure components and repair the spillway
- A new gravel trail on the east side of the lake to connect the two boat ramps.
- New south boat ramp parking lot, pit toilets, and boater access amenities.
- Most of the dredging for the project was completed in FY25, with shoreline and dam/spillway improvements to be completed in FY26.

Anticipated Cost: $4.3 Million; $3.14 Million LRP; $226k REAP; $75 Parks Infrastructure; $ 830k Marine Fuel Tax

MCKINLEY LAKE, UNION COUNTY



- Targeted removal of 250,000 CY of excess sediment to reclaim large portions of this lake that have been lost to sedimentation over the past 100 years
- 1400 LF of shoreline stabilization to reduce erosion
- City worked to install a wetland upstream of the lake to protect the lake from additional sedimentation
- Upgrades to the dam/outlet structure
- New park user amenities including a new ADA parking area, boat ramp, kayak launch, and courtesy dock.
- Approximately half of the project (dam infrastructure work and early dredging) was completed in FY25 and remaining work will be completed in FY26.

Anticipated Cost: $3.68 Million; (50% LRP; 50% City of Creston)

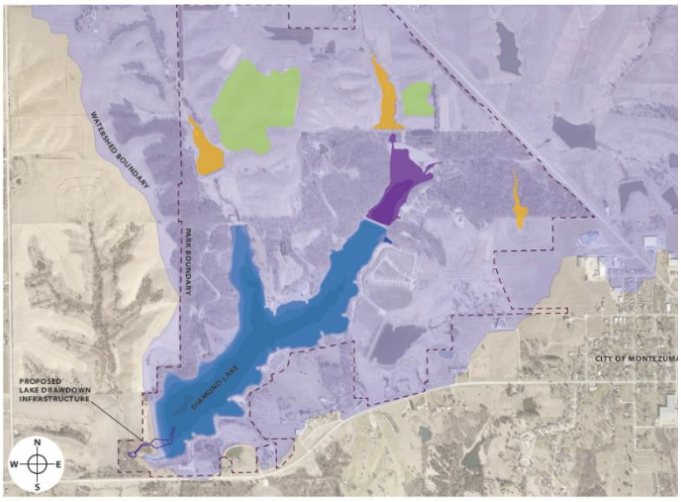
PHOSPHORUS INACTIVATION TREATMENTS AT GREEN VALLEY LAKE, UNION COUNTY, PRAIRIE ROSE LAKE, SHELBY COUNTY, LAKE OF THREE FIRES, TAYLOR COUNTY, AND SILVER LAKE, DELAWARE COUNTY

- Treat priority lakes with alum (aluminum sulfate and sodium aluminate) to inactivate soluble phosphorus in the water column
- Phosphorus is being released from the lake sediments through a process known as internal loading
- Binding phosphorus with alum creates a thin floc on the bottom of the lake and helps reduce internal loading
- Phosphorus is the principal limiting nutrient in many Iowa lakes, thus, binding phosphorus will help reduce algae blooms
- These treatments will likely be the first in a series of treatments to help reduce phosphorus concentrations in a suite of high priority lakes

Anticipated Cost: $1.7M in FY26 and FY27

DIAMOND LAKE, POWESHIEK COUNTY

- Remove excess sediment in the campground marsh (purple section in photo left) and in the upper reaches of the lake to restore depth (blue)

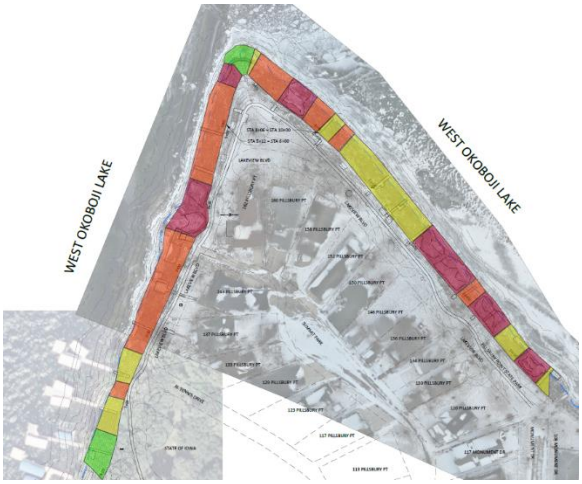


- Renovate the fishery to remove rough fish that negatively impact water quality
- Draw the lake down and add a low water drain to the lake's outlet structure
- Revitalize 2000 ft of existing shoreline and armor an additional 2000 ft to prevent erosion
- Install fish habitat structures throughout the lake to support a healthy aquatic ecosystem
- Improve the current boat ramp to improve the user experience at the park
- Watershed projects (orange on map) were completed in 2025 and include the renovation of two existing ponds, construction of one new pond, and timber stand and streambank improvement projects

Anticipated costs: $4M funding partnership between LRP and local partners

PILSBURY POINT SHORELINE RESTORATION, WEST OKOBOJI LAKE, DICKINSON COUNTY

- Following the extensive damage to the shoreline from the 2024 floods, this project works to address the slope stability around Pilsbury Point, a popular state park and public access point on West Okoboji Lake
- This project will address both areas that were severely damaged during the floods (red sections on map right), as well as improve the slope stability at other sections where future erosion is likely (orange and yellow sections)
- The project will also protect historic CCC structures near the point in place to prevent future impacts to these sites
- Construction is slated for fall of 2026 to the spring of 2027



Anticipated costs: $2.6M ($2.26M LRP; $340k MFT)

Lake Restoration Program
2025 Report and 2026 Plan

Supplemental Information

Submitted To
Joint Appropriations Subcommittee on Transportation, Infrastructure, and Capitals
and
Legislative Services Agency

Submitted By
Iowa Department of Natural Resources
Kayla Lyon, Director

December 31, 2025

Table of Contents

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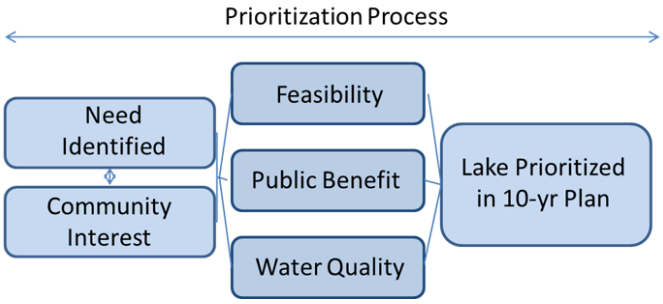
Prioritization Process and Project Assessment/Planning

How a Lake Becomes a Candidate for Restoration - Prioritization Begins with a Need

Lakes are identified in one of two ways to become potential candidate lakes within the Lake Restoration Program.

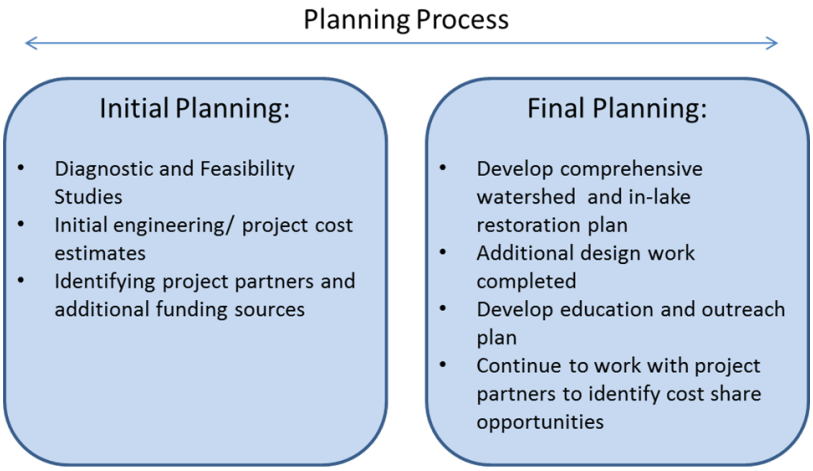
1. A need is identified by the local resource managers and through our science-based approach.
2. Communities may petition the director of the department to be included in the LRP.



The department meets with representatives of communities where prioritized lakes are located to provide an initial lake restoration assessment and to explain the process and criteria for being prioritized for lake restoration funding. As mentioned, DNR may initiate this process or in some cases the local community reaches out to the DNR about their concerns and potential involvement by the Lakes Program. The DNR ranking process, along with community's interest and commitment to lake restoration, provides the basis for the maintained list of not more than thirty-five significant publicly owned lakes and not more than five publicly owned shallow lake/wetlands prioritized for program funding (five-year plan).

Planning for Success

This phase of the process focuses on determining what types of work (both in the watershed and in the lake) will be most effective for improving water quality. The LRP partners with stakeholders and the community to complete (or use already completed) watershed improvement plans to target watershed best management practices (BMPs). If needed, additional assessment work is completed through a Diagnostic and Feasibility Study. The result of all of initial planning is tentative watershed BMPs design and placement, as well as conceptual cost estimates for restoration activities. Final planning includes more comprehensive engineering design and contracting for construction of watershed work. An important component of this part of the plan is continuous outreach with landowners and the community to engage those around the lake with the project.



Lakes in Initial Planning/Assessment Phase

The lakes highlighted below are good candidates for the program and are under development for a future project. For each of these projects, the Lake Restoration Program (LRP) has met with community members, stakeholder groups, or the local fisheries biologist to learn about the water quality challenges and potential restoration needs. In some cases, the LRP has started to engage with some small projects in the watershed to help move the project forward.

Lakes in Final Planning Phase

After some high-level conceptual planning has been completed, an individual project moves towards a comprehensive planning effort - where a restoration plan for both the lake and watershed is developed and more concrete design and engineering work is completed. This allows project partners to develop a budget for the overall project and communicate a projected timeline for restoration project elements to all stakeholders. Many lakes in this planning phase also are initiating or actively completing a watershed project to reduce sediment and nutrient inputs to the downstream lake through partnerships with other programs (US EPA Section 319 funding, Iowa Department of Agriculture and Land Stewardship, County Conservation Boards, etc.).

A summary for each of the lakes in the project development and assessment phase is provided below:

BIG HOLLOW LAKE (DES MOINES COUNTY)

Big Hollow Lake is a 154-acre lake located in southeastern Iowa and managed by the Des Moines County Conservation Board. The lake has a 29:1 watershed to lake area ratio, predominately in row-crop agriculture, and is a popular recreation destination for Iowans. Water quality data at the lake have been collected since 2011, and the lake is currently listed as impaired for algae due to high phosphorus concentrations. The Des Moines County Conservation Board and DNR hired FYRA Engineering (now HEI) to develop a 9-element watershed plan, in hopes of developing a watershed project to address nutrient and sediment loads to the lake. The plan was completed in 2022, with the goal of working with local landowners and producers to implement watershed best management practices on their ground. LRP also helped fund some sediment coring work (completed as a part of the watershed plan) to assess internal loading in the lake and determine if phosphorus inactivation may be a part of the lake's overall restoration strategy.

BOB WHITE LAKE (WAYNE COUNTY)

Bob White Lake is a 96-acre lake located within Bob White State Park, operated by the Wayne County Conservation Board. The lake has long been a popular fishing destination and served the City of Allerton as a drinking water source for many years. Water quality has declined with increased sedimentation in parts of the lake, as well as poor water quality from sediment deposition from the watershed and algae blooms.

DNR met with the conservation board in early 2023 to discuss options for improving Bob White Lake, as well as other lakes within Wayne County. One need identified within the meeting was a watershed assessment for the lake to better understand how nutrient and sediment are being transported from the watershed to the lake. Since Bob White Lake is located within the Rathbun Lake watershed, local project coordinators for Rathbun Lake volunteered to complete a watershed assessment for Bob White and help direct attention for watershed best management practices. Additionally, DNR began monitoring water quality at three lakes in Wayne County to better understand the current challenges and formulate a plan for improving water quality at Bob White Lake and others located within the county.

DON WILLIAMS LAKE (BOONE COUNTY)

Located in Boone County, Don Williams Lake is a 151-acre lake that drains a very large watershed located just outside of Ogden. A popular destination for boating, camping, and golf, the park is owned and maintained by the Boone County Conservation Board. The lake was drawn down in 2011 to renovate the fishery. Gizzard shad, Common carp, and water quality issues plague the lake. Sedimentation in the upper end of the lake limit recreation and habitat for aquatic life. Severe shoreline erosion around the lake also contributes to poor water clarity. The lake is currently listed as impaired for siltation and organic enrichment. DNR met with CCB staff in the summer of 2025 to discuss options and determine if the lake was a good candidate for the program. CCB staff indicated that a drawdown is anticipated in the next 2-5 years for needed dam inspections and maintenance. Local Fisheries staff has expressed interest in a lake restoration project if the CCB is required to drain the lake in the near future. Discussions between DNR and CCB are ongoing.

LAKE FISHER (DAVIS COUNTY)

Lake Fisher is an 82-acre lake located just west of Bloomfield in Davis County. Up until recently, the lake served as a water supply for the City of Bloomfield, but the area recently transitioned to a city park. DNR met with the City in the fall of 2022 to learn more about the lake and determine what additional information is needed to determine if the lake is a good candidate for the program. As a result, the lake was added to the ambient lake monitoring program to begin collecting water quality data. The lakes bathymetry was also mapped in 2023 so project partners can begin crafting a long-term plan to address shoreline erosion and improve the lake.

LACEY KEOSAUQUA PARK LAKE (VAN BUREN COUNTY)

Lake Restoration, Fisheries, and IDALS staff met in the summer of 2014 to discuss watershed improvement in the Lacey Keosauqua watershed. Previous efforts have identified watershed issues, primarily gullies and their associated head cuts, as the primary threats to Lacey Keosauqua water quality. A watershed assessment was completed in 2015 and potential watershed treatments are being considered for implementation. Project partners plan to begin meeting again in 2026 to start laying out a restoration project for the lake.

LAKE HENDRICKS (HOWARD COUNTY)

DNR and IDALS have worked periodically with the Howard County Conservation Board over the last 15 years to improve water quality at the park through the installation of a variety of best management practices. Lake Hendricks is a 49-acre lake with a lake to watershed ratio of 28:1. The lake sits in a largely agricultural watershed, and has suffered from poor water quality for a number of years. To address water quality concerns, the CCB installed several sediment ponds in the park, completed some grade stabilization and timber stand improvement work, and installed two nitrogen bioreactors to reduce nutrient and sediment inputs to the lake. However, the lake continues to have water quality challenges and currently listed as impaired due to high levels of algae and high pH, usually caused by excessive algae. The LRP has been working with the local fisheries biologist and CCB staff to formulate a plan to complete additional watershed and in-lake work to improve the lake. This lake is in the initial planning/evaluation state. Project partners met again in 2019 to discuss what additional information is needed to create a restoration plan for the lake.

LAKE MEYER (WINNESHIEK COUNTY)

Lake Meyer, located in northeast Iowa, is a 33-acre lake with a watershed to lake area ratio of 48:1. The bulk of the watershed (77%) of the drainage area is in working agricultural production. Lake Meyer, and the surrounding county park, provides a diversity of habitats for a variety of plants and wildlife, and the lake serves as a locally important recreation destination. The area is recreational hub that draws and estimated 18,000 visitors annually, resulting in an estimated $1.8 M in total spending. Popular activities at the lake include fishing, relaxing, wildlife viewing, trail use, and paddling. The park is also home to the Winneshiek County Conservation Board's headquarters, modern camping facilities, and a nature center.

The WCCB has worked with local partners for a number of years to preserve water quality at Lake Meyer. To date, numerous watershed practices have been installed to improve water quality in the lake and prevent future sediment and nutrient pollution. Practices installed include 66 acres of filter strips, 5 manure storage systems, over 35,000 feet of terraces, 8 grade stabilization structures, 5 sediment and water control structures, over 4,000 feet of grassed waterways, 3 bio-swales, and 4 wetlands. Additionally, about 11,000 tons of sediment (equivalent to about 700 dump trucks) have been removed from the lake. The WCCB petitioned the DNR to be included in the Lake Restoration Program in 2016 to complete restoration work in the lake and watershed.

In 2018, a culvert under the road to the nature center collapsed and impacted a pond located above the park. DNR and the WCCB worked together to re-design the pond to better protect the lake. Plans were completed in the fall of 2018 to build a pond in the park that will treat 46.4 acres of the watershed. As a part of the project, the existing basin was excavated to regain sediment storage capacity and the height of the dam was raised to allow for a longer design for the pond. The sediment basin was constructed at the park boundaries and revitalized the existing road infrastructure within the park as a part of the dam construction. The proposed basin was designed by WHKS engineering and project oversight was administered by the WCCB. DNR reimbursed the WCCB for 75% of the total cost of the project ($103k), which was completed in 2019.

In the fall of 2020, the CCB completed some additional repair work at the dam to minimize seepage from the lake. Construction for the project included siphoning water from the lake and filling holes in limestone rock wall along the dam with blue clay, bentonite, and flowable mortar. The area was then shaped and covered with cloth and riprap to prevent additional seepage. Seepage around the dam was observed again in 2025, and the LRP is working with the Winneshiek CCB to address seepage and necessary dam repairs. Project partners continue to work together to develop the next phase of watershed and in-lake improvements at the park.

LAKE PAHOJA (LYON COUNTY)

Lake Pahoja is a 65-acre lake with 5,280-acre watershed, and is managed by the Lyon County Conservation Board (LCCB). Over the past several years, the LCCB has invested heavily in improving water quality in the lake, including a fishery renovation, which has led to an increase in water clarity. Prior to these efforts, several ponds were constructed in the watershed in the 1990s to reduce sediment delivery to the lake, and have likely reached their useful design life. Since the lake was constructed, sedimentation of the upper arm has increased, reducing depth and recreation opportunities in the upper end of the lake. The CCB approached the LRP in 2019 with the long-term goal of acquiring land upstream of the upper end of the lake to install a large pond or in-lake silt basin to reduce sedimentation and dredge the upper end

of the lake to restore functionality. Additionally, efforts to restore ponds and build new structures in the watershed is a goal for long-term success of proposed restoration activities. The LRP and LCCB met in 2019 to begin discussion a long-term plan for the lake. LRP met with the LCCB in the summer of 2025 to discuss park needs with the goal of developing a plan for the lake and completing a diagnostic study in 2026.

PINE LAKES - UPPER AND LOWER (HARDIN COUNTY)

Upper and Lower Pine Lakes are constructed lakes located in Hardin County and serve as a popular camping and recreation destination for the area. The lakes are currently impaired for poor water quality related to low water clarity from algal and non-algal turbidity and bacteria.

- Hardin County approached DNR in 2014 to discuss the potential for construction of a large pond upstream up Upper Pine Lake. A bridge near the proposed construction site needed to be replaced the opportunity arose to raise the road and put in a large pond to prevent nutrients and sediment from entering Pine Lakes instead of re-building the bridge.
- DNR Engineering developed preliminary design plans and cost estimates and presented them to the County Conservation Board, the County Engineer, several other stakeholders, and the land owners in 2016. DNR is waiting on a consensus from the land owners before moving forward with a potential project.
- LRP met with Parks staff in the summer of 2018 to discussed sedimentation concerns in both lakes, as well as discuss ongoing geese and vegetation issues at the lake. The LRP will continue to work with local project partners to develop a long-term plan for managing the lake.
- The lake was also re-mapped in 2018, showing substantial sedimentation in the last 10 years within the lakes. One of the long-term goals of this project is to protect the watershed to reduce erosion and subsequently, sedimentation within the lakes.

Shallow Lakes and Wetland Initiatives

Iowa has experienced a significant decline in the total number and quality of wetland complexes and shallow lakes. Contributing factors have been major changes to the hydrology of these systems, high/stable water levels, introduction of carp and sediment/nutrient loading. Iowa has made great strides over the past years in protecting valuable lake resources through wetland enhancement and improving shallow lake habitat.

Shallow lake management has always been a challenge in our highly modified environment. Shallow lakes are scattered throughout northwest Iowa and, in most of these lakes, water quality at these lakes is severely degraded. Significant watershed changes, altered hydrology, and the introduction of common carp in the late 1800s have forever made management of these water bodies a challenge. Most of these lakes are turbid, algae-dominated systems with little to no vegetation, and poor sport fisheries comprised mostly of common carp and black bullheads if not actively managed today. Successful restorations of deeper lakes have historically focused on reducing nutrient inputs by repairing the watershed and/or removing phosphorus-laden sediments from the lake. Successful shallow lake management strategies require intensive in-lake management strategies that can immediately flip the basin from the turbid-water state to the clear-water state, and long-term watershed protection efforts and effective water level management and fish barrier that mimics historic conditions scan help maintain clear water over time.

Intensive shallow lake monitoring for a variety of water quality parameters began in 2006 to better understand these unique ecosystems and evaluate how individual systems responded to restoration efforts. A number of surprising results were found when analyzing both the differences between unrestored and restored shallow lakes and the differences in individual lakes both pre and post-restoration. Overall, restoration efforts have resulted in lakes with better water clarity, changes to the nutrient dynamics in the lake, and changes to the plant and invertebrate communities. These changes are indicative of a clear-water, plant-dominated stable state (Balmer, 2016).

Many of the designs for shallow lake management incorporate water control structures and pumps that allow for the temporary draining of the basins and fish barriers that preclude the passage of rough fish (e.g. carp) back into the lake. However, each site is different and requires solutions specific to a given area. Restoration or enhancement activities rely on engineering survey, design and feasibility analysis. Engineering needs for these projects include specifications of project features (e.g. water-control structures, pumping/tiling systems, fish barriers, etc.), associated cost estimates and design documents that can be included in a construction bid package.

The Lost Island Lake project alone resulted in the enhancement over 1,000 acres of wetland habitat within the Barringer Slough/Blue-wing Marsh complex. This 2,200-acre wetland and lake complex is one of Iowa's top recreation and tourism destinations and wetland protection was critical to the project's success. Shallow lake restoration will provide long-term ecological, recreational and economic benefits for Iowans. Ducks Unlimited engineering staff surveyed and designed a series of water control structures and fish barriers that will allow managers to effectively manage for productive habitat. Unique fish barrier solutions, from electric to physical and specific to five different sites were needed for this project. To date, average water clarity has improved over 2 feet since the wetland restoration and commercial fishing efforts began.

Inlet dredging at the wetland/slough complex that drains into Black Hawk Lake reduced loading of phosphorus and sediment pollution to the lake by 68%. Now the inlet serves as critical habitat for a variety of birds, amphibians, and fish. This project has not only improved the quality of the wetland, but also helped to protect one of Iowa's most visited lakes.

Many of the designs for shallow lake management incorporate water control structures and pumps that allow for the temporary draining of basins and fish barriers that preclude the passage of rough fish (e.g. carp) back into the lake. However, each site is different and requires solutions specific to a given area. Restoration or enhancement activities rely on engineering survey, design and feasibility analysis. Engineering needs for these projects include specifications of project features (e.g. water-control structures, pumping/tiling systems, fish barriers, etc.), associated cost estimates and design documents that can be included in a construction bid package.

Wetland Enhancement at Iowa's Significant Publicly Owned Lakes

The DNR Lake Restoration Program (LRP) is a statewide effort focused on Iowa's significant publicly owned lakes (SPOLs). Projects are designed to meet program goals as outlined in Iowa Code 456A.33b and are prioritized for public benefit, feasibility, and potential for water quality improvement. As a part of this commitment, the program works to enhance wetlands in priority lake watersheds, since wetlands are a critical component to achieve water quality goals and provide important habitat for wildlife.

Investment decisions at Lake Restoration Program lakes are driven by individual lake restoration plans. For certain lake plans, marsh/wetland enhancement is identified as a critical component to achieve water quality improvement. For example, over the past several years the LRP has worked on a number of wetland restoration projects in priority watersheds draining to a SPOL (e.g. Little Storm Lake, Lost Island Lake wetlands, Marble/Hottes (Iowa Great Lakes), Little Storm Lake, and the Black Hawk Lake Inlet). These projects meet the program criteria since the objective is to improve and/or protect a lake already prioritized according to the program guidelines. Lake restoration projects involving wetland enhancement rely on strong partnerships and public education and outreach to collaboratively work with different user groups - addressing needs of individual groups while educating communities about what healthy wetlands look like and how they are critical for downstream water quality improvement.

Over $11 Million dollars have been invested in marsh/wetland restoration efforts in the watersheds at priority lakes, including a program investment of over $6 Million.

Highlighted Wetland Enhancement Projects:

BLACK HAWK LAKE INLET, SAC COUNTY

- Blackhawk Lake is the southern most natural lake in Iowa - a 922-acre lake with a 14,097-acre watershed that has faced numerous water quality problems over the years.
- Restoration efforts in the lake and watershed began in 2012, and the diagnostic and feasibility study for the project specifically called out deepening the inlet of the lake.
- Inlet restoration would reduce phosphorus delivery to the lake by as much as 68% and serve as critical habitat for migratory waterfowl

- A spoil site for the project was developed utilizing a previous spoil site on state land and re-constructing the area to hold the new spoils from the inlet
- Construction was completed and involved the removal of 330,000 CY of material and re-meandering the channel
- The mean depth was increased from 1.8 to 3 ft, which allowed for sediment from the watershed to filter through wetland vegetation and drop out before entering the main lake
- A new fish barrier was constructed in 2020 that gave DNR water level management capability through a pump system and prevented carp from entering the inlet from the main lake, restricting access to their primary spawning habitat.

$3.67 Million invested by all project partners; $3.0M LRP; $250k City of Lake View; $200k USEPA Section 319 Grant; $138k REAP Open Spaces

CLEAR LAKE (VENTURA MARSH), CERRO GORDO COUNTY

- Ventura Marsh is a large wetland complex that flows into the western end of Clear Lake.
- Before the restoration project, the marsh served as a major source of nutrients contributing to water quality problems in the lake and was a major reproduction area for common carp.
- The goal was to work with the USACE (on a Section 206 Aquatic Ecosystem Restoration Project) to restore Ventura Marsh and gain water level management capabilities, allowing for fish removal and revegetation of the marsh.
- The old stop log structure was removed and replaced in 2011 and a flow path was dredged to allow the deeper portions of the marsh basin to drain towards the pumping station, allowing for nearly a complete drawdown.
- In 2013 /2014, DNR constructed of a catch basin and a water flow path in the southwest corner of the marsh. This feature treats water entering the marsh from two large tile sources and allow for longer retention of water entering the marsh before it gets to Clear Lake.

Carp are still present in Ventura Marsh, but water quality remains excellent. Dense beds of cattail exist on 80% of the basin.

Photo by Zenner, October 2014

- In 2020, DNR wildlife staff began working with the LRP to restore Lewka Marsh (which drains to the lake) and improve the Ventura Marsh Wildlife Management Area, which included repairs to the pump system at the marsh.
- Project partners also worked to expand the Ventura Marsh WMA in 2021, purchasing a new tract and working to restore it to wetland habitat ($125,000 LRP; $200,000 NAWCA; $75,000 US EPA Section 319; $100,000 INHF donors).

$4,775,580 invested ($783,818 LRP; $3,991,762 Federal USACE)

IOWA GREAT LAKES, DICKINSON COUNTY

The Iowa Great Lakes are a significant resource in Iowa and bring over 750k visitors to the lakes (Big Spirit Lake, East Okoboji Lake, West Okoboji Lake, Upper Gar, Minnewashta, and Lower Gar) annually

East and West Hottes Lake/Marble Lake/Grovers Lake Complex

- Located within the Kettleson Hogsback wildlife complex in northern Dickinson County, these 4 basins are of extreme importance to fish and wildlife as well as water quality in the Iowa Great Lakes. Mable Lake (160-acres) and West Hottes (225-acres) drain to Big Spirit Lake. Nearly 20% of the water entering Big Spirit Lake comes through these lakes.
- The Big Spirit Lake Association, DNR, DU, Dickinson County, and others provided funding and technical guidance to develop a comprehensive feasibility study to identify ways to return ecological health to this critical habitat.
- Final design incorporated water control structures and pumps that allowed for the temporary draining of the basins and the installation of fish barriers that allow for the passage of game fish but preclude the passage of carp.
- In 2015, Ducks Unlimited installed new pump facilities and a fish screen that will transform the shallow water areas of these three lakes from murky, open water to stands of emergent vegetation such as cattail and bulrush. All phases of construction were completed in 2015 and the new infrastructure allowed West Hottes and Marble Lakes to be drawn down. Water levels have been managed to maximize water quality and aquatic plant benefits.
- This project enhanced more than 450 acres of shallow lake/emergent marsh and provided better hunting and fishing opportunities on these popular lakes.

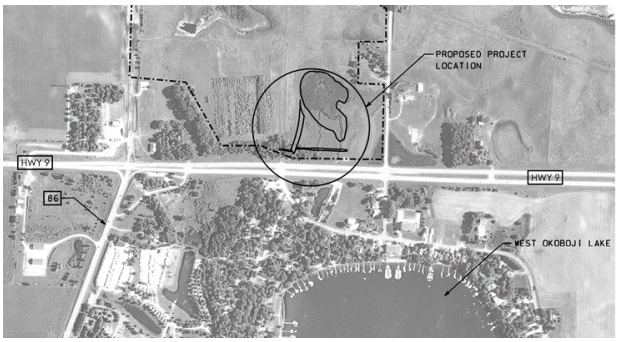
Before (left - 2014) and after (right - 2015) project photos of West Hottes Lake.

SPRING RUN COMPLEX (DICKINSON COUNTY)

- The Clemens Tract within the Spring Run Marsh Complex is a recent addition to the wildlife management area. This management area drains to Lower Gar Lake. Restoring and establishing wetlands throughout the prairie pothole region is important for establishing habitat for aquatic organisms and improving water quality statewide. This project involved the construction of two wetlands totaling 17 acres that will filter water draining to the Iowa Great Lakes and establish good habitat for a variety of aquatic and migratory animals. Engineering design was completed by Ducks Unlimited, and project construction began in 2017 for a total cost of $394,702 ($228,927 LRP / $ 98,756 DU / $51,311 NAWCA / $15,000 WQC) and was completed in 2019.

APPLE JACK MARSH (DICKINSON COUNTY)

- Apple Jack Marsh is part of the much larger Welsh Lake wetland complex, which helps protect West Okoboji Lake from sediment and nutrient pollution.
- The marsh filters about 26,000 acres in the Iowa Great Lakes watershed and is critical for habitat and water quality at West Okoboji Lake.
- Naturally occurring wetlands, like this marsh, eventually fill in over time, and thus, restoration was needed of this critical wetland. A restoration project was designed in 2016 to excavate excess sediment from the basin and reroute



Wetland improvements at Apple Jack Marsh

incoming water from the watershed to better filter through the wetland before moving downstream to the great lakes.

- As a part of this project, approximately 4 acres along the edges of the marsh were deepened and a new channel was dug for incoming water. Additionally, a fish barrier was placed at the outlet of the marsh to minimize invasive fish passage and promote vegetation growth.

$2.95 Million invested by all project partners at these projects (Marble/Hottes: $2.31 M; $854,607 LRP / $1,452,546 Other. Little Swan Lake: $317,937 LRP, DU, NAWCA, and Dickinson County Water Quality Commission. Garlock Slough: $323,222; $250747 LRP / $72,475 NAWCA)

LOST ISLAND LAKE, PALO ALTO COUNTY

- This project includes multiple wetlands within the >2,200-acre complex, which includes the 1,162-acre lake. The plan included reducing the existing numbers of carp in the system and preventing the remaining rough fish from accessing most of their spawning habitat, which help maintain lower a lower population over time.

Constructed electric fish barrier in the Lost Island Lake watershed.

- Drawdowns were also completed on numerous wetlands throughout the complex (780-acre Barringer Slough, 150-acre Blue-wing Marsh) and eliminating rough fish from surrounding wetlands. Resulting germination of aquatic plants and consolidation of bottom sediments restored proper wetland function and improved the water quality at Lost Island Lake.
- The project included an innovative plan to allow for the removal of up to 75% of the existing carp biomass, aggressive stocking of predatory fish and new construction or rehabilitation of four water control structures and five fish barriers throughout the complex.
- Ducks Unlimited designed the effective water control and fish barrier structures. The survey and design work began during summer/fall 2009. Local support regarding the project has been high. Nearly 70 local stakeholders attended a December 2009 public meeting and voiced strong approval for the design work.
- The NRC approved Lake Restoration Funding toward the $834,263 bid from Landwehr Construction, St. Cloud, MN for the project. The Watershed Improvement Review Board awarded the Palo Alto County Conservation Board $180,000 to cover part of the cost (two water level control/fish barrier systems); construction began in the fall of 2010 and was completed summer of 2012. The $1.3 million project has been a partnership between the Iowa Department of Natural Resources, Palo Alto County, Ducks Unlimited, and the Lost Island Protective Association.
- Various basins within the complex were initially dewatered to eliminate rough fish and create favorable conditions for re-vegetation. All basins are now at full pool providing excellent habitat for wildlife species and much-improved recreational opportunities for Iowans.
- Over 1.27 million pounds of common carp and buffalo have been removed from Lost Island Lake since 2008 reducing the common carp density from nearly 400 lbs./acre to 55 lbs./acre. The lake has shown substantial increases in water quality and habitat.

$1.45 Million invested by all project partners; 1,226,866 LRP; $180k WIRB Grant by Palo Alto County; $25k Casino Grant

STORM LAKE (LITTLE STORM LAKE), BUENA VISTA COUNTY

Storm Lake is a shallow natural lake (3rd largest natural lake in Iowa) with a surface acreage of 3,104 acres. Little Storm Lake is a unique project in that it involved the City of Storm Lake, the Storm Lake Preservation Association, the Iowa DNR, and Ducks Unlimited working together to improve water quality in Storm Lake. The little lake encompasses 190 acres.

- Approximately 70 percent of the watershed flows through Little Storm Lake and into Storm Lake.
- The project includes a water control structure between Little Storm Lake and Storm Lake and the construction of a pumping station and associated equipment. A serpentine inlet was also created to slow water and capture sediment before entering Little Storm Lake.
- Management involves periodic lowering of Little Storm Lake to consolidate bottom sediments, improve aquatic vegetation growth, and eliminate undesirable fish species ultimately improving water quality for waterfowl, other wildlife, and people. A spoil site for the project was developed utilizing a previous spoil site on state land and re-constructing the area to hold the new spoils from the inlet
- In 2025, a new pump was installed that can better handle vegetation and fish in the wetland during a drawdown. A new precast water control structure was installed at the north end of the wetland and the fish screen at the outlet structure was also retrofitted as a part of this project.

$1.43 Million invested by all project partners; 2011 Project $917,031 LRP; $163,040 WIRB Grant; 2025 Pump Capital Reinvestment $336k LRP

TWELVE MILE LAKE, UNION COUNTY

Twelve Mile Lake is a 595-acre lake with a 17 ft. mean depth and 42 ft. max depth. This multi-use resource (Wildlife Management Area) has a 14,080-acre watershed and 24:1-acre watershed to lake ratio. During its peak in the late '90s Twelve Mile held nearly 30 fishing tournaments per year. By 2004, that number dropped to two. There were problems with common carp, decrease in water quality and drinking water required additional treatment.

- Work began in 2005 to improve water quality in the lake that included a shoreline protection, terraces, buffer strips, and sediment detention basins in the watershed.
- DNR renovated the fishery to eliminate the carp population to improve water clarity
- Restoration efforts in the lake and watershed began in 2012, and the diagnostic and feasibility study for the project specifically called out deepening the inlet of the lake.
- A 40-acre wetland was constructed on the north end of 12-Mile Creek Lake in 2014 to retain nutrients and sediment. The project was delayed several times in 2014 due to record summer rainfall in southern Iowa.

- Lake Restoration Program and DNR Wildlife funds were used to help survey the 12-mile Creek Lake watershed and implement three grade control structures in the watershed.
- Since the project was completed, visitation has soared at the lake, attracting visitors for over 50 miles away (twice the statewide travel distance average) and hosting numerous fishing tournaments annually.

$447K invested by all project partners; $297k LRP; $75,000 NAWCA; $75,000 State Duck Stamp

Iowa's shallow lake and wetland conservation efforts involve strong partnerships. Ducks Unlimited (DU) has partnered with DNR on over 20 shallow lake restoration projects, and works in concert with the Wildlife and Fisheries Bureaus' staff to design and implement projects. Working cooperatively through DU's Living Lakes Initiative in Iowa and Minnesota, great strides have been made in our management capabilities and the habitat quality of these systems.

Public education and outreach is another critical piece of shallow lake and wetland conservation, and our team is committed to helping communities and user groups come together to make these projects truly successful demonstration models for improving not only water quality, but fostering partnerships for the long-term active management required to maintain the health of these lakes.

The Living Lakes Initiative was established by Ducks Unlimited to focus conservation work on large marshes and shallow lakes throughout the Prairie Pothole Region of Iowa and Minnesota. Their long-term commitment has resulted in the protection and improvement of Iowa and Minnesota's shallow lakes and enhancement of extensive wetland habitat. Contributions include innovative engineering solutions for carp control and water level management capabilities, in-kind support from their staff and partnering with resource agencies to obtain federal grants.

Ducks Unlimited efforts have resulted in substantial funding resources being brought to Iowa and Minnesota for shallow lake/wetland work. DU has facilitated a number of North American Wetlands Conservation Act grants from the U.S. Fish and Wildlife Service to protect wetland habitat and shallow lakes in Iowa. In addition, DU has partnered with the U.S. Department of Agriculture Natural Resources Conservation Service to deliver Wetlands Reserve Program habitat restoration projects on private lands. These projects improve watershed functions and complement our lake restoration efforts.

Shallow Lakes Management Initiative

The DNR Conservation and Recreation Division manages wetlands in the North-Central part of the state for improved water quality, fishery health, and habitat restoration for migratory waterfowl and other aquatic life. The shallow lakes management initiative is regional in nature and focused on a select group of counties in northwest Iowa, as these lakes were created through glaciation, and therefore, only present in a small part of the state. In recent history, most of these lakes have been turbid, algae-dominated systems with little to no vegetation and poor sport fisheries comprised mostly of common carp and black bullheads. Successful restorations of deeper lakes have historically focused on reducing nutrient inputs by repairing the watershed and/or removing phosphorus-laden sediments from the lake. Successful shallow lake management strategies require intensive in-lake management that can immediately flip the basin from the turbid-water state to the clean-water state along with long-term watershed protection efforts that help maintain clean water over time. The goal of these projects is to develop tools (i.e. water level management/carp control) that managers can use to shift and maintain shallow lakes in a clear water state.

The DNR Lake Restoration Program and Wildlife/Fisheries Bureaus in cooperation with partners like Ducks Unlimited have identified a list of shallow lakes prioritized for renovation. These lakes are typically under 4 ½ foot mean depth and about 6 to 8 feet deep at their deepest spots.

Since 2006, there have been 40 completed or on-going projects improving 14,000 wetland acres.

Each initiative involves a large amount of staff time that goes into planning (feasibility studies, surveying, hydraulic modeling, partnering with affected landowners, securing funding, public outreach, designing, and permitting); managing (system specific goals and strategies, water level management and fish barrier maintenance, rotenone applications, monitoring responses; on-going public education and information; and, internal and external research.

Public meetings are used to educate and promote the water quality/system health aspects of these projects. In addition to the benefit of improved water quality brings these projects result in diversified vegetation and insect communities, excellent fish and wildlife habitat for game and non-game species, improved recreational, educational, aesthetic opportunities, improved quality of life and local economic opportunities.

Since 2006, there have also been a number of completed or on-going projects targeted on improving shallow lakes or wetland complexes. The Lake Restoration Program has been involved with most of these efforts as a cost-share partner (approximately 50% of project costs for the majority of projects completed). This cost-share partnership enables DNR's Wildlife Bureau to be more effective in obtaining North American Wetlands Conservation Act (NAWCA) grants. NAWCA was enacted in 1989 and provides federal cost-share funding to support the North American Waterfowl Management

Plan. The goal is to conserve North America's waterfowl, fish and wildlife resources while producing a variety of environmental and economic benefits. Some recent projects include:

Garlock Slough:	$374,302 ($250,747 LRP / $123,555 NAWCA)
West Swan Lake / High:	$822,261 ($529,061 LRP / $293,200 NAWCA)
Jensen Slough:	$125,400 ($75,240 LRP / $32,604 DU / $17,556 NAWCA)
Little Swan Lake:	$317,937 ($190,762 LRP / $79,484 DU / $41,331 NAWCA / $15,000 WQC)
Morse Lake:	$279,588 ($127,794 LRP / $127,794 NAWCA / $24,000 DU)
Pickeral Lake:	$224,301 ($60,000 LRP / $164,300 NAWCA)
Silver Lake (Worth):	$370,709 ($174,591 LRP / $196,118 NAWCA)
Virgin Lake:	$234,596 ($130,715 LRP / $103,882 NAWCA)
Spring Run Wetland:	$394,702 ($228,927 LRP / $ 98,756 DU / $51,311 NAWCA / $15,000 WQC)
Apple Jack Marsh:	$86,982 (LRP)
Goose Lake:	$100,000 ($50,000 LRP / $50,000 NAWCA)
Pleasant / Lily Lakes:	$250,000 ($125,000 LRP / $125,000 NAWCA)
Eagle Lake:	$267,000 ($195,000 LRP / $75,000 NAWCA)
East Twin Lake:	$396,750 ($198,375 LRP / $198,750 NAWCA)

DAN GREEN SLOUGH (CLAY COUNTY)

Dan Green Slough is located northeast of Spencer in Clay County. A donation of a key tract of land facilitated the installation of a pump system and fish barrier at this 311-acre wetland in the fall of 2008 and winter of 2008/2009. The lake was temporarily drawn down during and shortly after construction to facilitate the removal of rough fish and allow for vegetation to re-establish in this shallow lake. The lake was returned to full pool in 2010. Since the restoration was completed, turbidity levels have dropped dramatically and in 2019, the pump needed some repairs to facilitate water level control ($10,000 LRP).

EAGLE LAKE (HANCOCK)

Eagle Lake is an 890-acre marsh in Hancock County. Eagle Lake was once at the center of a vast complex of emergent wetlands. The last whooping crane in Iowa, and the last nest found for nearly 60 years was in this wetland complex in 1894. The last trumpeter swan in Iowa's PPR prior to reintroduction was observed at or near Eagle Lake in 1883. Only a small portion of the marsh has consistent open water, so unlike many of Iowa's shallow lakes, Eagle Lake is a true marsh. Historically, the marsh covered over 1,700 acres; however, extensive drainage of all but the deepest portions prior to 1915 has reduced its size. Its watershed historically was nearly 7,000 acres (7.5:1 watershed to wetland area) but some of the extensive public drainage ditch infrastructure, mainly to the south and east, may have increased this area by crossing divides and certainly increased the contributing area of the watershed by facilitating drainage of small wetlands.

The current water control structure is deteriorating and needs to be upgraded in order to effectively manage water levels. This upgrade will improve water quality and aquatic habitat for the benefit of fish and wildlife populations as well as public recreational opportunities. This project included upgrading the water control structure as well as the installation of a fish barrier ($267k; $195k LRP; $95k Federal NAWCA Grant). Construction was completed in 2024.

GARLOCK SLOUGH (DICKINSON COUNTY)

Garlock Slough is a 91-acre wetland that drains directly to West Okoboji Lake. Restoring this wetland is key to providing both essential habitat for aquatic life and migratory waterfowl and protecting water quality in West Okoboji Lake, as well as improving water quality in the wetland itself. Restoration plans for the slough included installing a pumping system that would allow managers to manipulate water levels and restore native plants to the wetland, and constructing a fish barrier to prevent carp from entering the slough to reproduce. Carp uproot aquatic vegetation when feeding and contribute to turbidity issues in shallow lakes and wetlands. Construction was started in 2022 and is expected to be completed in 2023 for $374,302 ($250,747 LRP / $123,555 NAWCA). A Dickinson County Water Quality Commission Grant also funded the engineering costs for this project. Engineering design and construction oversight was provided by Ducks Unlimited, Inc.

GOOSE LAKE (CLINTON COUNTY)

Goose Lake is a 360 -acre marsh predominant herbaceous vegetation of cattails, hardstem bulrush, pickerelweed, and water lilies. This wetland system historically naturally had variable water levels. Due to changes in hydrology within the Goose Lake watershed, the water level remains unnaturally high during spring and summer months. This high water prohibits new hydric perennial and annual vegetation as well as degrading existing perennial vegetation. Additionally, due to the changes in hydrology, in particular changes in agricultural drainage, the channels necessary to manage water levels within the marsh to become filled with silt.

This project included channel excavation within the marsh as well as lowering the existing water control structure two feet. These activities will allow staff to control water levels more actively with a goal of maintaining a proportion of the area in open water, a portion in perennial vegetation, and the ability to dewater and attract annual wetland vegetation. This active management will benefit spring and fall migrating waterfowl as well as breeding taking place on the area. Construction was completed in 2024 and was a partnership between the LRP and with Wildlife Bureau, utilizing Federal NAWCA grant funds ($100k; 50/50 cost share between partners).

JENSEN SLOUGH (EMMET COUNTY)

Using engineering plans completed by Ducks Unlimited, this project involves drawing down the lake, installing a water control structure and fish barrier on the outlet of the lake, and eliminating rough fish from this wetland. Once completed, the fish barrier will minimize movement of rough fish between wetlands in the marsh complex, effectively cutting the fish off from their spawning areas. Additionally, the water control structure will allow managers to manipulate water levels to encourage healthy vegetation growth throughout the marsh complex. The project will restore the 57-acre slough and construction was completed in June 2020 for $88,750 ($11,585 LRP / $47,655 DU / $26,000 NAWCA / $3,500 County).

LITTLE STORM LAKE (BUENA VISTA)

Storm Lake is a shallow natural lake with a surface area of 3,104-acres and a watershed to lake ratio of 5:1. Little Storm Lake is located immediately northwest of the main lake and consists of open water and wetland habitat. Approximately 70% of the water from the watershed flows through Little Storm Lake before entering the main lake; therefore, when in a healthy vegetated state, this area can prevent much of the sediment and nutrients from entering Storm Lake.

A dike system, water control structure, pump, and fish barrier were added in 2011 and created the ability to promote and maintain a higher quality wetland above the main lake. However, given the existing state and capabilities of the infrastructure, staff are no longer able to effectively manage for control of rough fish and water movement and certain components need major repair/replacement to reestablish full operation. This project consists of installing a precast water control structure at the north end of the wetland, replacing the existing pump system, retrofitting a fish screen on the outlet structure, and minor grading and rock placement ($336k; 100% LRP). Construction will be completed in 2025.

LITTLE SWAN LAKE (DICKINSON COUNTY)

Using DU completed designs, this project included the construction of a new water control structure and invasive fish passage barrier. The fish barrier will help limit movement of rough fish throughout the wetland complex. Additionally, the water control structure will allow managers to manipulate water levels in this shallow lake. Water level variation is integral to good water quality in shallow lakes, as low water levels allow plants to germinate and stabilize lake sediments. This project will improve water quality in Little Swan and improve water quality throughout the entire lake complex. The project will enhance 545 acres of wetland and marsh habitat, and will improve migratory bird habitat. Construction was completed in 2017, and cost $317,937 (funding was a partnership between the LRP, DU, NAWCA, and a grant from the Dickinson County Water Quality Commission. The rock barrier was enhanced in 2020 ($50,000 LRP) to better filter water and prevent fish migration.

LIZARD LAKE (POCAHONTAS COUNTY)

Prior to restoration Lizard Lake was highly degraded, with some of the worse water quality in the state. Rough fish (buffalo, bullhead and carp) dominated the lake population, which limited aquatic vegetation and the lake experienced frequent and severe algae blooms. The below are pre (2010) and post (2015) photos taken at the Lizard Lake outlet.

During 2008 and 2009, DNR staff had met several times with local partners and stakeholders to discuss management options for Lizard Lake. With strong support from most local constituents, the DNR constructed a new water control structure and fish barrier in 2011. Design of a velocity tube fish barrier was provided by Ducks Unlimited. DNR drained the lake to eliminate high populations of common carp and other problem fish, allow for the consolidation of loose bottom sediments, and promote the growth of aquatic plants. These plants will help keep water in the lake clean by holding down bottom sediments, reducing wave energy, using up nutrients otherwise available for growing algae, and providing habitat for the small invertebrates that eat algae. Aquatic plants will also provide excellent habitat for sport fish and a multitude of game and nongame wildlife species that depend on clean-water lakes for survival.

Water at the outlet of Lizard Lake before (left) and after (right) restoration.

- Lizard Lake was drawn down during the winter/spring of 2011 as planned. The draw-down went very well and weather conditions allowed vegetation to establish in the exposed lakebed.
- Construction activities on and around Lizard Lake were completed as planned. A new outlet and water control structure was installed to replace the antiquated one. The final elevation of the new structure was discussed with the public prior to construction and a private firm was contracted to survey the outlet structure to assure local citizens that the new outlet structure was installed at the agreed upon elevation.
- A velocity tube fish barrier was installed just downstream of the outlet structure at Lizard Lake. This fish barrier is the first of its kind for Iowa. DU's resourceful design allows debris to flow through the structure, but does not allow fish to pass through it because it is installed at a steep enough grade.
- DU is providing funding through the Living Lakes Initiative and a NAWCA grant that will allow the County Conservation Board to purchase 119 acres immediately adjacent to the lake. This acquisition will increase public recreation opportunities as well as help decrease the nutrient and sediment load entering the lake.

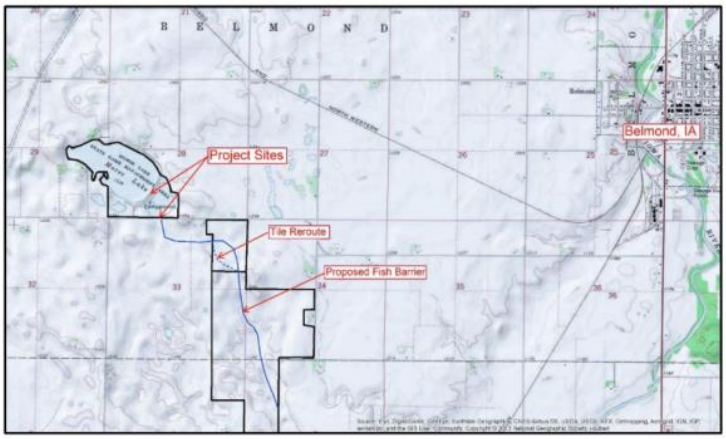
DNR stocked yellow perch into the lake in 2012, 2013, 2014, and 2015; and although drought conditions early on may have limited the success of the initial stockings, the DNR has documented survival of yellow perch in the spring of 2015. In addition, the DNR has stocked northern pike in the lake every year since 2013.

In 2017, DNR altered the outlet structure at Lizard Lake to add capacity for managing water levels in the lake. The new structure was completed in the fall of 2017, and allows for water to be held at a higher level (at the ordinary high water line for the lake). This additional capacity may help mitigate vegetation concerns at the lake. Following the completion of the restoration project in 2012 and 2013, cattails established throughout the basin, and removing them from the main area of the lake has been very challenging. Allowing for deeper water will help limit the extent where cattails can establish and survive in the lake. Total cost for this project was $16,950 (100% LRP).

MORSE LAKE (WRIGHT COUNTY)

Morse Lake, a 103-acre wetland located in Worth County, is plagued by nuisance algae blooms, little to no submerged vegetation, and poor water quality. As a result, this important shallow lake has been underutilized by migratory waterfowl and other species of conservation need. Ducks Unlimited (DU), in partnership with DNR's Living Lakes

Initiative are working to improve water quality and migratory waterfowl habitat in this shallow lake. DNR hired DU to design and construct a new outlet structure and invasive fish passage barrier at Morse Lake, planned for construction in 2018 and 2019. The project cost a total of $279,590 ($127,795 LRP, $127,795 federal NAWCA grant; $24,000 DU). Together, project partners held a public meeting in June of 2018 to answer the public's questions and address concerns about the project. Construction was completed in 2019 with spring 2020 fish stocking.



PICKEREL LAKE (BUENA VISTA COUNTY)

Pickerel Lake, located in extreme NE Buena Vista County, is a 170-acre basin that suffered from the same problems as most other shallow lake basins in the upper Midwest: poor water quality due to an intensively modified watershed, an overabundance of rough fish, and a lack of beneficial aquatic plants. Even with poor water quality, walleyes have surprisingly been able to reproduce in Pickerel Lake. Project partners initiated intensive in-lake management to enhance water quality, fish and wildlife habitat in Pickerel Lake. In addition, they will continue to work long-term throughout the watershed to ensure that soil, fertilizers, and pesticides stay on the uplands. In-lake actions included installing a new water control structure and fish barrier on the lake's outlet and enhancing existing draw down channels in the lake and downstream of the new water control structure. Once this infrastructure was in place, the DNR temporarily drained the lake to allow for the elimination of problem fish, the consolidation of bottom sediments, and the establishment of beneficial aquatic plants.

Pickerel Lake was drained in the late winter/early spring of 2011 and now has gone through its second year of a draw down since the project's inception. No boards were put in the stop log structure to hold water in 2012 and good stands of perennial emergent vegetation were established. Some attempts were made to hold water in Pickerel Lake in 2013, but water levels are quite low. Even with low water levels, 42,000 yellow perch were stocked into Pickerel Lake in July 2013 in the hope to get a start on the fishery going into 2014. DNR fisheries staff has been monitoring water levels at Pickerel Lake in 2014 and have assisted with stocking adult perch and fertilized perch eggs.

PLEASANT/LILY LAKES (DICKINSON)

Pleasant Lake and Lily Lake are two shallow lakes that are connected by their hydrology located in Dickinson County within the Spring Run PPJV Priority Area, the Spring Run Bird Conservation Area, the West Fork Little Sioux River - Little Sioux River Ducks Unlimited Living Lakes Initiative Emphasis Area, as well as the Spring Run Wildlife Area Important Bird Area.

The Pleasant Lake - Lily Lake Complex is at the north end of the Spring Run Wetland Complex. Pleasant Lake outlets into a marshy channel then inlets into Lily Lake. Lily Lake outlets at the headwaters of Muddy Creek which empties into the Little Sioux River at the north and through a drainage ditch at its south end that flows through numerous marshes in the Spring Run complex, into Lower Gar Lake, and to the Little Sioux River. The majority of Lily Lake is a deep emergent marsh with a wide fringe of temporary and saturated-soil wetland plants.

Due to the altered hydrology in northwest Iowa and southwest MN to improve agricultural production and the interconnectedness of these shallow lakes' hydrology, water levels have stabilized and prevented the cycles of high and low water years needed for promoting aquatic vegetation. This project replaced the existing outlet structure on Lily Lake and improved drainage way between the two lakes. These changes will allow managers the ability to manage water levels on both lakes independently at each lake, as well as at the same time, depending on management goals. Construction was completed in 2024 and was a joint effort between the LRP ($125k) and the Wildlife Bureau, utilizing a Federal NAWCA Grant ($125k; total cost of $250k).

RICE LAKE (WINNEBAGO COUNTY)

Aerial image of Rice Lake and the slough that drains to the lake.

Local interest has developed for shallow lakes management on Rice Lake. The fishery has declined and the water quality is currently poor. DNR held public meetings to discuss shallow lakes management with the community. The public meetings held in 2013 had overwhelming support for shallow lakes management.

Taking advantage of a severe drought, the lake was drawn down 4 feet in late 2013 to facilitate renovation of the fishery and promote aquatic vegetation growth. The DNR applied rotenone through the ice during the winter of 2013/2014. Vegetation growth responded well and water levels were brought up slowly starting in the spring of 2014. In addition, fish stockings were initiated in June 2014. Fish stocking included yellow perch ribbons and adults, walleye fry and fingerlings, largemouth bass fingerlings, bluegill fingerlings. The lake remained about 20 inches low going into winter 2014. In 2015 the lake level returned to crest. Fish stockings continued in 2015 with the fishery developing nicely. Water quality remained good in 2015. The aquatic plant community remains relatively stable.

Throughout 2014 and 2015, Ducks Unlimited worked with DNR and local stakeholders to design a new water control structure that would allow DNR managers to preserve this newly restored habitat. Construction of the new structure was completed in early 2016. DNR now has the capabilities to conduct periodic drawdowns to enhance vegetation, as well as barriers to prevent carp from reaching the lake.

SILVER LAKE (WORTH)

DNR conducted shallow lakes restoration work at Silver Lake starting in 2011 in response to poor water quality. The plan was to replace the current water control structure, dig a channel in the lakebed to aid in draining the basin, and renovate the fishery. The benefits will be improved water quality, establishment of an aquatic plant community, and a restored fishery.

Rock fish barrier at Silver Lake

Silver Lake water control structure was replaced in 2011/2012 and a drawdown was conducted in 2012 for vegetation establishment. Three feet of stop logs were placed in new structure in August 2012 to begin re-filling the lake. The plant community response has been good. There is a good stand of bulrush establishing with several other species of aquatic plants coming as well.

Fish stockings of yellow perch and bluegill occurred in 2013. However, that fall the DNR started getting reports from the public that carp where in the lake. A DNR electrofishing survey confirmed that carp were present in the system. The Conservation Officer also collected some carp with a mud motor after the electrofishing survey. The only gamefish collected was one perch. A public meeting will be held and explain the situation. The opinion of the DNR is that a 7-inch rain event in late May either topped the barrier or allowed a few fish to jump the barrier and that required a modification of the barrier to address vulnerable spots for fish migration.

The management strategy was to lower the lake after freeze up and try to winterkill the carp. Rotenone was added under the ice to get a complete kill. The lake was then be boarded up to near crest to capture as much as the spring 2014 as possible. Spring 2014 fish stocking included yellow perch ribbons and adults, largemouth bass fingerlings, and bluegill fingerlings.

In 2015, additional material was added to the water control structure berm (see photo above). The dirt and rock work was needed to stop water from leaking across the berm during high water events and prevent any possibility of carp

entering the lake. The aquatic plant coverage and density declined in 2015, especially the emergent cattail and bulrush growth.

SILVER LAKE (PALO ALTO COUNTY)

Silver Lake is a natural shallow lake in Northwest Iowa with a mean depth of 4.3 feet. In August 2013, the lake association met with Fisheries, Wildlife, and Lake Restoration staff to determine if restoring this lake was possible and what it would take to improve water quality at Silver Lake. Together, the local group and DNR invested in a Diagnostic and Feasibility study to better understand how nutrients and sediment were being transported to the lake from the watershed and what could be done to improve water quality in the lake. The study was completed in 2016. The next step for the project is to complete a comprehensive restoration plan for the lake and watershed focused on improving water quality at the lake. Additionally, the local group and other project partners have invested in the future of Silver Lake through the following projects:

- The Silver Lake Protective Association was successful in 2012 at acquiring local grant money to pursue survey, design, and engineering of a fish barrier on the existing outlet structure and determining the feasibility of using the existing drawdown structure. The initial design is complete but implementation is on-hold to examine how the barrier will fit into the overall improvement plan.
- The Iowa Natural Heritage Foundation also acquired a tract of land along the shoreline in 2016 with the long-term goal of enhancing the land to help protect the lake through wetland improvements and native plantings along the shoreline of the lake. DNR acquired this piece of land from INHF in 2017 for the appraised value of $920,400 ($300,000 LRP; $600,000 MFT; $20,400 REAP Open Spaces).

VIRGIN LAKE (PALO ALTO COUNTY)

Virgin Lake is a unique 220-acre basin in western Palo Alto County that features a highly diverse shoreline, back bays, peninsulas, and islands. Like other shallow lakes in Iowa and the upper Midwest, it had become unhealthy due to intensive agriculture in its watershed and an overabundance of rough fish. Together, these and other factors had resulted in turbid water in the lake and the subsequent loss of the beneficial aquatic plants needed to sustain clean water and provide habitat for sport fish and aquatic wildlife. Project partners, including DNR and DU improved the lake by ridding the lake of problems fish species, restoring aquatic plants, and stocking quality game fish. The lake was drained fall 2011 and was drawn down completely during early 2012. Aquatic plants germinated over the entire basin. Water levels recovered very slowly because of drought conditions in 2013.

View of Virgin Lake following restoration highlighting all of the emergent vegetation.

Approximately 20,000 yellow perch fingerlings from Genoa National Fish Hatchery were stocked in August 2014. Walleye were stocked in Virgin in 2015. Drought conditions in 2012 and 2013 were unexpected and provided an opportunity for both aquatic and terrestrial vegetation to become very thick in the lakebed. This situation should improve with water back in the lake. The lake opened up slightly in 2015. An additional fish barrier was constructed in 2021 ($40,000 LRP).

WEST SWAN LAKE/HIGH LAKE (EMMET COUNTY)

West Swan Lake is located approximately 6 mi southeast of Estherville and 1 mile north of Ingham Lake. Historically, West Swan covered 1,530 ac, but a petition to drain the eastern 733 ac in 1911was approved and by 1916, the lake had been reduced to its current size of 797 acres. A dam and fish passage structure separating the west and east halves of Swan Lake was constructed in association with excavation of the ditch that drained the eastern half of the lake into a channelized section of Jack Creek, which flows into the West Fork of the Des Moines River. Jack Creek was the historic outlet for the lake; however, today the modern outlet is the drainage ditch that historically separated East and West Swan Lake.

Most of West Swan Lake is 2-5 feet deep, with the deepest portions offshore of the south boat ramp (where it exceeds 6 ft). The Iowa State Highway Commission on Lakes and Lakebeds stated in its 1917 report that West Swan Lake was "a favorite hunting ground for people in that part of the state. Fishing is also reported as good and all the more common varieties of fish are caught. So far as learned, the lake has never been stocked." The Commission's recommendation was that West Swan Lake be preserved without alteration.

Today, West Swan Lake receives drainage input at several points from drainage district tiles. Color aerial photos collected since 2000 indicated that the lake is in a turbid water state, likely due to the stabilized water level, nutrient enrichment, and rough fish population.

In 2018, Ducks Unlimited was hired to complete some survey work at the lake and develop a conceptual plan for West Swan Lake. The project was designed to be completed in two phases: 1- Install a water control structure on the east side of the slough and a fish barrier located on the south end of the lake; and 2 - install a drawdown structure at the lake outlet and draw the lake down to allow for vegetation to re-establish and remove the rough fish community from the lake.

Engineering work was completed in 2021 and construction began in 2022 ($822,261). The project includes installing a fish barrier located on the downstream side of East Slough to prevent rough fish from entering East Slough from Ingham Lake. Due to the interconnectedness of this system, the placement of a rock fish barrier on the downstream side of East Slough will not only keep undesirable fish species out of East Slough but also Snipe Meadow and West Swan Marsh. Silt was removed from interior marsh channels upstream and downstream of East Slough and downstream of Snipe Meadow in order to have the ability to completely dewater the marshes. Finally, existing water control structure at the outlet of West Swan Lake was replaced with a new water control structure. These new structures allow for active management of the lake including draining the lake as necessary to consolidate sediment, decreasing turbidity, increasing emergent and submergent vegetation, providing for improved waterfowl and other wetland dependent species habitat. The lake was chemically renovated in 2024 to remove carp from the system, as carp have a negative impact on water quality.

Current Shallow Lakes and Wetlands Projects (FY26 and FY27)

BAYS BRANCH (GUTHRIE COUNTY)

Bays Branch (300-acres) is a fresh water marsh system with herbaceous vegetation of cattails, hard stem bulrush, pickerelweed, and waterlilies. The marsh has a series of water control structures to allow the marsh to be managed for annual wetland plants for the benefit of waterfowl and waterbirds. The current water control structures do not have the capacity to handle the rain events becoming more common in Iowa. This can limit the duration and type of responses that are achieved from a draw down. Additionally, siltation from the predominantly agricultural watershed, has limited drawdown capabilities as well. Rough fish have been introduced to the Bays Branch wetland system. These non-native fish reduce aquatic vegetation and water quality by increasing turbidity. Increasing the size and capacity of the water control structure and including a fish barrier will improve habitat quality and management capabilities on 300 acres.

Bays Branch is also home to one of the state's remaining populations of Blanding's Turtles, a state listed threatened species. Due to this important population staff make great efforts to ensure habitat is available for overwintering turtles while providing spring and fall migration habitat as well as nesting habitat for waterfowl. This project will encompass replacing multiple water control structures and renovating the fishery to eliminate rough fish from the system and promote a healthy aquatic ecosystem. Construction is anticipated in late 2026 or early 2027 ($550,000 ($275,000 LRP / 275,000 NAWCA)

ELM LAKE (WRIGHT COUNTY)

Elm Lake is a 460-acre lake in Wright County, Iowa, located about five miles northeast of Clarion. In the past, it was a popular destination for swimming and YMCA camps and now serves as a local destination for fishing, some boating, and wildlife watching. In 2018, DNR worked to install a fish barrier at the south end of the lake to limit fish movement into the lake by invasive carp. The barrier was ineffective and frequently plugged with vegetation and sediment. As a result,

DNR began pursuing alternative options for installing a fish barrier below the lake's outlet that would prevent fish from being able to swim up to the lake.

Project partners began developing a plan to install a velocity tube downstream of the lake that would limit fish movement and are working through the design process. Construction for the project is slated for 2026 (anticipated cost $85,000 LRP).

HARMON SLOUGH (WINNEBAGO COUNTY)

Harmon Slough is located within the Harmon Lake Prairie Pothole Joint Venture Priority Area as well as the Upper Winnebago Ducks Unlimited Living Lakes Initiative Emphasis Area. The Harmon Lake Wildlife Management Area is a wetland complex in Winnebago County. The largest wetland in the complex is the 73-acre sovereign shallow lake known as Harmon Slough. This wetland is controlled via a small water control structure (WCS), which was installed in 1974. The structure is a "Wisconsin Tube" meaning it is constructed from corrugated metal pipe (CMP) sections connected together and fitted with wooden stoplogs to control the height of water in the wetland. The WCS received repairs in 2000 and since then has been plagued with a number of minor issues making control of the water level very difficult to impossible. The structure is afflicted with a capacity that is too low to handle large events and leaking issues within the dike itself (presumably caused by the CMP pipe rusting out). When the WCS is overwhelmed the water from the wetland finds its way through the system over the emergency spillway and we have experienced large, long duration flow events that have caused significant erosion to the emergency spillway as well. The management goal for Harmon Lake would be to manage for good water quality, exclude fish, and have a good variety and distribution of native aquatic vegetation. A new WCS should make all of this possible. Design for this project to replace the WCS was completed in 2025 and was bid in late 2025 and will be completed in early 2026 ($7,500; $4000 NAWCA; $3,500 LRP).

HENDRICKSON MARSH (STORY/MARSHALL COUNTY)

Hendrickson Marsh is located in the East Indian Creek Ducks Unlimited Living Lakes Initiative Emphasis Area and the Northern Tallgrass Prairie Refuge priority area. The existing concrete structure and was constructed in 1968. The watershed of Hendrickson Marsh is over 8,500 acres, causing difficulties in water level management due to the size and design of the structure. Larger and more frequent rainfall events are also posing challenges for this marsh. The size of the watershed and the amount of water that enters Hendrickson Marsh limits the ability to successfully complete drawdowns. This has led to a more open water state with little emergent vegetation. Runoff coming through the marsh has also caused the upper end of the marsh to silt in causing a loss of nearly 20% habitat in the basin. That is now a reed canary grass flat, which provides poor quality habitat. Additionally, the introduction of non-native rough fish has led to a turbid state, minimizing the quality of the habitat and submerged vegetation. Upgrading the size and capacity of the water control structure will allow for staff to actively manage water levels, allow for the compaction of suspended sediment, the growth of emergent and submergent vegetation, and to re-water the upper end of the marsh, expanding it back to its original size. Design for this project is underway with construction anticipated in 2026; $230,000 ($115,000 LRP / $115,000 NAWCA).

MYRE SLOUGH (WINNEBAGO COUNTY)

Myre Slough is a large marsh (~220 acres) in Winnebago County, and is home to migratory waterfowl and other aquatic life. Like many other shallow lakes in Iowa, however, water quality has degraded over time, and stabilized water levels have contributed to the decline in water quality. The marsh is controlled by a water control structure that was installed about 1950. The water control structure has been feeling the effects of aging for some time. Water is controlled via two "stoplog bays" that hold wooden stoplogs and allow us to manage the water by adding or removing a piece of 4"X4" dimensional lumber about 5' long. The concrete is severely weather checked and the top of the control structure has no "walkway" so the only way to manipulate the stoplogs is by entering the water with waders, which poses a safety hazard for management staff. Additionally, the stoplogs cannot be adequately secured and so there have been numerous occasions where the stoplogs have been manipulated by vandals (either removing or adding stoplogs). The management goal for Myre Slough is to maintain the marsh in a state of interspersion of wetland plants and open water pockets or a "hemi-marsh". The functionality of the control structure is paramount to this goal and would allow DNR to manage this critical habitat. This project will encompass replacing the current structure to allow for better long-term management of the slough. Design is complete and construction is planned for 2026; $180,000 ($97,500 LRP / $82,500 NAWCA).

REED FARM (DICKINSON COUNTY)

Reed Farm is in the eastern central area of Dickinson County, Iowa, approximately ½ mile east of East Lake Okoboji. The property was historically comprised of small pothole wetlands that drain to both East Okoboji Lake and Lower Gar Lake, depending on where you are within the tracts. Recent uses of the project area have been agricultural production and pasture areas with surrounding areas being either agricultural production or previously restored wetland and upland areas, as well as a landfill directly south of the project site. The Spring Run WMA and WPA are adjacent to the site as well as other natural areas including East Lake Okoboji and Upper Gar Lake. Ducks Unlimited is working in partnership with the Iowa DNR to restore and enhance the site by restoring the hydrology on the tract and allowing historic pothole wetlands to re-establish with upland prairie restoration. Proposed work for the project involves the following: Investigation and removal of existing field tile and field tile intakes and creation of berms, some with water control structures which will allow DNR staff to actively manage new wetland areas. The project will also include the creation of a gravel driveway and parking area connected to 185th street. Wetland scraping and other excavation is needed in places on the tract to create larger and more beneficial wetland areas.

Design for the project includes berms, spillways, risers, water control structures, culverts, riprap, and other minor design elements. The goals of the project include the restoration of historic wetland and upland areas. Many ancillary benefits will be realized including the recharge of groundwater, runoff retention, improved water quality, enhanced habitat, biodiversity, and the creation of natural public areas, among others. The project model shows a reduction in discharge from the site as a result of the project, which aids the overall flood capacity of the Iowa Great Lakes region. Design for the project is complete and construction is slated for 2026 with a $150k contribution from LRP to the project.

TWELVE MILE (EMMET COUNTY)

Located in Emmet County, Twelve Mile Lake has experienced extensive hydrologic alterations, primarily through tile drainage, and has experienced sedimentation that has impacted its ability to function. The lake has had poor water quality and habitat for over 50 years. Since the 1960s, the lake has been vegetation free and in a turbid state. Aerial photos going back to the 1970s verify this condition. The lake is occasionally used for goose hunting, especially during the opener and in most springs, bullhead fishermen occasionally use the lake, but overall, the lake is very underutilized by outdoors people. This project includes engaging the local community to develop a drawdown plan for the lake and designing and installing a new water control structure that will allow for better water level management and establishment of vegetation. Carp eradication will also be a critical component of the project to help establish and maintain healthy submerged and emergent vegetation. Design for this project is nearly complete and construction is anticipated in 2026 or early 2027; $228,000 ($115,000 LRP / $113,000 NAWCA).

Future Shallow Lake Improvement Projects (within ten-year planning effort)

- Elk Lake (Clay)
- Iowa Lake (Osceola)
- Little Clear Lake (Pocahontas)
- Prairie Lake (Dickinson)
- South Twin Lake (Calhoun)
- Sunken Grove (Pocahontas)
- Trumbull/Round/Mud (Clay)
- West Swan/High/Ingham Lakes (Emmet)

Monitoring Programs and Research

AMBIENT LAKE MONITORING

The DNR invests in monitoring the status and trends of many of Iowa's publicly owned lakes. Data are collected three times each growing season (once in early summer/late spring, once in mid-summer, and once on late summer/early fall) to better understand water quality at Iowa's Lakes.

The program was created in 2000 based on lake surveys completed by Bachmann in the late 1970s and early 1990s. Currently the program includes 135 lakes throughout the state; they are monitored for chemical, physical, and biological parameters. Data are used to inform stakeholders, determine the impairment status of lakes in the state, establish water quality trends, and prioritize lakes for restoration. All data collected are made available to the public through Iowa AQUIA (online database) or through a records request made to the DNR.

The Lakes Restoration Program (LRP) has served as a partner in this monitoring program since its inception in 2000. Currently, the LRP funds a 40% cost share for monitoring program with the Water Quality Monitoring and Assessment Section in the Water Quality Bureau. Iowa State University contracts with DNR to conduct monitoring, training students in aquatic ecology, while providing important data for the state. Data collected as a part of this program are used to prioritize lakes for restoration and evaluate the success of restoration activities. Water quality data collected through this program are also used to determine how Iowans value/perceive water quality and how water quality influences lake visitation and spending rates.

SOCIAL/ECONOMIC IMPACTS OF LAKES IN IOWA

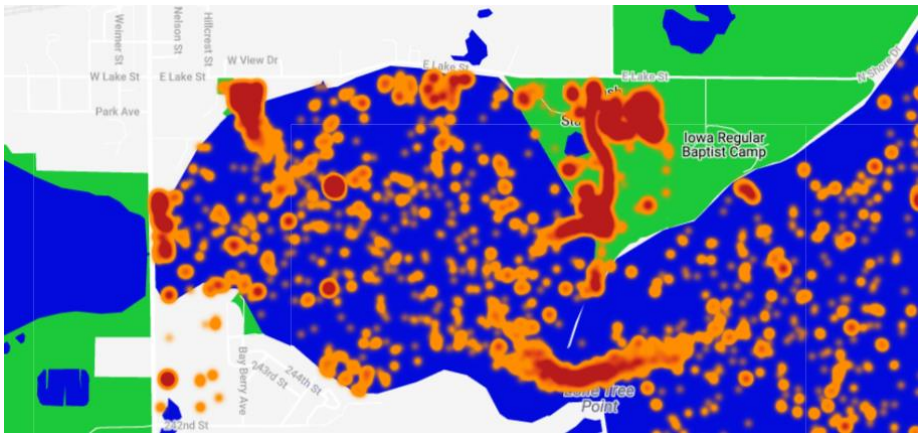
For the past 20 years, the Iowa Lakes Valuation Project (CARD Survey) was an economic study funded by the Lake Restoration Program that identified where and how frequently Iowans visit lakes and the value water quality. The survey was first conducted in 2002 through the Center for Agricultural and Rural Development (CARD) at Iowa State University, coupling survey data collected from Iowans across the state and water quality data collected through the Ambient Lake Monitoring Program. Since the program's inception, the survey was carried out in 2002, 2003, 2004, 2005, 2009, 2014, and 2019 and was jointly funded by the Iowa DNR LRP and the U.S. Environmental Protection Agency. More information on the survey and data collected through the survey can be found at: http://www.card.iastate.edu/lakes/.

The LRP began contracting with Citydata, Inc. in 2024 to capture lake usage data around the state, including visitation counts, travel distance, and basic demographic data through the use of anonymous capture data, most frequently captured through cell phone location data. DNR is currently working to capture all of the lake areas as a part of the study, and the dashboard is anticipated to be ready for public use in early 2026. The current contract will run through 2026 and capture use data for 2024, 2025 and 2026 at over 135 lakes of interest.

As a part of this effort, DNR has also been collecting lake use data through interview surveys at boat ramps since 2019. Through this effort, we've captured a snapshot of how Iowans are using our lakes and gained a better understanding of spending related to visiting individual lakes. We've learned that many Iowa lakes act as local resources, serving communities within a 10-30-mile radius. Other lakes have emerged as "destination lakes," pulling visitors from around the state for popular amenities like camping, high quality fishing, and boating experiences. Understanding how our lakes are being utilized by the public helps us target both restoration strategies and amenities for users.

In 2024, these projects captured 13.7 Million lake visits at Iowa lakes, with around 60% of the population making at least one visit a year. These visits represent $1.32 Billion in spending, and the average cost per visit is ~$36 for single day trips at Iowa lakes. Visitors from all 50 states were recorded in 2024, with highest visitation rates observed in the late spring throughout the summer months. 62% of visits were made on the weekend, and data collected from this study allows us to better understand where resources are being utilized (see heat map of visitation on the western portion of Clear Lake) to the most popular travel routes and travel distances.

ROUGH FISH BIOMASS AND COMMERCIAL FISHING



Common carp and bigmouth buffalo negatively impact water quality in many Iowa lakes. Common carp can alter their environments through their feeding habits, which consists of grubbing through bottom sediments and uprooting aquatic vegetation to find food. As a result, they are commonly associated with low water clarity and an overabundance of nutrients, especially in shallow lakes. DNR has worked to eradicate common carp, as well as other species of rough fish, from many Iowa lakes in an effort to improve water clarity and reduce internal nutrient loading associated with disturbing the bottom sediments. Complete removal of rough fish from a lake is a commonly used restoration practice, however; in some

systems it is not feasible and complete eradication of carp and other undesirable fishes can result in excessive aquatic plant growth following restoration.

A pilot study was conducted between 2008 and 2013 at Lost Island Lake, a large natural lake in Palo Alto County, where DNR incentivized commercial fishing for common carp in an effort to reduce the overall population size and biomass of carp in the lake and improve water quality. At the start of the project in 2008, Lost Island Lake had an estimated common carp population of ~450 lbs./acre. With biomass reduced to about ~70 lbs./acre, water clarity improved greatly (from ~1.5 ft. in 2008 to over 7 feet in 2013). Because the efforts were so successful at Lost Island Lake, the LRP began employing this strategy at other lakes.

Additionally, the LRP with Iowa State University on a 4-year project to better estimate population sizes of carp and buffalo at five shallow lakes around the state. The study found that electrofishing could be used as a tool to estimate carp population sizes, but that many hours of electrofishing effort were needed to accurately estimate the population size. The study also found that electrofishing was not a very effective tool for estimating population sizes of bigmouth buffalo.

Carp penned at North Twin Lake as a part of a removal project

DNR continues to look for opportunities to learn how fish populations influence water quality in shallow lakes. After several successful commercial fishing contracts, DNR Fisheries and LRP are looking for new ways to better track populations and isolate adult carp, removing them from these lakes. The first of these efforts began at Black Hawk Lake in 2025, where the LRP invested in tagging 50 carp throughout the basin and utilizing radio telemetry to track where these fish congregated during the spring spawning season. Of the 50 fish tagged, 45 (90%) were observed near the inlet fish barrier in 2025. These results suggest that a high proportion of the population visits the barrier each year and that this could be an effective location for targeted fish removal during the spawning season. Additional monitoring will be completed in 2026 with the goal of selectively removing a large proportion of fish that negatively impact water quality.

INTERNAL LOADING

Excess phosphorus in shallow lakes can fuel harmful algal blooms (HABs) which are increasing in frequency and severity in Iowa lakes. HABs are one of the biggest concerns and challenges when initiating a restoration project in Iowa. The bioavailable phosphorus (the type that plants and algae can easily use), that fuels HABs in surface waters, comes from the watershed or internal loading. While it is generally thought that the majority of phosphorus moving to inland waters is coming from the watershed, internally-cycled phosphorus can also contribute substantially to HABs, poor water clarity, low oxygen concentrations, and a host of other water quality problems. Internal phosphorus availability is driven by sediment resuspension, bioturbation from organisms such as carp, food web structure, the presence of macrophytes (aquatic plants), and the redox environment (water and oxygen chemistry). The ability to predict and understand the phosphorus cycling processes that are contributing to water quality problems in Iowa's shallow lakes is critical for implementing more cost-effective restoration and management.

The LRP hired Dr. Grace Wilkinson and Dr. Ellen Albright (first at Iowa State University, then University of Wisconsin - Madison) to conduct a multi-year study internal loading at a suite of Iowa lakes. Field work for the study was completed in 2021, and the final report was submitted in 2023. The report outlines mechanisms for internal loading in Iowa and management tools that can be used to address internal loading, include a diagnostic tool for the program that will help the program identify dominate pathways for internal loading (see below).

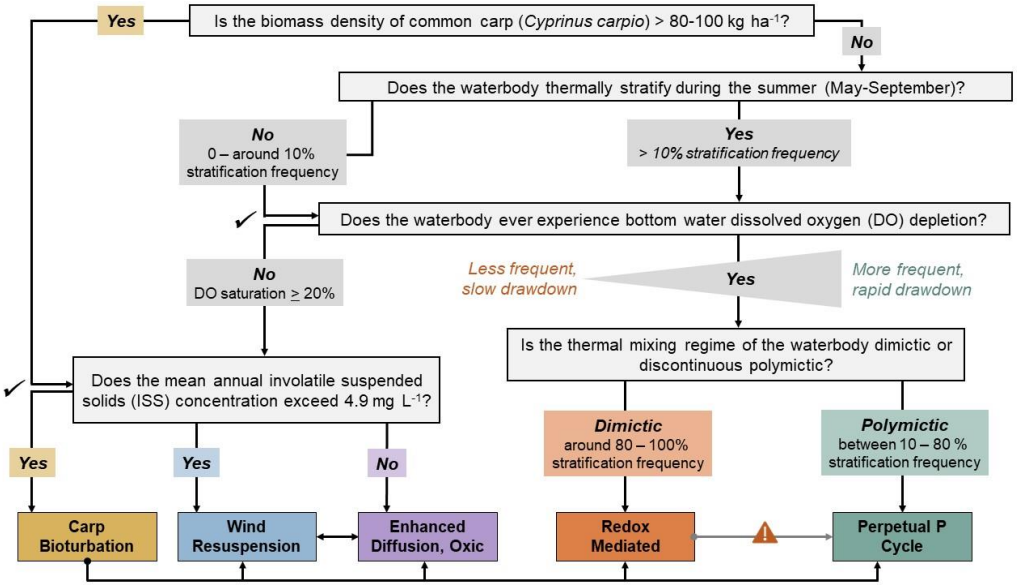


Figure 1. Flow chart showing pathways for internal loading in Iowa lakes. Albright and Wilkinson, 2023

Phosphorus Inactivation (Alum)

Internally-recycled phosphorus is very difficult to manage in shallow lake ecosystems and can have a huge impact on surface water quality. Excess phosphorus is the primary contributer to algae blooms in Iowa lakes, and thus, managing phosphorus is key to maintaining good water quality. Reducing nutrient inputs from the watershed is important for the long term success of a restoration project, but addressing residual phosphorus being recycled within the lake is also important for seeing immediate water quality improvements.

Submerged habitat visible at Prairie Rose lake following the spring alum application, which significantly improved water clarity.

One tool for addressing internal loading, is phosphorus inactivation, most often achieved by adding alum (aluminum sulfate) to a lake. Alum binds to soluble phosphorus and creates a floc on the surface of the lake sediments, reducing phosphorus release into the water column from the sediments. The LRP previously utilized alum as a part of the Carter Lake restoration project. The treatment resulted in an immediate increase in water clarity and dramatically reduced phosphorus concentrations in the lake for over five years. Given that many lakes in Iowa have substaintial internal loads, exploring tools that will allow the LRP to address this challenge. In 2023, the LRP hired Barr Engineering to conduct a phosphorus dosing study at nine priority lakes to determine if and where an alum phosphorus management program could benefit our lakes. Nine lakes were cored and lake sediments were analyzed to decide if they were good candidates for an alum treatment program. As a result of this study, the LRP treated began two alum application programs in 2025 at Green Valley Lake and Prairie Rose Lake. These treatments improved water clarity by as much as 15ft and resulted in fewer and less intense algae blooms throughout the summer, in spite of high rainfall totals. Additional treatments at two new lakes (Lake of Three Fires and Silver Lake in Delaware County) are planned for 2026.

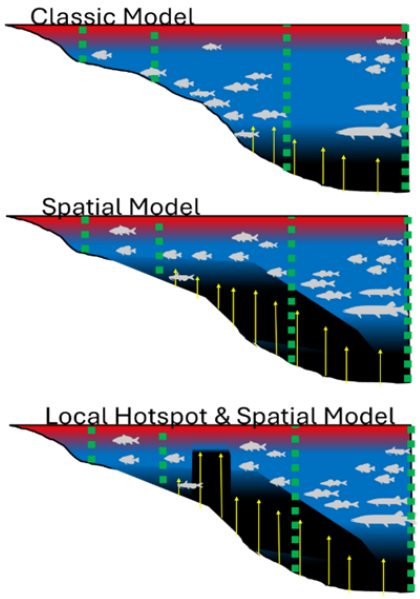
Study of Oxygen and Thermal Dynamics in Iowa Reservoirs

While Iowa is a leader in water quality monitoring at our lakes and reservoirs, we still have a limited understanding of how different areas within a reservoir function, because most data are collected from a single sampling point at each waterbody. Thus, water quality parameters that likely vary considerably across a reservoir, such as temperature and

oxygen concentrations, are oversimplified and the impacts on internal nutrient loading and harmful algal blooms is poorly understood..

Most of Iowa's public lakes are man-made reservoirs. Temperature and oxygen gradients, coupled with phosphorus-rich sediments drive internal nutrient loading in our reservoirs. DNR has invested heavily in both understanding the mechanisms for internal nutrient loading in our lakes and reservoirs, as well as managing internal loading in several lakes through alum applications to inactivate phosphorus being released from the sediments. However, the variation in oxygen and thermal stratification (oxythermal dynamics) across our dendritic reservoirs is not well-documented. Oxythermal dynamics influence everything from algae blooms to fish distrubution and habitat use across reservoirs (see conceptual diagram above).

The classic model described in limnological and freshwater ecology textbooks (Wetzel 2001; Kalff 2002; Dodds & Whiles 2010) would indicate that both temperature and dissolved oxygen are evenly distributed as descriptions of temporal change are based on a single point, often the deepest point. Reservoirs are highly spatially heterogeneous with multiple drivers. Understanding what mechanisms are present in Iowa reservoirs and where different features will help the Lake Restoration Team be more targeted in their restoration work. In the above, red indicates too warm, black indicates low DO, blue indicates habitable water for most species with yellow lines showing where phosphorus may be released from sediments and influence internal loading. The vertical green lines show locations where profiles and loggers may capture variability, though spatial integrators like fish could be key in identifying localized hotspots.



The DNR Lake Restoration Program (55%), DNR Fisheries Bureau (18%) and Iowa State University (27%) are collaborting on a multi-year study to gain a better understand oxythermal dynamics in Iowa reservoirs. This study will use computer 1-Dimensional modeling to characterize temperature and oxygen dynamics. This approach will leverage 25 years of monitoring data from over 100 reservoirs already collected by DNR, with fine-scale data collected by ISU students from a subset of 20 reservoirs, and provide a unique tool for predicting reservoir responses to different restoration activities. Additionally, we will use acoustic telemetry, and tagged fish as biological indicators of sufficient oxythermal conditions in our reservoirs, providing insight about stocking, habitat use and restoration efforts.

The results of this project will lead to a better understanding of spatial and temporal oxygen and temperature dynamics in Iowa reservoirs and how they impact both water quality and fish, and provide management recommendations to guide future lake restoration and fishery improvement projects in Iowa resevoirs.

Partnerships and Outreach

LOCAL, STATE, AND FEDERAL PARTNERSHIPS

In order to achieve lake restoration goals it is critical that the DNR form effective watershed partnerships. This includes partnerships at the local level, but also at administrative levels of government. Local, state and federal programs offer a multitude of programs for financial assistance to landowners for soil conservation and other water quality protection practices. The strategy pursued in the lake restoration program will be to seek out key individuals with expertise at the local level and the program administration level. This expertise will maximize access to financial incentives for landowner participation in watershed improvement and lake restoration projects. Listed below are several examples of potential partners in watershed improvement and lake restoration.

Local:

- Chamber of Commerce, City/Town Mayors and Councils
- Conservation and Recreation Clubs and Organizations
- County Board of Supervisors, County Conservation Board
- DNR Field Offices (Environmental Services, Fisheries, Forestry, Parks, Wildlife)
- IDALS/ Division of Soil Conservation and Water Quality- Project Coordinators
- Lake Associations / Groups / Watershed Organizations / Private Landowners
- Soil and Water Conservation Districts (SWCD)
- Resource Conservation and Development (RC&D)

State:

- IDALS/ Division of Soil Conservation and Water Quality
- Iowa Department of Transportation
- Iowa Environmental Council
- Iowa Farm Bureau
- Iowa Natural Heritage Foundation
- State Revolving Fund

Federal:

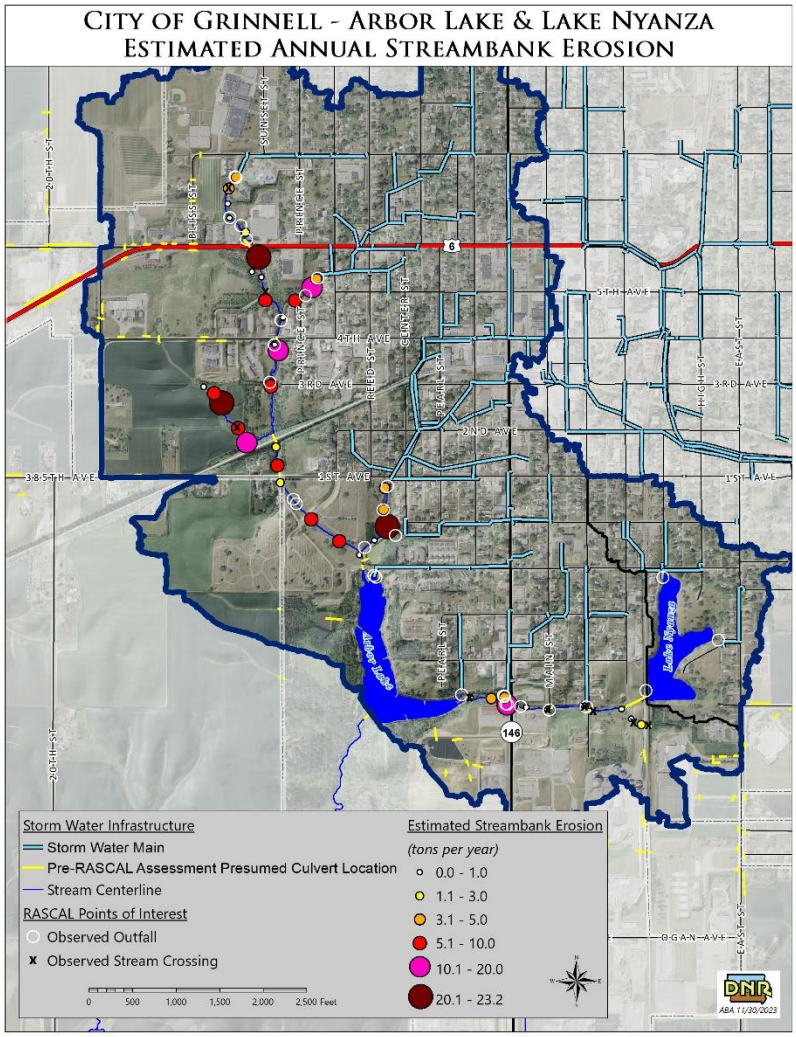
- U.S. Environmental Protection Agency / U.S. Fish and Wildlife Service
- Natural Resources Conservation Service
- U.S. Army Corps of Engineers / U.S. Geological Survey

Current and Recently Completed Projects

Arbor Lake and Lake Nyanza, Poweshiek County

Background

Arbor Lake, a small urban lake (15 acres) in Grinnell, Iowa, with a watershed to lake surface area ratio of 66:1. The City of Grinnell reached out to the LRP to address ongoing water quality concerns at this popular lake. The lake was impaired for nutrients and siltation in the early 2000s, and a TMDL was developed in 2003 to address these water quality challenges. The City reached out to FYRA Engineering (now HEI) in 2021 to complete a monitoring study and make recommendations for future restoration work that would improve water quality and recreational opportunities at the park. Results from the monitoring study show high levels of nutrients and excess soft sediment accumulation in the upper arms of each lake (about 50,000 CY in each lake).



Planning for Future Work

In 2023, DNR and the City hired Houston Engineering (HEI) to create a watershed model, complete in-lake sediment testing, and develop a suite of restoration alternatives for both lakes. Additionally, DNR staff completed a watershed assessment and a timber stand assessment, with the goal of prioritizing areas within city parks that could benefit from forest management and instream restoration work. The goal of this study and all of the assessment work being completed is to give project partners a road map for restoring water quality and improving recreational opportunities at lakes within the City of Grinnell. Total cost for the study is $128,300 (50/50 cost share with the City of Grinnell). The study was completed in 2024 and called for a variety of stormwater practices to help reduce pollutants being delivered to both lakes. Additionally, the plan outlines potential strategies for restoring water quality in both lakes. The City of Grinnell and DNR hired HEI Engineering to select recommended practices and develop a restoration plan, which includes final design and engineering, public outreach, permits, and easements associated with meeting the restoration goals and recreational opportunities for Arbor Lake and Lake Nyanza. The total cost for the restoration plan is $800,400 (75% DNR - $600,300; 25% City - $200,100), and implementation of watershed and in-lake improvements are scheduled to begin in 2028.

For More Information

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Badger Creek Lake, Madison County

Background

Badger Creek Lake has great potential to become one of Iowa's premier recreational areas due to its proximity to the Des Moines Metropolitan Area and its size and configuration. However, current water quality at the lake is poor, with heavy siltation and frequent nuisance algae blooms plaguing this 269-acre lake. These water quality problems have led to several impairments for the primary contact and aquatic life uses at the lake.

The Lake Restoration Program identified Badger Creek Lake as a priority for future funding and restoration efforts in the 2010s and began working with partners to implement a watershed improvement plan. This management plan establishes water quality goals and builds on the current efforts of project partners toward the Total Maximum Daily Load (TMDL) goals already established for the lake.

Watershed Improvements

In the watershed, project partners are working to address sediment and phosphorus loading to the lake. Accomplishments to date on private land include three grade stabilization structures, 4.7 acres of filter strips, 35,992 feet of terraces, 8.9 acres of grassed waterways, 439 acres of cover crops, 207 acres of conservation cover (CRP), and 40 acres of pasture/hay land management. Accomplishments on public land in the watershed include three grade stabilization structures, two sediment basins, 257 acres of brush management including removal of Tartarian honeysuckle, and 17 acres of prairie STRIPS.

STRIPS is an integrated prairie and agriculture system that utilizes small strips of prairie (10% of the total field area) at the base of a row-crop agricultural field to reduce nutrient and sediment exports from the field and improve soil health. Prairie strips also provide a number of other ecological benefits.

Additionally, sediment detention structures were built on public land in 2017 to reduce sediment input to the lake and reduce phosphorus loading. These structures eliminate active gully erosion in the watershed and treat surrounding surface water runoff. Three wet ponds and two dry ponds were constructed for a total cost of $116, 392 with a 50/50 cost share between DNR's Watershed Improvement Section (Section 319 funds) and the Lake Restoration Program. Additionally, one of the ponds constructed has the capacity to be used as a fish rearing pond.

Finally, invasive species and woody encroachment removal continues on the Badger Creek Wildlife Management area. Removal of non-native and undesirable plant life near the lake will allow new plants to be established that will help stabilize the soils in the management area. Curly leaf pondweed, an undesirable aquatic plant was also treated in 2018, resulting in a 70% reduction of the plant in Badger Creek Lake. This reduction provides improved fishing access and may help reduce the severity of summer algal blooms.

Planning for In-Lake Restoration

Preliminary planning for in-lake restoration activities at Badger Creek Lake is also underway. Sedimentation in the arms of the lake has reduced the mean depth of the lake and caused some issues with sediment re-suspension due to wind and wave action. High nutrient concentrations currently fuel intense algae blooms during the summer months. Thus, it is important to address nutrients entering the lake before tacking in-lake restoration work.

DNR Fisheries staff also installed several cedar tree brush piles over the winter to improve fish habitat and fishing success in 2015. Brush removal began on state land near the lake where two grade stabilization structures are planned. Finally, a comprehensive fishery survey was completed in 2018, yielding good numbers of quality bluegill and crappies.

In 2019-2021, wildlife staff continued to work to improve the wildlife management area surrounding the lake, removing invasive species and installing fire breaks so the area could be better managed in the future. The long-term goal is to manage the area as an oak savannah prairie. Invasive brush was cleared through manual removal and herbicide applications, and native seed was used to restore prairie at the park. Watershed improvements have been a collaborative initiative, using a combination of funds, including a US EPA Section 319 grant, and funding from the Wildlife Bureau and Lake Restoration Program. Native vegetation helps stabilize soils and prevent erosion into the lake, and provides excellent habitat for upland species.

In 2022 and 2023, project partners worked to install sediment retention structures on publicly owned property in the next two years. DNR Engineering designed and built several small several sediment detention ponds and grade stabilization structures that will reduce sediment inputs to the lake and intercept nutrients from throughout the watershed.

A hand wheel for the dam gate valve was purchased in 2025, which will allow managers to completely drain the lake. In-lake improvements have not yet been defined, but could include shoreline stabilization, targeted dredging, outlet structure maintenance, and fish habitat enhancements. Several cohorts of Common Carp are also present, so the project will involve a fishery renovation. Project partners plan to hold a stakeholder meeting in 2026 to develop project scope for restoring the lake.

Cedar trees and brush were installed on ice in the winter of 2015 to provide additional fish habitat within the lake.

Badger Creek Lake has a stable fishery, with good numbers of catchable bluegill and crappie, and a moderate abundance of largemouth bass.

For More Information

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Big Creek Lake, Polk County

Background

Big Creek State Park/Lake is a major recreational destination for the citizens of Iowa. Over 350,000 visitors travel to Big Creek each year and generates over $19 million in spending annually. Improving the lake's water quality through watershed improvements is critical to maintaining and even increasing recreational use of the lake.

Big Creek Lake is currently on the impaired waters list for high levels of bacteria and poor water quality associated with algae blooms. A comprehensive review of the watershed indicates that the watershed annually delivers approximately 6,379 tons of sediment and 8,280 pounds of phosphorus to the lake. We must significantly reduce these numbers to improve the lake's water quality and extend the lifespan of the lake. Additionally, we must also reduce waste products from humans and animals within the watershed that adversely affect water quality. During the past several years, Blue-green algae blooms put Big Creek Lake in the news multiple times. Water quality sample data also revealed high E. *coli* levels at the beach.

Soil Quality Restoration at Big Creek Lake

Projects Completed to Date

- A 2007 development grant provided analyses of the Big Creek watershed. In addition, a 2008 gully analysis and 2009 land use analysis established a better understanding of critical areas in the watershed. Watershed assessment identified several gullies with severe erosion on publicly owned property.
- The Iowa DNR Watershed Improvement Section completed a Water Quality Improvement Plan in September 2010 and in March 2010 contracted with the Iowa Department of Agriculture and Land Stewardship to provide Polk SWCD and Boone SWCD with funding to complete a Watershed Management Plan. The EPA approved the Big Creek Watershed Project for $292,834 over the five-year duration of the project.
- Extensive water quality sampling was completed in the tributaries and main lake during 2011. Intensive beach monitoring began in 2013 and has continued over the past several years to better understand where beach bacteria are coming from and how to best manage the beach to minimize risk from pathogens.
- Watershed coordinators working on the Big Creek watershed formed a Big Creek Citizens Advisory Committee.
- Education efforts, beginning in 2015 included numerous programs, such as female landowner meetings, public presentations, and the annual Big Creek Appreciation Day. Project coordinators taught over 200 4th graders about soil and water conservation during an outdoor classroom event.
- Sediment basin construction on the two most severely eroded gullies was completed in 2015 and alternative BMP's will be explored for the other gullies that contribute significant sediment to the lake.
- Best Management Practices (BMPs) have been installed throughout the watershed, including 24.3 acres of grassed waterways, 8 sediment control basins, 13 acres of streamside buffers, 1720 feet of terraces, 1200 acres of cover crops, and 2 grade stabilization structures.
- The U.S. Army Corps of Engineers replaced the outlet structure on the lake between 2016 and 2019.
- Goose management continues at the beach to help reduce bacteria levels in the lake. Park staff have worked extensively to design and implement a beach-grooming program to reduce goose feces at the beach.

Additionally, DNR Watershed Improvement Section staff have monitored the lake extensively for several years to learn more about if and where pathogens are found when high levels of beach bacteria are recorded.

- The DNR Lake Restoration Program and DNR's watershed Improvement section (319 funds) partnered to construct a large grade stabilization structure on park land. Construction was completed in 2017 at a cost of $25,275.

Planning for Future Work

Runoff from rain events at the beach contributes to ongoing issues with indicator bacteria, leading to spikes in bacteria concentrations after rainfall events. In 2024, DNR's Watershed Improvement Section hired Shive Hattery to provide project partners with a suite of BMP's to reduce overland flow of water at Brushy Creek Lake and Big Creek Lake beaches. The original contract was amended in 2025 to incorporate modifications to the Big Creek Lake beach parking lot area that will redirect overland flow from the beach. Shive is in the final stages of BMP selection, permitting and design. The goal is to effectively reduce bacteria concentrations at the beach and the total cost for engineering is $147,450 ($117,950 319 Program; $29,500 LRP). Construction of BMP's is slated for fall of 2026.

The long-term goal for Big Creek Lake is to continue to improve water quality through the installation of BMPs in the watershed and improvements in the park. The Lake Restoration Program will continue to partner with other groups to make improvements to the lake and watershed.

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Big Hollow Lake, Des Moines County

Background

Big Hollow Lake is a 178-acre lake located within Big Hollow Recreation Area, and is managed by the Des Moines County Conservation Board (DCCB). According to the 2014 CARD survey, the lake has an estimated 41,000 visitors annually, and is a popular destination for fishing, boating, and trail use. The lake is currently listed as impaired due to high levels of algae and a pH (associated with high levels of algal growth). The lake is surrounded by a predominately agricultural watershed with some highly erodible soils that contribute nutrient and sediment pollution to the lake and fuel algae blooms.

Current Restoration Activities

As a result, the DCCB, Iowa Department of Agriculture and Land Stewardship (IDALS), local stakeholders and the DNR are working address pollution in the lake, develop a comprehensive watershed assessment, and plan to identify priority conservation areas within the watershed for Best Management Practices (BMPs). One component of this planning effort entails better understanding existing BMP structures within Big Hollow Recreation Area. Additionally, understanding lake sediment geochemistry is critical for addressing internal nutrient pollution within the lake. Therefore, the LRP and the Des Moines County Conservation Board (DCCB) hired FYRA Engineering, Inc. to complete an evaluation of the sediment chemistry at Big Hollow Lake to determine what role internal nutrient recycling plays in the overall water quality observed ($20,137 LRP; $2,347 DCCB). The study also addressed the impacts of gypsum accumulation within the lake and was completed in early 2022.

In 2024, the local SWCD hired a watershed coordinator to lead conservation efforts highlighted in the watershed management plan through 2029. The coordinator is funded by a 319 grant, and working with 15 watershed landowners to install BMP's that are targeted at reducing sediment and nutrient loading to the lake. To date, watershed landowners have seeded 350 acres with cover crops (>7% of the 4,600-acre watershed) and installed two terraces. The coordinator is currently collaborating with DCCB, IDALS, and DNR on a proposed wetland.

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Black Hawk Lake, Sac County

Lake Restoration at Black Hawk Lake

Black Hawk Lake is the southern most natural lake in Iowa, located in Sac County, Iowa, near the town of Lake View. This 922-acre lake has a watershed of 14,097 acres and has faced numerous water quality problems that have been documented as early as the 1930s. Restoration at Black Hawk Lake began in 2012 to improve water clarity in the lake, provide a better sport fishery for anglers, and to improve water quality in the lake by reducing nutrient and sediment inputs to the lake.

Black was one of the original 35 lakes prioritized for funding in the Lake Restoration Program due to its poor water quality, high use, and small watershed to lake area ratio (15:1). According to the CARD survey completed by Iowa State University, over 64,000 people visit the lake annually, taking part in a variety of recreational opportunities, including: swimming, fishing, boating, and wildlife watching.

Community members began meeting in 2008 to discuss improvements within the lake. Black Hawk Lake had suffered from a long history of poor water quality, including frequent and intense summer algae blooms. A Diagnostic and Feasibility Study by Iowa State University was commissioned in 2008 to better understand nutrient loading to the lake and identify potential restoration strategies for the lake and watershed. Planning efforts and the study determined that reducing phosphorus from the watershed, as well as in-lake work, including dredging the inlet and rough fish removal would improve water quality in the lake.

A TMDL for the lake was also completed in 2008 that helped project partners identify areas of the watershed where best management practices were most critical. A watershed plan was developed and in 2012, a watershed coordinator was hired through the US EPA Section 319 grant program to work with local landowners to implement pollution reducing management practices on their land.

Past Restoration Work

Watershed improvement efforts have continued since 2012, and to date, over 211 practices have been installed in the watershed, including 2 CREP wetlands, 15,915 feet of stream restoration, 46.1 acres of grassed waterways, 46,455 feet of terraces, and 47.5 acres of wetland restoration. Additionally, the City of Lake View has worked to reduce storm water runoff to Black Hawk Lake through the installation of numerous urban practices including bioswales, a wet detention pond, and rain gardens. Together, these practices have reduced the annual sediment load to Black Hawk Lake by 4,034.8 tons and the annual phosphorus load by 8,678.3 pounds. This represents over 50% of the phosphorus reduction goals laid out in the watershed plan.

In-lake restoration work also began in 2012. Capitalizing on a historic drought, project partners first worked to lower the level of the lake using siphon tubes. Fish barriers were then installed around inlets to the lake to prevent migration of undesirable fish species into the lake, including common carp and bigmouth buffalo. A fish barrier was installed at the outlet of the lake, constructed and fabricated by a local company; the barrier was funded by a local county endowment fund and the lake protective association (LPA) for $21,000.

In the fall of 2012, after the lake was lowered, the lake was chemically treated to renovate the fishery, removing all undesirable fish from the ecosystem and re-stocking the lake with a healthy sport fishery. Over 354,000 pounds of undesirable fish that contributed to high turbidity were removed from the lake. Since 2012, the sport fishery has continued to grow and thrive, and the lake once again has a strong muskellunge fishery. The City of Lake View and the Black Hawk Lake Protective Association also recently invested in an ADA fishing pier and fish cleaning station that makes angling more accessible for everyone and provides new recreational opportunities at the lake. Creel surveys to better understand lake use and angling pressure resumed in the last several years, including a winter creel survey in 2018-2019 to evaluate the social and biological impacts of the fishery renovation.

Shoreline armoring has also been critical for turbidity in the lake caused by erosion. Approximately 350 of shoreline along Denison Beach as armored using field stone. Additionally, a section of shoreline near Ice House Point was armored using a combination of native seedings and native field stone to stabilize the shoreline. Funding for this work was provided through a wildlife management grant, and work was completed in 2014 and 2015.

Following the fishery renovation in 2012 and numerous improvements to the watershed, the water clarity in Black Hawk Lake has been significantly improving. Because of the improved water clarity, vegetation has started to grow in the lake basin on scale that has not been seen in decades. While aquatic vegetation is essential to maintaining good water quality and sport fish populations, it can interfere with certain types of aquatic recreation if there is too much vegetation. DNR fisheries wrote a comprehensive aquatic vegetation management plan to address these issues. As a result, the Lake Restoration Program purchased an aquatic vegetation harvester to remove excess vegetation from the lake in select areas and facilitate recreation at Black Hawk Lake. The harvester has been operated annually by the City to control excessive vegetative growth. Periodic herbicide applications have also been completed with the help of the LPA to create boating lanes around the perimeter of the lake and channels to the main basin for recreational boating.

In 2015, a small scale dredging projected was completed at the State Marina using Marine Fuel Tax funds to remove 3 feet of soft sediment from the lake bottom. The total cost of this project was $93,390, and allowed for better access to a cove of the lake that was especially shallow. The combined efforts of the community and improvements in the fishery and lake water quality have led to a boom in local tourism. The campground (operated by the City of Lake View) has experienced record high camping registrations due to positive changes in the lake (see photo below).

In 2015, work also began to dredge the inlet of Black Hawk Lake. The Merehoff Tract, which had previously been used as a containment site, was excavated to be re-used as a spoil site for dredging the inlet of the lake. A contract was awarded to Spring Lake Construction for $729,533 to prepare the site for dredging. Dredging of approximately 330,000 CY of soft sediment from the inlet began in 2017 and was completed in 2020 by Bedrock Gravel at a cost of $1.9M. As a part of the project, the channel throughout the inlet was also re-meandered, allowing for additional sediment and nutrient storage. This project will reduce sediment and nutrient loads to the lake by approximately 65% and is critical for continued water quality improvement.

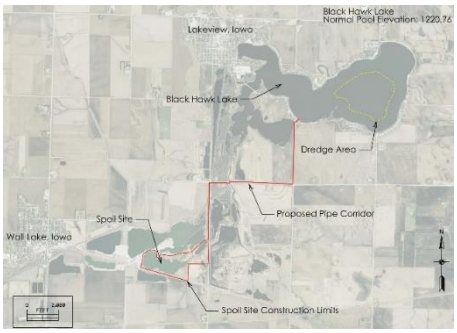
Managing fish migration between the inlet and the main basin of the lake is critical for the long-term health of both systems. Rough fish species, like common carp and bigmouth buffalo, generally spawn in shallow lakes and wetlands, so minimizing movement of these species is critical for long-term health of the ecosystem. Construction of the barrier was

a joint effort amongst many project partners (photo to the right). Ducks Unlimited designed and oversaw construction of the project, and funding was a collaborative effort between the City of Lake View (utilizing sponsored project funds from SRF), US EPA Section 319 funds, the Lake Restoration Program, REAP Open Spaces, and the local Lake Protective Association. Total project costs for the barrier was $843,500, and was completed in the spring of 2021.

Fisheries staff worked throughout the summer of 2021 to lower water levels in the inlet (which they were able to complete utilizing the new pump installed with the fish barrier) and renovate the fishery in the inlet. By drawing the inlet down and removing rough fish from the system, they will promote the growth of healthy aquatic vegetation throughout the basin and improve overall ecosystem health.

In 2020, DNR secured the rights to spoil material at a nearby quarry pit. Since the right were initially secured, DNR has worked with local project partners to ensure that a safe and effective dredging project can be executed at Black Hawk Lake. DNR worked with the Iowa Geological Survey to examine potential impacts to the nearby water supply wells. Additionally, project partners invested in water quality and sediment monitoring at both the lake and the intended spoil site to better understand the types of materials being moved and potential impacts to overall water quality at each location.

A major dredging project in the main basin of the lake was completed in 2022 and 2023, removing 785,623 CY of sediment (see photo at right). This effort increased the average depth of the lake in the 220-acre dredging area by 4 feet. Dredging will minimize excessive aquatic vegetation in the main basin of the lake and reduce re-suspension of sediments due to wind and wave action, thus, improving overall water quality and recreational opportunities in the lake. JF Brennan was hired to complete the project, spoiling material in a nearby quarry pit. Total cost for the dredging efforts: ($6.7 Million; $6.5 Million LRP; $200k Black Hawk Lake Protective Assn.) Additionally, shoreline stabilization work was completed at Black Hawk Lake in 2022, with a project to reduce erosion and improve shoreline access along gunshot hill within Black Hawk State Park. Total investment for all restoration work completed to date $18.5 Million. Lake Restoration Program investment of $9.8 Million



Current & Future Restoration Work

DNR fisheries and the LRP are tracking Common Carp movement with acoustic telemetry to quantifying visitation at the fish barrier (photo to the left). Spring runoff creates flow at the barrier, attracting carp to the bottleneck between the main lake and Provost Bay. Environmental variables, such as water temperature, water quality and flow rates are also being monitored to determine if carp respond to environmental cues. DNR fisheries tagged 50 carp in the spring of 2025, and 45 (90%) of the tagged fish visited the barrier before the end of the year. The majority of the visitation occurred in May/June, corresponding with the spawning period ($59k LRP). Intense and predictable visitation presents an opportunity to capture and remove carp to reduce abundance and improve water quality.

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Blue Lake, Monona County

Background

Blue Lake is a Missouri River oxbow lake located in Monona County three miles west of Onawa and three miles east of the Missouri River. The lake was an active channel of the Missouri River in 1804 when the Lewis and Clark expedition went through the area. The lake is now part of Lewis and Clark State Park. Current water quality impairments include aesthetically objectionable conditions caused by excessive algae and low water clarity due to algal and non-algal turbidity. These problems combine to limit the recreational use of the lake.

The Lake was chemically renovated and rough fish removed in 2006. 2007 showed considerably better water quality in the lake as rough fish were no longer disturbing bottom sediments and removing rooted aquatic vegetation. However, high water in 2007 and 2008 allowed rough fish to re-enter the lake and caused poor water quality conditions to return.

The Department of Natural Resources (DNR) completed a Water Quality Improvement Plan for Blue Lake in 2008. DNR held public meetings in 2008/2009 to present the lake assessment and restoration process and develop a local technical advisory team of conservation agencies and local stakeholders to help guide the project. Objectives of the project are to reduce nutrient and sediment inputs from the watershed, reduce re-suspension/recycling of in-lake nutrient and sediments, eliminate rough fish introductions and evaluate lake and water table interactions.

Completed construction on Nebowa Bay in Fall 2016

A public meeting was held in March of 2011 to discuss potential restoration efforts with the community. Lake Restoration contracted with MSA Professional Services to conduct a diagnostic-feasibility study on the lake. Extensive data collection was conducted by local DNR staff throughout 2010. The final report from MSA on the diagnostic-feasibility study was completed in November of 2011. The report proposed that construction of a storm water settling basin, reconstructing water control structures to minimize common carp introductions, dredging and removal of common carp will achieve desired water quality goals for the lake.

A Technical Advisory Team meeting continued to work in 2013 to discuss the report and develop a restoration and implementation plan.

Recent Restoration Activities

The last several years have been busy construction years for the lake. The MSA diagnostic-feasibility study called for four major restoration activities to achieve water quality goals.

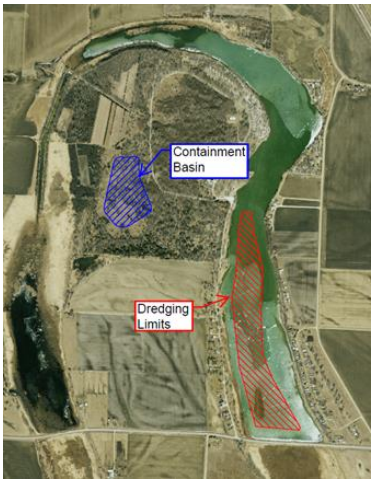
1. Construct fish barriers around the lake to exclude rough fish from the lake
2. Reduce nutrients entering the lake from the watershed by installing ponds in the watershed.
3. Selectively dredge areas of the lake to minimize sediment and nutrient re-suspension in the water column and reduce impacts of aquatic vegetation.
4. Chemically renovate the fishery to remove the rough fish population from the lake.

The lake aeration system was upgraded in 2013 with a new motor and blower to prevent fish winterkills. In 2015, a variety of fish barriers were installed around the lake to minimize the ability for rough fish, mainly carp, to enter the

lake. Blue Lake is the first Iowa lake to utilize rotating screen fish barriers (as pictured) that allow managers to more easily clean the barriers and minimize water backups from debris.

Construction was started on renovating and improving Nebowa Bay in 2015. The creation of ponds within the watershed was specifically called for in the diagnostic and feasibility plan, and the rehabilitation of the bay, including the mechanical removal of sediments, will allow the bay to act as a natural filter for the watershed. Construction of the bay was delayed considerably in 2015 due to very high water and heavy rains throughout the construction period. High water continued in the spring of 2016, however, construction was able to be completed in the fall of 2016. Installation of the three fish barriers in the lake and the excavation of Nebowa Bay/Church Camp Slough cost a total of $357,529. The enhancement of the bay will also help limit the interaction of the McCandless-Cleghorn ditch and the lake during high water events.

Project stakeholders decided the next step in the restoration process was to update the well/pump system that helps keep water levels stable in Blue Lake. Aging infrastructure and a broken pipe limited the DNR's ability to manage water levels at the lake. As a result, during years of drought, water levels dropped significantly. Prior to pursuing a dredging plan for the lake, it is important to be able to maintain an adequate pool level for the lake. Thus, design was completed to update the pump system by replacing the outdated pipe to the lake and increasing the pumping capacity of the system to better maintain water levels during low water years. A new pipe was replaced in 2018, at a cost of $319,792. Additionally, the pump was tested to verify added capacity of the system with the new pipe in place.



Project partners also worked to stabilize critically eroding shoreline and re-vamp the beach in 2017. The KOA campground armored part of the shoreline on their property along the Eastern shore of the lake. DNR armored 1,795 feet of public shoreline along the western shore and replaced the seawall at the beach. The DNR project was completed in 2018 at a cost of $174,242.

The third action identified within the management plan was to selectively dredge areas of the lake to improve water quality and recreational opportunities. DNR located a spoil site within the park and hired Shive-Hattery Engineering to design the containment site and dredging project ($328K LRP). In 2020, construction began on the spoil site, building embankments to contain dredge material ($786K LRP). The dredging project was bid in the fall of 2021, with construction completed in 2022. 455,385 CY of soft sediment was removed from the lake ($1.9 M; Dredge America; LRP funded) and increased depth in the 100-acre dredge area by 2.7 feet.

A comprehensive rough fish population study was initiated in 2017 and completed in 2021. Due to the shallow nature of Blue Lake, excessive vegetation could become a concern if the entire rough fish population is eradicated. High numbers of carp, but virtually no buffalo were found in the lake. Managing the carp population at a low density through commercial angling is being considered. Carp have a negative impact on overall ecosystem health, disturbing bottom sediments and uprooting aquatic vegetation that reduces re-suspension from wind and wave action in the lake.

In 2025, DNR responded to public inquiries regarding the low water levels at Blue Lake. DNR fisheries presented at a well-attended (210 attendees) public meeting in

Onawa. Following the meeting, DNR extended the boat ramps at Blue Lake to improve usability during low water conditions. In addition, 115 acres of volunteer trees and phragmites in the exposed lake bed were sprayed with herbicide by a contracted drone operator ($7k LRP).

Future efforts

To improve communication between the DNR and the local community, an email delivery system was developed. The DNR intends to draft a quarterly newsletter that will provide updates for Blue Lake, Lewis and Clark State Park and other surrounding resources. To sign up, please email

The DNR hired Shive Hattery to evaluate the well pump output capacity, develop a water budget and ultimately provide cost-effective recommendations for future use of the pump at Blue Lake. In 2025, the DNR completed necessary maintenance to the pump and installed additional components for the study (photo to the right). To date, $52k (LRP) has been spent on the analysis, parts and pumping.

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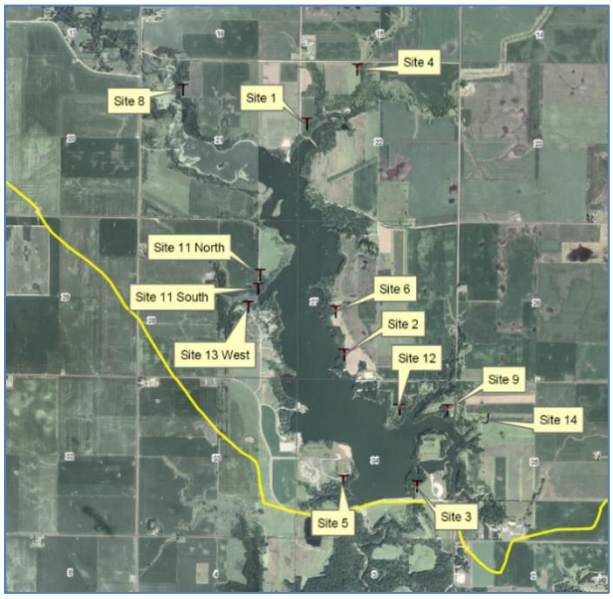
Brushy Creek Lake, Webster County

Background

Brushy Creek is a 690-acre lake, constructed in 1998 that is managed by the DNR. The lake is a major recreational destination for Iowans, offering swimming, beach cabana rentals, fishing and boating. Nearly 140,000 visitors travel to Brushy Creek Lake each year. Improving the lake's water quality through active management and enhancement projects is important to maintaining and increase future use.

At 6,500 acres, the surrounding recreation area is one of the largest state parks in Iowa. The 45 miles of trails can be used for horseback riding, mountain biking, hiking, snowmobiling and cross-country skiing. The Brushy Creek offers camping and shelter rentals, along with hunting and target-shooting opportunities.



The Webster County Soil & Water Conservation District led a watershed project from 2005 to 2010, with a goal of implementing best management practices (BMP's) in the watershed. Projects were funded by the Conservation Reserve Program (CRP), Environmental Quality Incentives Program (EQIP) and the 319 program. Matching funds from 17 partners, included the DNR, were used to improve water quality at Brushy Creek. The DNR Lake Restoration Program contributed by installing 13 grade control structures within the park in 2010 for $64,618 (see site map to the left). In total, the conservation practices implemented during this 5-year project reduced sediment loading to the lake by of 1,765 tons per year.

Current Restoration Efforts

Runoff from rain events at the beach contributes to ongoing issues with indicator bacteria, leading to spikes in bacteria concentrations after rainfall events. In 2024, DNR's watershed improvement section hired Shive Hattery to provide project partners with a suite of BMP's to reduce overland flow of water at the Brushy Creek and Big Creek beaches. Shive is in the final stages of BMP selection, permitting and design. The goal is to redirect stormwater runoff and reduce bacteria concentrations at both beaches. The total cost for engineering is $147,450 ($117,950 319 Program; $29,500 LRP) and construction is slated for 2026.

The Lake Restoration Program will continue to seek partnerships and work toward improving water quality at this popular lake.

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Carter Lake, Pottawattamie County

Background

Carter Lake is a natural lake that is uniquely located in both Iowa and Nebraska. Carter Lake is an old oxbow of the Missouri River that was isolated from the river main channel in 1877. The lake is approximately 300 surface acres at conservation pool elevation 970.0 feet, with a watershed area of 2,675 acres (watershed area to lake area ratio of 8/1). The lake is approximately 75% in Nebraska and 25% in Iowa. Park areas in Nebraska and the City of Carter Lake in Iowa dominate land use adjacent to the lake. Problems at the lake had centered on poor water quality, chronic low water levels and nuisance algae bloom. Past impairments included nutrients/algae, indicator bacteria, and fish contaminants (PCBs).

Restoration Work

Carter Lake is a highly productive lake with a history of poor water clarity, high nutrient concentrations, frequent algal blooms, and periodically high bacteria. Given the nature of the problems at Cater Lake, corrective measures focused on the reduction of phosphorus, which is the driving force behind algal production. The goals for this project pertained to protecting aquatic life and public uses of the lake such as recreation, fish consumption, and aesthetics.

- Restoration of Carter Lake involved the cooperation of Iowa, Nebraska, and the cities of Omaha and Carter Lake. A local Iowa group, the Carter Lake Preservation Society (CLPS), was very active in moving this project forward. In 2006, the cities of Carter Lake, Iowa and Omaha, Nebraska, requested assistance from environmental agencies in addressing water quality problems at Carter Lake. The Carter Lake Environmental Assessment and Rehabilitation (CLEAR) Council, with assistance from numerous local and state agencies, developed a conceptual plan to address water quality concerns. The community led steering committee finalized the Carter Lake Water Quality Management Plan in the spring of 2008.

- Fall 2008, the Metro Area Planning Agency (MAPA), with support of project partners, selected Tetra Tech, Inc. for the purpose of preliminary design and engineering of critical components of the Water Quality Management Plan for Carter Lake. Their work focused on the restoration alternatives of water-budget/seepage management, dredging, storm water, and in-lake alum treatment. By winter of 2009 projects partners had enough information on probable cost, effectiveness and permitting issues to determine how to best move forward with implementation.

- Metropolitan Area Planning Agency (MAPA) hired a project coordinator to work with both the local Watershed Council and agencies. One of their primary responsibilities was to finalize plans on a first group of watershed improvement projects and have these projects ready to bid for final design/construction by fall of 2010.
- Project partners made significant progress at Carter Lake in 2010 with a spring alum treatment followed up by a complete fish renovation in the fall. Nebraska and Iowa, following the community accepted restoration plan guidelines established a no-wake zone on 100 acres of the lake in 2010 to lessen the impacts of recreational boating.
- Clear water conditions have persisted post restoration allowing aquatic plants to fill a significant portion of the water column. Lifelong residents of Carter Lake commented that they had never seen the bottom the Carter Lake before. Due to the clarity and resulting response in plant growth a plan for aquatic plants was drafted in consultation with the local communities to establish guidelines for future plant management efforts.
- As part of the vegetation management plan the Technical Advisory Team authorized the chemical (herbicide) treatment of vegetation around public access points, canals, private docks, and ski club area. State agencies treated the public access areas in 2014. Local homeowners contracted a private aquatic pesticide applicator to treat vegetation around privately owned docks, canals, and ski club area. The TAT discussed various options, but ultimately decided to chemically treat a limited number of acres of open water areas to open up boating lanes. A permit to apply aquatic herbicide and a contractor were secured by the City of Carter Lake to chemically treat 100 acres of open water area with the herbicide "Reward" in 2014 and 2015.
- The lakes re-charge system was completed and activated in 2012. This system provides well water to Carter Lake, which helps maintain water levels during dry summer conditions and allows for better recreational use of the lake.
- To address aquatic plant management needs at Carter Lake, Iowa and Nebraska purchased an aquatic vegetation harvester (picture at bottom right); operation and maintenance is provided by the cities of Carter Lake and Omaha.
- The Iowa DNR continues to partner with the City of Carter Lake and the Nebraska Game and Parks Commission to manage American Lotus for improved habitat, water quality and recreation.

In 2018, the DNR partnered with the City of Carter Lake to repair some eroding shoreline along Wavecrest Park, 8th and Avenue R Park, and the Carter Lake Public Access Area. DNR supplied the riprap for the project (valued at $40,000) and the City installed the rock to protect the shoreline.

In 2022, DNR met with local residents and City of Carter Lake staff to address concerns with low water levels in the lake. The City's goal was to move forward with a hydrologic study to better understand if there were mechanism available that could help project partners stabilize water levels in drought or low water years.

DNR has continued to work with the City of Carter Lake to address vegetation issues over the years. In 2025, the lake was treated to help reduce encroachment of American Lotus emergent vegetation.

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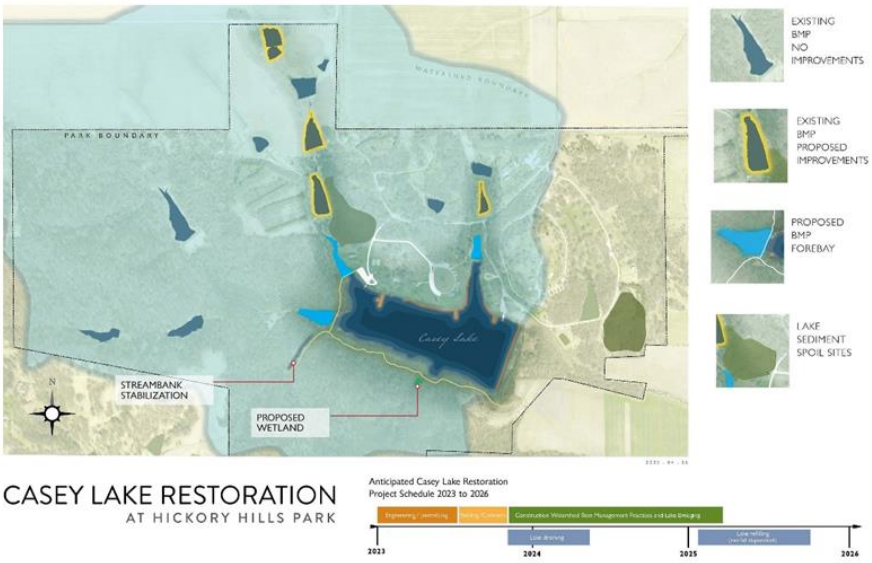
Casey Lake, Tama County

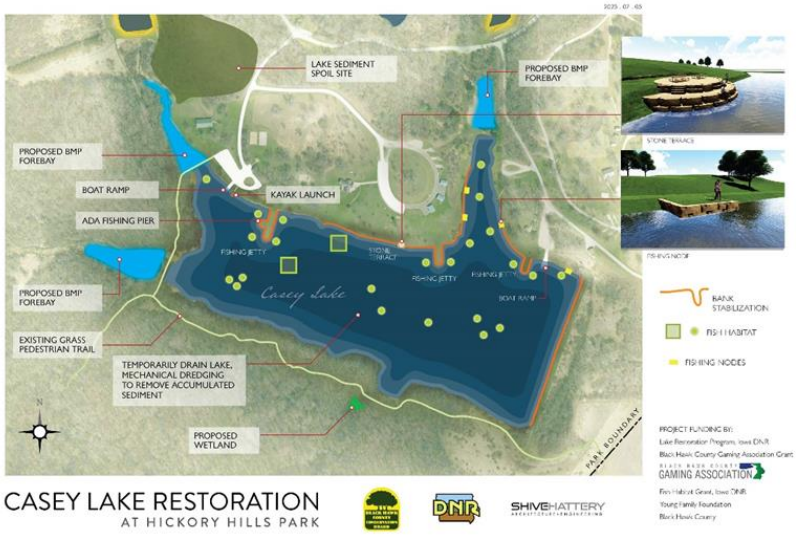
Background

Casey Lake is a 38-acre lake located in Hickory Hills Park in Tama County and currently managed by the Black Hawk County Conservation Board (BHCCB). With a 14:1 watershed to lake area ratio, the lake is an excellent candidate for restoration. The watershed also has a high percentage of forested land, which is unique for Iowa. Water quality is pretty average, but the lake suffers periodically from high turbidity. A TMDL was completed for the lake in 2013, and the lake is currently not listed as impaired. Project partners met in 2019 to discuss park improvements. The local project staff worked to complete a gully assessment within the park and prioritize areas of the watershed for restoration. DNR fisheries staff also completed a shoreline assessment to determine which areas around the lake would benefit from shoreline stabilization.



Current Restoration Activities

In 2021, DNR and the Black Hawk County Conservation Board (BHCCB) jointly hired Shive-Hattery to evaluate potential restoration practices for the lake and park and help prioritize elements of a future restoration project. Their report outlined next steps for the project, including renovating many existing BMPs within the park, as well is building several new in-lake silt dike structures to protect the lake from future sedimentation. Additionally, the report recommended dredging excess soft sediment from the lake and protecting shorelines to improve water quality. Project partners completed engineering design for the project in 2023 and bid let the project in the fall.



Restoration work took place in 2024/2025 and included the renovation of four existing ponds within the park and the creation of three new in-lake forebays/ponds to capture sediments and nutrients before they reach the lake. Additionally, 138,831 CY of excess sediment were removed from the upper half and arm of the lake and 3,431 LF of shoreline was stabilized. Other amenities including a stone terrace, new outlet structure, new boat ramp, fishing pier and extensive fish habitat were also installed. Total cost for engineering through to construction was $3.3 Million ($2.43M LRP; $830k Black Hawk CCB).

In addition, BHCCB staff completed TSI work on the south shore of the lake in 2023. A team of 17 goats, as well as staff with brush clearing construction equipment removed invasive species in many areas of the park (see photo below).

Timber stand improvement helps open up the canopy and allow light to reach the forest floor, promoting growth of native groundcover, stabilizing soils, and reducing erosion to the lake.

Following updates to the primary water control structure, Casey Lake began refilling in January 2025 (photo below). Restocking of the fishery began in May 2025 with stockings of Bluegill, Channel Catfish, and Largemouth Bass. The lake is approaching full pool elevation, so BHCCB and DNR are planning a ribbon-cutting celebration in the spring of 2026.

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Cedar Lake, Linn County

Background

Cedar Lake is located near the heart of downtown Cedar Rapids. The lake was historically a slough/backwater of the Cedar River, but was modified in the early 1900s to provide cooling water for the coal generation station owned by the local utility. The drainage area of Cedar Lake contains roughly 3,000 developed acres that drain directly to the lake (via the Kenwood watershed). The urban setting and associated storm water runoff has contributed to years of nutrient and sediment buildup in the lake and past activities within the watershed have compromised the quality of the sediment.

Cedar Lake serves as a backdrop to the downtown skyline and is becoming an important recreation destination for residents and visitors to the City. While challenges exist, past evaluations support that improvements to the lake would have numerous benefits, including increased recreation and urban fishing. Cedar Lake is poised to attract thousands of visitors annually, and already has a 1.5-mile trail loop around the northern basin of the lake that serves as a hub for the growing Cedar Rapids metro trail system.

In response to water quality problems, area stakeholders worked together to develop the Cedar Lake Watershed Management Plan. This plan serves as the most current culmination of existing studies, citizen and stakeholder input, and assessment of structural and non-structural Best Management Practices intended to reduce delivery of pollutants, reduce storm water runoff, and renovate Cedar Lake. This evaluation and planning process was a critical first step toward the future objective of advancing a comprehensive watershed and lake restoration action plan (i.e. the agreed upon suite of watershed protection and lake rehabilitation activities to meet goals of improving Cedar Lake).

Current Restoration Activities

Before restoration activities in the lake can begin, Cedar Lake needs to be protected from future flooding events. Cedar Lake has experienced considerable sedimentation in the past associated with flooding; therefore, flood protection that protects Cedar Lake from additional sediment inputs from the Cedar River is critical. DNR worked with the City and other partners starting in 2022 to build a levee between the lake and the river (total estimated cost of $16.7M). DNR's contribution toward this effort is $525,000 of the $1,269,000 cost to rebuild a new outfall channel that will improve routing of water from the lake to the Cedar River (photo right). Construction was completed in 2024.

Reducing nutrient and sediment inputs to the North and South cells of the lake is critical for long-term health of the system. Thus, formulating a plan to install watershed best management practices throughout this urban watershed is key. With recent modifications to McCloud Run, the Kenwood Basin is now the only watershed contributing flow to the lake. Cedar Lake is located in an industrial area, and historic industrial activities combined with urban stormwater runoff have negatively impacted water quality and recreational use of the area. DNR and the City of Cedar Rapids hired a consultant (HR Green) in 2022 to address these challenges and formulate a plan for addressing storm water inputs from the Kenwood Basin ($203,600; $35,500 LRP / $168,100 City of Cedar Rapids).

Additionally, the consultant will develop conceptual plans and designs for a dredging project (sediment removal) from the North cell of the lake and conceptual designs for a large wetland or sediment forebay in the South cell of the lake to capture storm water runoff. The initial project plan was completed in 2023. Project partners continue refining concepts from the original plan to create a restoration action for the lake and Kenwood watershed.

DNR staff joined the City of Cedar Rapids and the U.S. Army Corps of Engineers at a ribbon-cutting event to celebrate the completion of the McLoud Run portion of the flood control system in August 2025. The levee will prevent flooding, reduce sediment inputs from the river into Cedar Lake, expand the Cedar Valley Nature Trail and enhance angler access.

Anticipated Future Restoration Activities

Future work includes design and installation of stormwater management and other best management practices to reduce nutrient and sediment inputs to the lake. Additionally, construction of a large sediment forebay in the South Cell of the lake and sediment removal in the North Cell is anticipated.

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Center Lake, Dickinson County

Background

Center Lake is a 257-acre natural lake located in Dickinson County and is part of a large watershed that ultimately empties into West Lake Okoboji at Haywards Bay. Center Lake exhibits excessive algal growth causing reductions in water clarity and impacting recreational use and lake ecology. The reasons for the reduction in water quality and algae growth have been linked to a combination of erosion, runoff from the urban watershed, a high population of common carp, and some issues with the downstream marshes. This restoration project is designed to improve water quality in Center Lake and the associated downstream marshes by repairing some major shoreline erosion, stopping the migration of common carp, and improving the wetlands to better filter the outfall water before it enters the Iowa Great Lakes chain.

Center Lake Restoration

Restoration of Center Lake was a major focus in 2016 and 2017. Center Lake drains directly into West Okoboji Lake, and has experienced problems with high densities of carp, low vegetation, frequent algae blooms, and shoreline erosion. Restoration activities included:

- Common carp barriers were constructed between the lake and two wetlands to prevent carp from accessing spawning areas in an effort to curb carp reproduction.
- Over 1,100 feet of severely eroding shoreline was armored and re-graded to allow for natural vegetative cover to return and minimize sediment and nutrient delivery to the lake from wind and wave erosion (see before and after

- Wetlands surrounding the lake were also enhanced as a part of this project to filter nutrients and sediment before water enters the lake and enhance wildlife habitat (see above photo).
- Work continues on a feasibility study by the Iowa Great Lakes Sanitary District to determine the cost and methods for replacing septic tanks on the south side of the lake with sanitary sewer service.
- Partners worked to improve an existing storm water retention pond in an urban area of the watershed.
- The LRP worked to improve the water control structure at Center Lake. Construction was completed in 2019 and cost a total of $80,400
- DNR funded a study to better understand carp and buffalo populations in Center Lake, with the hope of incentivizing commercial fishing operations to remove large quantities of these fish. Rough fish can have a negative impact on overall water quality in shallow lakes. DNR continues to pursue commercial harvest of carp and buffalo to improve both the sport fishery in the lake and reduce turbidity in Center Lake.
- 77,400 lbs of rough fish were removed in early 2023, representing a 352 lbs/acre decrease in the common carp population, most likely bringing the density of carp below 50 lbs/acre. This incentivized harvest will help improve water quality in the lake ($30k LRP).

DNR staff met in the summer of 2025 to discuss additional opportunities for shoreline restoration around Center Lake with the goal of developing a project over the next few years.

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Central Park Lake, Jones County



Lake Restoration at Central Park Lake

Central Park Lake is a 24-acre lake in Jones County, Iowa, located in a 365-acre watershed (watershed to lake area ratio of 15:1). The DNR identified the lake as one in need of restoration due to high siltation and poor water quality. Together, the Jones County Conservation Board (JCCB) and Department of Natural Resources (DNR) have worked together to improve the watershed by installing and managing several ponds in the watershed, upgrading septic systems within the park, and working to improve the lake through extensive restoration activities. The lake is currently listed as impaired due to a high pH, usually associated with excessive algae blooms. Central Park Lake is a heavily used local resource. According to the 2014 CARD survey, the park sees about 34,000 visitors annually and is popular destination for fishing, camping, and wildlife watching, and picnicking.

The JCCB conducted a watershed assessment and drafted an extensive plan to improve water quality at the lake in 2012. Together, the community, JCCB, and DNR worked to begin implementing the plan. Restoration efforts began in conjunction with other park efforts, including the construction of cabins, new playground area, an updated beach, and construction of an ADA fishing pier. A local steering committee was formed to help inform restoration activities and define goals for the project. Active partners include the JCCB, DNR, the Twin River Pheasants Forever Chapter, Watershed Improvement Review Board, and the DNR Fish Habitat Program.

Watershed Restoration Activities

Watershed improvements were completed around the park between 2012 and 2016. One of the biggest changes in the watershed that helped protect the lake was the acquisition of the Pearson Tract (77 acres of land located directly above the lake) that will be managed as prairie. Creation of a large sediment pond will both prevent nutrients and sediment from entering Central Park Lake and act as an additional opportunity for recreation at the park. The pond was completed in 2015 and has been a great addition to the park. The Lake Restoration Program allocated $56,122 for the creation of the pond. Two ponds and multiple wetlands have been constructed in the park to improve water quality.

In addition to the Pearson tract pond, DNR and the JCCB partnered to install a new septic system in the park. Prior to the updated installation, sewage from the park could enter the lake during periods of very high water, contributing to water quality problems in the lake. The updated septic system moves all treatment out of the watershed and will help protect water quality and human health for years to come.

The total cost for all watershed improvements was $319,324, with the Lake Restoration Program (LRP) providing a total of $56,122 (18%) and the remainder of funds being provided by local grants or county funds.

DNR Fisheries staff worked throughout the spring of 2016 to stock the new 6.75-acre pond adjacent to the lake. In the fall of 2016, a public meeting was held to discuss the in-lake improvements and other activities at the park. Following the public meeting, the lake was drawn down to allow for initial surveys to be completed in advance of in-lake construction. Construction of the new boat ramp, dredging, shoreline stabilization, and additional amenities took place in 2017 and 2018.

In-Lake Restoration Activities

In-lake restoration activities began in 2017 with the lake drawn down to remove rough fish from the system and prepare the lake bottom for mechanical dredging. In-lake work was completed in 2017 and 2018 and included mechanical removal of approximately 130,000 cubic yards of sediment from the lake and hard armoring approximately 7300 feet of shoreline to prevent erosion from wind and waves. Additionally, fish habitat was installed throughout the lake bottom to provide quality fishing and spawning areas throughout the lake following restoration. Finally, the spillway for the lake was updated and modified through this project. The updated infrastructure will ensure that generations to come can enjoy this local resource. Total cost for this phase of the project was $1,306,565, with the LRP's cost share at $1,088,250 (83%). Construction for this phase of the project was completed in the spring of 2019.

The final phase of the project, also completed in 2019, worked to improve recreational opportunities at Central Park Lake. JCCB and DNR partnered to rebuild the boat ramp and parking lot on the north side of the lake, construct a new fishing access pier and parking lot that will be handicapped accessible, and rebuild the beach and replace road culverts near the beach that currently drain on the beach. The re-designed beach will be more attractive and user-friendly for park-goers and deter geese from the beach area and reducing runoff from the road and campground to the beach. As a result, the newer beach should experience fewer problems with high bacteria levels. The total cost for this phase of the project was $982,702 with the LRP's cost share at $109,120 (11%). A grand re-opening of the park was held in the fall of 2019 to celebration all of the restoration activities (below).

DNR biologists continue to work with the local park staff to manage aquatic vegetation for improved water quality, habitat and recreational access at the lake. Management continues to address concerns with large patches of curly leaf pondweed.

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Clear Lake, Cerro Gordo County

Background

Clear Lake is a 3,625-acre natural lake in Northwest Iowa. It has a watershed to lake area ratio of 2.3/1. In 2001, ISU completed a lake and watershed diagnostic/feasibility study. They presented a number of lake restoration options; specifically dredging of Little Clear Lake and restoration of Ventura Marsh.

- The DNR and local sponsors purchased a 208-acre dredge spoil site with approximately $660,000 of Lake Restoration Program (LRP) funds and an additional $660,000 local match. Contractors completed the $886,000 containment site in spring of 2008.
- DNR had a January 2008 bid letting for the hydraulic dredging of the Little Lake portion of Clear Lake and awarded the low bidder, L.W. Mattensen of Burlington, Iowa, the contract. Dredging commenced in late spring of 2008 and was completed by late summer of 2009. Contractors removed a total of 2.3 million cubic yards at a cost of $6.9 million dollars. (75% LRP and 25% local-match funding).
- 1,500 feet of publicly owned shoreline was protected with native stone rip rap in 2011. This work took place on the ice along the shorelines of McIntosh Woods State Park. One hundred twenty-five feet of this project was along the State Dock area on North Shore Drive (Project Cost $55,500; LRP 92%). An additional 750 feet of native riprap was completed for the State Dock area in 2013 ($62,270; LRP 90%).
- In 2013/2014, the DNR lowered the dikes on the dredge containment site. Trees were also removed and pushed into piles. The Wildlife staff burned the trees during the following winter. Long-term plan for the containment site is management as a wildlife area in native prairie.
- The recently dredged west end of Clear Lake has continued to show improved water quality when compared to pre-dredged conditions. Recent monitoring data indicates that water clarity is returning to what was seen in the mid-1970s. The west-end sampling site has shown better water quality than the other two sites on Clear Lake now that dredging has been completed. Prior to dredging, the west end site showed poorer water quality than the other two sites. Overall, the water quality of Clear Lake has shown substantial improvement over the past ten years that watershed and lake improvements have been implemented.
- Construction was completed on a Section 206 U.S. Army Corps of Engineers Aquatic Ecosystem Restoration Project for Ventura Marsh, which flows into the west end of Clear Lake. In its past degraded state, the marsh served as a major source of nutrients contributing to water quality problems in the lake and was a major reproduction area for common carp. The Army Corp of Engineers (COE) budgeted $3.2 million for the Ventura Marsh restoration project. Ventura Marsh state land and in-kind credits of $1,331,200 and approximately $884,062 in LRP dollars funded the DNR's portion of the marsh restoration project. The goal was to work with the COE to restore Ventura Marsh by gaining water level management capabilities, allowing for better control of rough fish and revegetating of the marsh.
- The old stop log structure at the Ventura grade was removed and replaced with a new structure. The stop log structure will be used to control water levels from the marsh crest elevation down to Clear Lake's water level. For water level manipulations below Clear Lake's level, the pumping station will need to be used. A flow path was dredged to allow the deeper portions of the marsh basin to drain towards the pumping station. This will allow nearly a complete drawdown.
- In 2013 /2014, DNR constructed of a catch basin and a water flow path in the southwest corner of the marsh. This feature will treat water entering the marsh from two large tile sources and allow for longer retention of

water entering the marsh before it gets to Clear Lake. The implemented project established two sediment basins to treat major tile inlets in the southwest corner of Ventura Marsh.

- Periodic pumping of Ventura Marsh will allow for low water conditions that are favorable to maintaining low carp densities in the marsh. Stop logs can then be removed post pumping to allow Clear Lake water to flow west into Ventura Marsh, stabilizing the marsh with the current lake level, which gives adequate levels in the marsh to allow for waterfowl hunting opportunities.

In 2015 the DNR completed work on the Ventura grade project. This work included placing a concrete pad on top of pump station outlet / carp capture structure (jetty) and adding a chain link fence panel to the bottom railing section of pump outlet to prevent carp from jumping onto the shoreline area. In addition, DNR installed metal grating over the area between the Ventura Marsh stop logs and the County Road S14 culvert to prevent rough fish transport from Ventura Marsh to Clear Lake.

The total cost of all above activities was approximately $17.0 million. Of this amount, local and federal match represented 40% of the funds necessary to complete these restoration efforts. Restoration efforts and improvements in water quality have the potential to double the annual economic return that Clear Lake generates to the local economy. The Center for Agriculture and Rural Development at ISU has projected a significant benefit to cost ratio from lake and watershed restoration at Clear Lake. Restoration of Ventura Marsh will improve the water quality of Clear Lake and help keep the carp population under control. Local groups and DNR Section 319 continue to pursue watershed projects that have the potential to decrease sediment delivery to Clear Lake.

In 2020, DNR completed installation of a rock reef fish barrier at Lekwa Marsh ($37k LRP) and began a shoreline stabilization project along McIntosh Woods State Park to reduce shoreline erosion in the lake that was completed in 2021 (LRP $50k; 319 $50k).

<u>Additional Projects in 2021-2023:</u>

- Shoreline project on Public access points along South Shore with Cerro Gordo County ($23k LRP)
- Fish renovation of the containment site
- Water monitoring in Clear Lake and Ventura Marsh ($5k annually - 50/50 partnership with APCL)

Current Restoration Efforts

Eurasian Watermilfoil was discovered in 2024. DNR is partnering with several local partners (Cerro Gordo County, City of Clear Lake, City of Ventura and the APCLA) to cost-share a whole-lake herbicide treatment to eradicate this invasive aquatic plant (64% LRP $287,335; 36% Local Partners $161,500). This treatment was applied in the fall of 2025 and will be monitored throughout the winter.

Total LRP Investment to Date: ~ $10.8 Million

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Diamond Lake, Poweshiek County

Background

Diamond Lake Park is a 660-acre county park with a 98-acre lake that is managed by the Poweshiek County Conservation Board (Poweshiek CCB). The fishery is managed by the DNR. Diamond Lake Park is located near the city of Montezuma and features fishing, camping and day use activities. The Poweshiek CCB and the DNR have a history of working together to maintain water quality and provide a fishery at Diamond Lake.

The DNR entered into an agreement is to reimburse the Poweshiek CCB for repair and modification of the existing spillway at the lake outlet. The spillway that had been in place was in need of repair, and upgrading the lake's infrastructure would help preserve this important resource for years to come. By working with the Poweshiek CCB, project partners were able to modify the spillway with a 10-foot drop, which will eliminate migration of rough fish (e.g. carp) from Moon Creek into the lake. Modification of the spillway with an effective fish barrier is an essential step in the long-term restoration plan for Diamond Lake. Construction took place in 2015 (see pictures above) and was the first step in the in-lake portion of this restoration project. The spillway modification was completed in 2015 with costs totaling $160,000. DNR Lake Restoration contributed 80% of the funds for the project, with the county conservation board contributing 20% of the funds needed to complete the spillway modification.

Restoration Activities

Modifying the spillway to prevent the encroachment of rough fish was a critical step to any future restoration efforts. Additional work will likely include a fishery renovation to remove rough fish already living in the lake. Project partners continue to meet periodically to discuss next steps for the project. The CCB completed a watershed gully assessment in 2020, with the goal of constructing some best management practices on public ground in 2022 and 2023 to reduce pollution to the lake. Additionally, project partners met to discuss potential alternative water sources for the City during a restoration project. Currently, Diamond Lake is the sole water supply for the City of Montezuma. Identifying an alternative water source is critical for in-lake restoration work.

Poweshiek County Conservation Board and DNR hired Shive-Hattery Engineering in the fall of 2022 to complete a watershed assessment for areas within the park. As a part of this assessment, existing watershed best management practices (BMPs) will be evaluated and new BMPs will be recommended for the park to reduce nutrient and sediment inputs to Diamond Lake ($77,700; $58,275 LRP / $19,425 Poweshiek CCB). Using the assessment completed in 2023, project partners identified a number of watershed practices to move forward with for engineering design ($379,100; $284,324 LRP; $94,775). Construction for the watershed phase of the project was completed at the end of 2025 and included the renovation of two ponds (removing 32,000 CY of material from the ponds; yellow in photo at right) and construction of one new pond. Additionally, 600 feet of streambank were stabilized to protect the lake from nutrient and sediment runoff ($455k; 75% LRP; 25% Poweshiek CCB).

The City of Montezuma has constructed a new well to provide an alternative drinking water source for the community. The Montezuma Water Department is in the process of testing the new water source to determine appropriate treatment options. The DNR, Poweshiek CCB and the Montezuma Water Department collaborated on an updated Water Use Permit. The permit provides guidelines that allows the Montezuma Water Department to use lake water for drinking purposes, while protecting the in-lake restoration investment, and allowing Poweshiek CCB to better manage the lake in the future.

Future Restoration Efforts

In 2025, DNR and the CCB continued working with Shive Hattery to provide engineering services that include the evaluation of potential in-lake restoration practices ($104,420: 75% LRP, 25% Poweshiek CCB). In-lake restoration efforts will include targeted dredging of soft and native soils to increase depth for enhanced recreation, stabilizing 1,900 linear ft of shoreline, installing fish habitat structure, enhancing shoreline access and re-establishing depth in the in-lake silt basin. Shive Hattery was retained to complete a wetland delineation and 50% design for notching the dam and installing a low-water drain ($25k: 75% LRP, 15% Poweshiek CCB). Proposed dam upgrades will improve drawdown capacity in the future. The In-lake engineering and construction is estimated to cost $4.5 million, which will be cost-shared between DNR and Poweshiek CCB.

Project partners are making improvements to the park and watershed that will improve habitat and water quality in the lake. For example, the CCB is actively managing over 150 acres of timber to increase light penetration to the forest floor, encourage understory growth and stabilize soil. The CCB is also restoring native, tall-grass prairie on over 200 acres of park land. DNR fisheries is delineating Common Carp presence throughout the watershed, in preparation for a fishery renovation as a part of the larger lake restoration project.

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Easter Lake, Polk County

Background

The DNR Lake Restoration Program (LRP) is a statewide effort focused on Iowa's significant publicly owned lakes (SPOLs). The program's goals are to ensure a cost effective, positive return on investment for the citizens of Iowa; ensure local community commitment to lake and watershed protection; ensure significant improvement in water clarity, safety, and quality of Iowa lakes; provide for a sustainable, healthy, functioning lake system; and result in the removal of the lake from the impaired waters list.

Easter Lake is a 178-acre constructed lake with a watershed to lake area ratio of 36:1. Constructed in 1967, Easter Lake began as a lake in an agriculture/suburban watershed that over the years has shifted to a highly developed urban area. The lake currently is estimated to have over 95,000 visits annually. Construction activities and storm water issues have contributed greatly to more than a 20% reduction in lake volume. Non-algal turbidity continues to cause the majority of water quality problems, resulting in very low water clarity observed throughout the year at this lake. The Polk County Conservation Board owns and manages this area, and they continue to work in partnership with DNR and other stakeholders to accomplish lake and watershed improvements.

A technical advisory team was formed for the project and met for the first time in 2008 to discuss the future of Easter Lake and how partners may work together to improve water quality. DNR hired Iowa State University in 2009/2010 to complete a diagnostic and feasibility study on the lake and watershed. The study helped project partners identify problems in the watershed and develop a suite of restoration alternatives that would help improve water quality at Easter Lake. Following the completion of the study, EA Engineering, Inc. was hired to develop a comprehensive restoration plan for the lake and watershed with project partners. All of these efforts culminated with a memorandum of understanding signed by a number of stakeholder groups committed to improving water quality at Easter Lake.

Watershed Restoration Activities

Project partners began funding a watershed project at Easter Lake in 2012. The Iowa Department of Natural Resources Watershed Improvement Section (Federal Section 319 funds) and the Iowa Department of Agricultrue and Land Stewardship jointly hired a watershed coordinator in 2012 to work with homeowners and businesses throughout the watershed to implement best management practices aimed at reducing storm water pollution to the lake. To date, over 103 rainscaping practices have been installed, including rain gardens, permeable paver driveways, bioswales, and rain barrels. Practices installed to date have helped manage and treat over 6 million gallons of water that travel to the lake annually. On average, storm water flows have been reduced by 27% in neighborhoods where many practices have been installed.

The DNR has also partnered with the City of Des Moines to address stream bank erosion in Yeader Creek, the primary tributary to Easter Lake. A number of priority stream segments were identified for restoration in the restoration plan for Easter Lake. Initially, two priority segments were restored to minimize sediment pollution to the lake from stream bed and bank erosion. Before and after photos are pictured below.

In 2017, the City of Des Moines and DNR's Lake Restoration Program and Watershed Improvement Section partnered to complete engineering designs for the remainaing priortiy stream segments on Yeader Creek, as well design out a number of other watershed practices. Project partners then worked to restore these sites to reduce nutrient and sediment inputs to the lake and manage storm water.

In addition to watershed practices on Yeader Creek and surrounding neighborhoods, project partners have worked to install a number of wetlands and ponds around the lake to treat water draining to the lake. A large sediment basin was added to the west side of the the historic covered bridge adjacent to the lake. The new basin is expected to reduce 214 tons of sediment to Easter Lake annually. In 2017, project partners also added a wetland near the dam on the northeast side of the lake to intercept runoff from nearby housing developments. This wetland (pictured above) will help capture sediment for years to come.

Several additional watershed practices were initiated in 2018, with construction commencing in 2019. The City of Des Moines, in partnership with the Section 319 program and the LRP initiated engineering design for additional storm water practices along SE 14th Street to reduce runoff to Yeader Creek. Project partners also removed excess sediment at serveral detention basins in the watershed and restored five sections of stream along Yeader Creek to reduce erosion during storm events. Constuction was completed in 2020. Additionally, a large gully was addressed near the park entrance. Through the removal of woody vegetation and re-shaping the creek shorelines, a newly created stormwater detention structure provides a welcoming entrance to the park and reduces runoff to the lake. Finally, a fishery renovation was completed in late 2018 in part of the watershed to remove invasive fish species from the watershed as a part of the lake's restoration.

Lake Restoration Activities

A variety of restoration strategies have been employed in the lake to reclaim volume lost to sedimentation and improve the lake for years to come. Synder and Assoicates was hired to develop a dredge plan for Easter Lake and help project partners design and build practices to protect the lake and improve recreational opportunities. First, the outlet structue of the lake was modified through the addition of invasive fish barriers that will prevent rough fish (like carp and buffalo) from entering the lake during periods of high water. Rough fish have a negative impact on water quality by removing vegetation from the lake bed and re-suspending nutrient-rich bottom sediments. In addition to the fish barriers, a fish rearing pond was built on the east side of the lake. This pond will allow managers to grow juvenille fish on site before releasing them into the lake for anglers.

The Polk County Conservation Board (PCCB) and DNR worked to develop a dredge plan and locate an appropriate spoil containment site for placement of dredging materials proir to developing a full dredging plan for the lake. PCCB aquired an old gravel pit to use as a spoil site a couple miles away from the lake across the Des Moines River. Dredge America was hired to hydraulically remove ~300,000 cubic yards of sediment from the lake and pump it to the containment site in 2016.

The lake was then drawndown in the spring of 2017 to prepare the basin for shoreline work, construction of the wetland on the north east side of the lake, and to upgrade the outlet structure for the lake. Additionally, PCCB is constructing a multi-use recreational trail around the lake, and needed the lake drawn down to complete parts of the trail on the dam face.

In May of 2017, additional dredging was completed in the bay near shelter 4 of Easter Lake Park to increase depth (see photo top right). A total of 4,000 cubic yards was removed from the bay. Fish habitat structures will be installed in 2018 and additional work will be completed to stabilze shorelines in the bay. Lastly, railing heights on the pier overlooking the bay will be adjusted to improve accessibility.

The second phase of in-lake was designed in the fall of 2017 with the goal of removing an additional 271,000 cubic yards of sediment. An extensive mechanical dredging project was completed in 2018 to remove excess sediment from bays in the lake and shape the shoreline to create additional park greenspace, fishing jetties, and habitat. An in-lake silt dike on the western (Yeader Creek) arm of the lake was constructed below the newly added trail bridge that will reduce nutrient and sediment inputs to the lake and improve overall water clarity. Extensive shoreline armoring was also completed to protect the shores from shoreline erosion. Total costs for this phase was $3,873,827 ($968,456 PCCB; $2,905,827 LRP). The PCCB also invested grant monies to install fish habitat throughout the lake and reconstuct the main boat ramp at the park.

Easter Lake Celebration and Grand Opening of the Mark C. Ackelson Trail

A celebration and grand re-opening for the park was held at Easter Lake on June 23, 2019, to showcase the restoration project and inform park users about water quality. Over 1,500 visitors attended the event, where they were treated to a innuragal bike ride on the Mark C. Ackelson trail, boat rides and canoe/kayak paddles around the lake, native landscaping seminars, and a casting clinic. While watershed improvement work continues within the watershed, the lake celebration highlighted all of the partners' accomplishments on this $23 Million restoration project.

Current Restoration Activities

Polk CCB hired Synder & Associates in 2024 to develop a shoreline stabilization plan to address areas of erosion and bank failure around the lake. The project will stabilize approximately 5,075 linear feet of shoreline, reducing direct input of sediment and nutrients to the lake. The total estimated cost is $796,500 (75:25 cost-share: $546,500 LRP: $250,000 Polk CCB), and construction is slated for 2026.

DNR engineering is also providing design for an extension of the fish exclusion grate. The grate prevents undesireable fish species (i.e. Common Carp) from reentering the lake during flood events. Design will be completed during the winter of 2025/2026, and installation is slated for 2026.

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Five Island Lake, Palo Alto County

Year	Cubic Yards
1991-1993	1,390,000
1994-1999	3,028,000
2002-2011	1,926,296
2013	205,221
2014	250,968
2015	208,912
Total	**7,009,397**

Background

Five Island Lake is a 973-acre natural lake located on the north side of the town of Emmetsburg, Iowa in Palo Alto County. In 1989, following years of diminished recreational opportunities and poor water quality conditions due to low lake levels, a group of concerned citizens formed the Five Island Lake Board. They established two major goals for the project: Increase the lake water depth; and, improve the lake water quality. Goals of the 1994 diagnostic feasibility study included goals for dredging and shoreline stabilization. From the early '90s, the Lake Board has stabilized almost 10.5 miles of lake shoreline, dredged over 7 million cubic yards of silt, and has worked in the watershed to reduce nutrients and sediment from entering the lake. Funding for this project since 2000 has required a combination of 1:1 state and local matching grants. Dredging concluded in 2015 and together DNR and the City of Emmetsburg began moving forward with a new plan to improve water quality in the lake.

Planning for Success

The City of Emmetsburg hosted an informational meeting in winter 2016 to explore the need for additional restoration work at Five Island Lake. While dredging improved the overall depth of the lake, water clarity only improved marginally. The City, in partnership with the DNR, issued a request for proposals in the summer of 2016 to complete a lake and watershed assessment and examine the current outlet structure at the lake. FYRA Engineering was hired to complete a two-year study that culminated with a suite of restoration alternatives for project partners to consider, as well as a watershed assessment that will allow partners to better address watershed issues. Preliminary watershed modeling results show that about half of the total phosphorus load to the lake is coming from the watershed, and about half of the annual load is recycled internally, thus focusing on both watershed and in-lake restoration strategies will be important moving forward. The long-term goal for the project is to find alternatives for the lake that will result in better water quality while minimizing the impact of excessive vegetative growth in the lake. As a part of the study, FYRA will regularly be meeting with the community to ensure that the needs and concerns of the community are being addressed throughout the next phase of this project.

In 2018, the DNR also initiated a study to better understand how rough fish may be impacting water quality at Five Island Lake. As a part of this project, carp and buffalo fish populations are tagged and monitored annually to estimate population size and their relative biomasses. The long-term goal for this project is to establish targets for removal that will help improve water quality. Rough fish, such as carp and buffalo can have a negative impact on water quality as they shift the plankton community in the lake and stir up bottom sediments. Partners in Palo Alto County initiated a watershed planning effort for Silver Lake, Five Island Lake, and Lost Island Lake in 2019 to prioritize watershed efforts to improve water quality in the lakes in Palo Alto County. A coordinator was hired in the fall of 2019 and completed a watershed management plan in 2021.

In 2025, DNR staff discussed an in-lake nutrient management that could improve water quality in the lake. Carp management strategies include installation of rock barriers to prevent carp from accessing quality spawning habitat, and retrofitting/replacing the outlet structure to prevent carp immigration into the lake. DNR fisheries completed a shoreline assessment to help prioritize and facilitate future shoreline stabilization and prairie/oak savanna restoration work. Finally, since approximately half of the phosphorus load comes from internal loading, alum treatments were also discussed as a potential solution to reduce phosphorus and harmful algal blooms in Towne Bay. Staff are also working to address areas of public shoreline that are eroding and in need of repair.

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George Wyth Lake, Black Hawk County

Background

George Wyth Lake is located within George Wyth State Park, and is a popular destination for fishing, relaxing, boating, wildlife watching and trail use, drawing an estimated 180,000 users annually. This 75-acre lake is surrounded by a 650-acre watershed (9:1 watershed to lake area ratio), and has a mean depth of 11.6 feet. The watershed is dominated by a mix of grassland, cropland, forest, and urban land uses.

Flexamat (pictured here) was installed along the shoreline in 2020 to protect the lake from erosion and provide access to the water.

George Wyth is a sand borrow-lake with relatively low overall fertility when compared to other Iowa Lakes. George Wyth's historic fishery was moderate to poor, due to relatively low productivity and a lack of aquatic vegetation. Water quality parameters in George Wyth Lake compare favorably to other Iowa lakes, due to a low watershed to lake ratio and relatively small portions of watershed in agricultural production.

- The DNR Watershed Improvement Section completed a Water Quality Improvement Plan for George Wyth Lake in 2008 to address impairment due to high bacteria levels on the beach, with the primary cause for impairment identified as resident geese.
- One of the primary goals of this project would be to promote the growth of native aquatic vegetation. Prior to 2009, very few aquatic plants were observed, which had a negative impact on the fishery and water quality.
- Starting in 2009, local biologists began actively planting aquatic vegetation to promote growth.
- A planning group met in 2018 to discuss needs for the project and begin formulating a restoration plan.

Restoration Efforts

While water quality at the lake is relatively good, the shoreline experienced some erosion over the past several years that needed addressed. In the fall of 2019, local park staff, DNR engineering staff, and Lake Restoration Program staff met to assess shoreline conditions and formulate a project. Together, they determined that about 960 feet of shoreline along the South East shoreline area needed armored with riprap. Additionally, shoreline near the east boat ramp needed armored. Upgrades to the boat ramps, sidewalks, and parking areas were also needed. Finally, rock was placed along the culvert on hwy. 218 to protect the culvert and the shoreline near the north parking lot (about 400 feet). The total cost for the project was $217,440 (LRP $196,529; Parks $20,911) and was completed in 2020.

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Green Valley Lake, Union County

Background

Green Valley Lake is a 390-acre lake constructed in 1950. It has a watershed to lake ratio of 11:1. The DNR implemented a limited lake restoration project through the State and U.S. EPA's Clean Lakes Program in the mid-1980s, however additional watershed and in-lake work was needed. Project partners initiated current restoration efforts at Green Valley Lake in 2006.

Union Soil and Water Conservation District (SWCD) and the Natural Resources Conservation Service (NRCS) completed a watershed assessment and developed a four-year plan to make needed watershed improvements. Cost share funding allowed local landowners to accomplish soil and water quality improvement projects on their property. Iowa State University also completed a Diagnostic Feasibility study in 2008 and presented a variety of restoration alternatives (i.e. spillway modification, fish restoration and dredging of coves) for consideration. A technical working group that included DNR staff, NRCS and SWCD staff, the City of Creston, Southern Iowa Rural Water Association, Green Valley Chemical and CIPCO was also formed to coordinate restoration project activities.

Restoration Activities and Park Improvements

DNR Parks has worked in parallel with lake improvements efforts to complete a facelift to the park. A number of improvements were made to the popular campground, including: adding full hook-up sites, removing a number of campsites to increase the size of each site, redesigning all the camping pads, and adding a new electrical system upgrading from 30 amps to 50 amps. Additionally, each site was upgraded with a new picnic table and fire grill and a new shower building was installed at the center of the campground. DNR Parks added new pit latrines at the campground, the cabins and the north picnic area and built a third camping cabin. Green Valley also has a new playground that was donated in part by the family of Greg Haley, who was the park manager when he passed away in January 2009, and built by volunteers. In addition, the park was connected to the City of Creston by a paved bike trail in 2009 that allows park visitors easy access to the amenities in town.

DNR's Lake Restoration Program worked with project partners to make a number of improvements to the lake and watershed. Restoration activities included:

- The local NRCS District Conservationist implemented a four-year, $409,000, watershed improvement plan to help reduce sediment and nutrient inputs to the lake.
- Elimination of yellow bass and common carp, species both considered detrimental to sport fish populations, with common carp having the additional negative impact of contributing to poor water quality conditions. The DNR renovated the fishery in September 2008 and has since restocked the lake with bluegill, largemouth bass, channel catfish, crappie and walleye. Fishing following the restoration has been excellent.
- Prior to restoration, the concrete spillway was starting to develop some structural problems and its design allowed common carp to enter the lake during periods of high flow. Iowa Bridge & Culvert LC completed a redesigned spillway in May 2009 at a cost of $510,435.

- DNR awarded a $348,767 contract to CL Carroll Company Inc. for in-lake fish habitat and shoreline protection through rock armoring. Fish Habitat Stamp funds in cooperation with Federal Dingell-Johnson, Marine Fuel Tax and Lake Restoration Program funds paid for this aspect of the project.
- The Natural Resource Commission approved the acquisition of a parcel of land adjacent to the northeast corner of Green Valley State Park. The Betty E. Gater Estate offered this 67.58-acre parcel for $338,000. This site first served as the containment site for sediments removed from the lake as a part of the mechanical dredging element of the restoration project. Following dredging, the site was re-seeded with native plants.
- Taylor Construction & Excavation signed a contract in the fall of 2009 for removal of approximately 250,000 yards of sediment targeted from both existing sediment retention basins and in-lake areas. In addition, a new sediment dike was installed at a location below an area identified in the diagnostic study as a subwatershed area contributing significant sediment and nutrient loading and critical areas of shoreline were stabilized.
- Since the lake restoration activities were completed and the fishery renovated, aquatic vegetation has once again been observed in the shallow areas of the lake. Aquatic vegetation is an important component for fish habitat, helps stabilize lake sediments, and helps retain nutrients in the water column.

- Project partners worked to expand the multi-use park trail. DNR Engineering, Parks, and the Lake Restoration Program constructed two silt dike dam structures to trap sediment and improve water clarity. These structures also facilitated the trail expansion that connects the city of Creston to the park. The Lake Restoration Program (LRP) contributed to the construction of the west silt dike. Total costs for this project were $180,756 ($168,756 LRP; $11,950 MFT).

Current Restoration Activities

DNR Park staff continue to manage the terrestrial vegetation within the park through timber stand improvement (TSI) and invasive species control. A combination of enhanced sunlight penetration and prescribed burns have resulted in native prairie regeneration. The LRP and a Section 319 grant provided to the DNR by USEPA purchased a forestry mower to increase efficacy of park staff terrestrial vegetation management efforts. Tallgrass prairie restoration improves soil health and stability, reduces sediment and nutrient loading to the lake, and improves wildlife habitat.

DNR met with the technical advisory team in 2018 to explore additional needs at Green Valley Lake. Together, they worked with Iowa State University to collect additional water quality monitoring data, which was completed throughout the summers of 2019 and 2020 and showed a high amount of internal loading in the lake. DNR hired Barr Engineering to complete an alum study of nine Iowa lakes in 2023, including Green Valley Lake. The study showed that Green Valley Lake exhibited a high degree of internal loading and was a good candidate for alum treatments to address internal phosphorus recycling and try to mitigate algae blooms.

DNR signed a contract with SOLitude Lake Management to apply a split-dose of alum to the lake (spring & fall; total 347,562 gal) for $1.14 million. The main lake and the two larger sediment basins received an initial alum treatment in spring of 2025 (photo to the right). The main lake received a second treatment in the fall of 2025, and the sediment basins are slated to receive a second treatment in the spring of 2026. Park staff installed a rock ramp on the northwest sediment basin to facilitate future alum treatments.

Following the spring alum treatment, water clarity improved from 6 to 11 ft. Feedback from park and lake users, including the angling community was also extremely positive. Parks staff also noted improved water clarity and reduction in algae blooms throughout most of the recreation season.

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Hannen Lake, Benton County

Background

Hannen Lake is a 38-acre constructed lake located in Benton County with a mean depth of 8.7 fee and a watershed to lake area ratio of 16:1. The lake is currently managed as a part of Hannen Park by the Benton County Conservation Board (CCB). Water clarity has declined since the ambient lake monitoring program began in 2000, with the average water clarity dropping from over 6 feet (2000) to about 4 feet in recent years. The lake is an excellent candidate for the program and ranks well using measures of water quality potential, public benefit, and feasibility. Park staff met with the DNR in the fall of 2018 to begin discussing needs for the park. In 2019, project partners worked together to begin a watershed plan for the park and list of proposed restoration activities for the park.

Restoration Planning

In 2025, Benton CCB, Iowa State University (ISU) and DNR developed a water quality monitoring plan to capture storm event driving sediment and nutrient loading from the watershed. ISU staff trained CCB staff on water sample collection procedures. CCB staff collected water samples following rain events, and samples were processed at ISU. The results will be used to better inform a future Diagnostic Feasibility (DF) study.

The CCB and DNR plan to contract ISU to complete a DF study in 2026, which will identify critical areas in the watershed that are contributing sediment and nutrients to the lake and causing water quality issues. Additionally, the study will provide cost-effective restoration options that will improve water quality in the lake.

Current Restoration Efforts

Benton CCB has implemented a Timber Stand Improvement (TSI) project, reduced mowing and are restoring native prairie within the park. TSI work opens up the canopy, allowing light to reach the forest floor, enhancing understory growth and stabilizes soil.

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Hawthorn Lake, Mahaska County

Background

Hawthorn Lake is a 181-acre constructed lake in southern Iowa with a watershed to lake area ratio of 18 to 1. The Mahaska County Soil and Water Conservation District (SWCD) applied for, received a watershed assessment grant from the Iowa Department of Agriculture and Land Stewardship, and completed the assessment during the winter of 2007. They then held a kick-off meeting in May of 2010, with 34 landowners, stakeholders, staff, commissioners, and news media in attendance. Partners discussed shoreline work, structures on public property, signage, private land opportunities, and reviewed goals. The Mahaska SWCD applied for and received a Watershed Improvement Review Board (WIRB) grant of $165,949 toward lake restoration activities. A total of $208,618 in Publicly Owned Lakes (POL) funds were available to the project. In addition, the DNR Lake Restoration Program utilized funds of $407,729 for in-lake shoreline stabilization (see picture), deepening, and watershed improvement on state lands.

Restoration Activities

- To-date, landowners have completed a grade stabilization structure with sediment loading reduction of 157 (tons/year). 3,238’ of terraces on private property have been installed reducing sediment loading by 104 (t/y), and 2,109’ of waterways reducing sediment loading by 32 (t/y) on private property.
- DNR awarded a $384,854 contract to Cornerstone Excavating, Inc. of Washington Iowa for in-lake restoration work at Hawthorn Lake ($147,824 Fish and Wildlife Habitat Funds, $137,030 Lake Restoration Program, $100,000 Mahaska County SWCD WIRB grant). The project, completed April 2011, consists of the placement of in-lake habitat, shoreline armoring and deepening, and jetty construction/repair.
- The fishery in the lake was renovated in 2010 and re-stocked in 2011. Following restoration, largemouth bass abundance and quality are excellent.

The DNR designed eight sediment control ponds for watershed improvement on public ground and stream protection on private ground. Phase I: Five of the eight structures on public property were constructed in 2012. The remaining structures were completed in November of 2016. A 40-acre parcel was added to the northwest portion of the Wildlife Management Area. This allowed for construction of the largest sediment control pond above the lake, additional wetland/stream enhancement, and restoration of prairie within the watershed of Hawthorn Lake. Total cost for the watershed projects were $343,569 ($138,803 LRP; $65,949 WIRB; and $6,921 Landowner).

Water quality benefits from restoration efforts have already been observed. Trends in water transparency suggest that water quality has improved in the years following the completed restoration efforts. Additional treatments completed in 2016 further improved water clarity. Project partners are working to eradicate woody vegetation from the management area surrounding the lake. Woody vegetation (like autumn olive and honeysuckle) can prevent vegetation from establishing on the forest floor and contribute to erosion. Following removal, native grasses are being planted to stabilize soils and improve both land and water quality at the management area.

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Hickory Grove Lake, Story County

Background

Hickory Grove Lake is a 100-acre constructed lake in Story County, Iowa, with a lake to watershed ratio of 40:1. In recent years, the lake has experienced a number of rain event-driven water quality problems that are negatively affecting this resource. Sedimentation in arms of the lake has impacted recreation and surface run-off has led to gully erosion, debris, and nitrogen spikes in samples collected from the watershed. Additionally, the beach at the lake has been listed as impaired due to high concentrations of indicator bacteria. While the fishery remains relatively healthy, carp have limited vegetation in the lake. Aquatic vegetation is important fish habitat and helps keep water clear by removing nutrients from the water column and minimizing sediment re-suspension due to wind and wave action in nearshore areas.

In 2008, a watershed technical advisory team was formed to discuss water quality improvement efforts at the lake. The Natural Resources Conservation Service received a development grant in 2008 to determine critical areas within the watershed for restoration and complete a land use assessment. In 2011, Iowa State University received a grant to develop a watershed management plan for Hickory Grove Lake. This plan outlined strategies for managing beach bacteria and included recommendations for goose control, lake draw-down, sediment removal and a fishery renovation.

Watershed Improvements

Story County Conservation Board (CCB) received a Watershed Improvement Review Board grant and partnered with the Department of Natural Resources Lake Restoration Program (LRP) to complete a livestock exclusion project and streambank stabilization project on the main tributary of the lake. The project was completed in 2016 and helped minimize new sediment and nutrients being delivered to the lake (before and after photos below).

In the summer of 2016, DNR and Story CCB worked to complete a preliminary assessment of the park grounds to determine where additional practices could be placed to mitigate gully erosion in the park and improve existing sediment ponds in the park. A project to implement Best Management Practices at identified locations was then initiated and 25 rock silt dikes were constructed, shoreline areas were armored, and drainage tile repair work was done. The $124,043 project (75% LRP, 25% SCCB) was completed in September 2018. Additionally, the County cost-shared with watershed residents to update unpermitted systems in the watershed to reduce nutrients delivered to the lake.

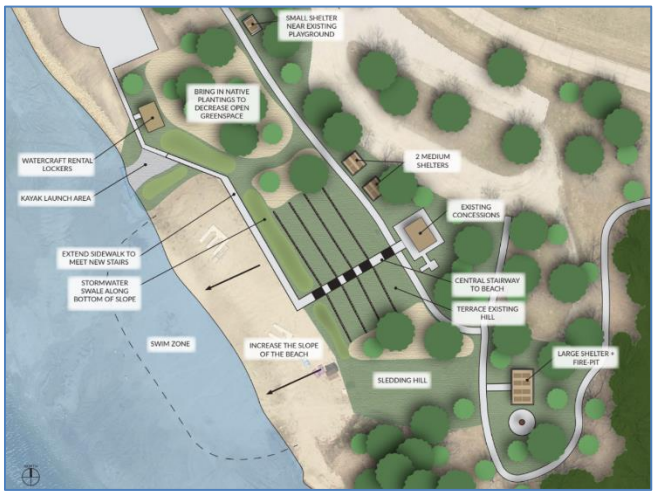
In-Lake Restoration

Beginning in 2013/2014, the CCB stabilized approximately 450 feet of shoreline with rip rap along the southwest shoreline and emergency spillway. A more comprehensive shoreline assessment was completed in 2014 to identify areas of critical need that were incorporated into the in-lake restoration project.

Engineering design for the in-lake portion of the project began in 2017. A public meeting was held at the park in the summer of 2017 to solicit feedback from the local community about project goals for the lake. DNR engineering completed a design plan for the lake that will remove excess sediment from targeted areas of the lake, armor shorelines, install needed fish habitat, and rehabilitate the eastern portion of the lake.

The lake was drawn down in the summer of 2018 to facilitate in-lake restoration activities and install a new outlet pipe that will allow for complete drawdowns in the future. Construction in the lake began in 2019 and was completed in the spring of 2020. A fish renovation was completed in the summer of 2020 before closing the gate valve and allowing the lake to refill. Construction was awarded to RW Excavation for $3.3 Million (Lake Restoration Program $2.36M, Story CCB $785K). As a part of the lake restoration project, 141,864 CY of material was mechanically excavated from the lake bottom, shorelines, and East Game area. Over 54,000 CY was removed from the East Game Area, improving depth across the basin by an average of 2.8 feet. Re-establishing this wetland complex will filter water from the watershed and reduce pollution to the lake. Additionally, 45,000 CY of sediment was removed near the beach area to improve recreational opportunities and reduce resuspension of sediments. Over 12,000 LF of shoreline was stabilized with riprap and Flexamat to reduce shoreline erosion. Both boat ramps were also renovated and expanded to enhance access. CCB staff worked with the contractor to construct and install dozens of fish habitat structures to improve angling opportunities. Project partners held a grand re-opening celebration on July 10, 2021, coupled with Colo Days, to showcase the project to the community.

Current & Future Restoration Efforts



Over 77% of Story County residents voted in favor of a $25 million, 20-year, Water and Land Legacy bond in November of 2024. The bond will fund conservation and recreation projects, improve water quality and enhance parks and trails. The CCB will utilize some of the funds to upgrade Hickory Grove Park amenities, which are highlighted in the 2023 park master plan. DNR and CCB hired Shive Hattery in 2025 to design stormwater management improvements at the Hickory Grove Lake beach. The consultant will provide engineering, and permitting for stormwater management infrastructure, beach and hillside grading, and native plantings for $100,170 ($75,127.50 DNR 75%; $25,042 CCB 25%). These improvements are expected to reduce indicator bacteria at the beach, increase recreational safety and potentially removing the lake from Iowa's Section 303(d) Impaired Waters List. Story CCB also committed to designing improved access and amenities near the beach ($20,790). The County is proposing three shelters and a fire pit area, stone terrace retaining walls, reinforced concrete steps, sidewalks, a kayak launch, and watercraft rental lockers (see photo above). Total anticipated cost for construction these improvements practices is around $1.1 million, which will be cost-shared between the LRP and SCCB.

Story CCB received a DNR County Fish Habitat Grant in 2021 to repurpose the campground sewage lagoon into a fish rearing pond. Construction to convert this structure is slated for 2026.

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Iowa Great Lakes, Dickinson County

Background

The Iowa Great Lakes (IGL) are a significant public resource in the state of Iowa. DNR recognizes this unique group of lakes and continues to support efforts to maintain and improve water quality in the region. In the last six years, the Lake Restoration Program (LRP) has partnered with a variety of other local and state agencies to improve the IGL. Together, partners have invested over $6 million dollars since 2010 in practices and restoration techniques to enhance the lakes. In addition to improving the Great Lakes, the DNR has worked to restore and enhance myriad of wetlands in the IGL watershed, providing important habitat for a variety of animals and reducing nutrient and sediment loads to the lakes.

Restoration Projects

The LRP is currently working with a variety of partners to improve water quality in the IGL. At present, the DNR is working with the Department of Agriculture and Land Stewardship (IDALS) to implement conservation strategies, in cooperation with the local County Soil and Water Conservation District including:

Urban Practices

- Improved storm water intakes for filtering storm water before it reaches the lake and improve lake shoreline to prevent further erosion
- Constructed several bio-cells as a water control structure to filter or settle sediment from water draining to East Okoboji Lake, West Okoboji Lake and Center Lake
- Constructed two subdivision bio-swales which filter storm water runoff
- Worked with the City of Okoboji and the Imagine Iowa group to restore a section of shoreline along Hattie Elston State Park

Wetland Restoration

- Implemented a wetland and prairie restoration on the North Shore of West Okoboji that reduced the amount of sediment reaching the lake.
- Enhanced a wetland to intercept 19 acres of agricultural runoff entering East Okoboji Lake

An ongoing partnership with the Dickinson County Water Quality Commission (WQC) has helped fund a variety of local projects including assisting the Spirit Lake Protective Association with a small land acquisition in a key sub watershed

entering Big Spirit Lake and providing funding for project management at the Great Lakes. Since the partnership began, the LRP has helped fund over 16 projects, contributing over $500,000.

Other project activities include:

- Participation in the annual Iowa Prairie Lakes Conference, hosted at the IGL. The 2020 conference was cancelled due to the pandemic, but partners resumed the conference in 2021. This event draws over 100 professionals and associations together to discuss issues natural lakes in the region face.
- Continued support of the Marble and Hottes Lakes restoration project in the Big Spirit Lake watershed. This important restoration filters nearly 20% of the land flowing into Big Spirit Lake. Construction was completed in 2015 but water level management to restore aquatic plants and water quality is ongoing.
- Completion of six underground tile inlets to reduce soil and nutrient loading to Big Spirit Lake in the Reeds Run sub-watershed.
- Collaborated to fund a 1.2-acre urban wetland detention basin in the East Okoboji Lake watershed (Francis Site).
- Funded FY18 -FY21 WQC projects, including the construction of an urban storm water wetland, shoreline protection on West Okoboji Lake, acquisition of two key wetlands in the watershed, and water quality monitoring.
- Apple Jack Marsh Restoration (near West Okoboji Lake) was completed in the fall of 2019 ($86,982 LRP; Diamond Concrete and Construction)
- Stabilization of East Okoboji Beach Shoreline completed in 2019 ($21,774 LRP)
- Shoreline stabilization project near Hattie Elston State Park with the City of Okoboji and the Imagine Iowa group (LRP contribution $19,000).
- Garlock Slough restoration through water level control and a fish barrier preventing rough fish from spawning in this shallow lake and then returning to West Okoboji Lake ($272,800; Federal NAWCA Grant ($123,555), Lake Restoration Program ($149,245))
- Ongoing water quality study to understand nutrient inputs to the IGL and movement of water and nutrients between lakes with the University of Iowa.

Francis Wetland

Project partners around the Iowa Great Lakes began working to address concerns with flooding and erosion to East Okoboji Lake (near the intersection between 28th Street and 255th Avenue) since 2012. To address these concerns and reduce nutrient and sediment inputs to the lake, partners worked with the East Okoboji Lakes Improvement Corporation (EOLIC), to develop a storm water wetland at the Frances Site that would remedy their concerns. In 2016, the County and City co-sponsored an engineering study to determine the size of the watershed that drains to this portion of the lake and develop a plan for constructing a wetland. Over the next three years, project partners worked to secure an easement to the property ($55,238.00 Dickinson CCB), raise funds, and develop engineering plans for the project. Construction commenced in 2019 on the 10.83-acre wetland and was completed in 2020. The project will intercept storm water flows from the 391-acre watershed and retain up to 50-year storm events within the wetland complex.

Angler's Bay

Over the past several decades, shoreline vegetation along the southeast section of Angler's Bay on Spirit Lake, at Hale's Slough Wildlife Management Area, has grown up from an open, park-like native oak savanna to a largely closed woodland dominated by green ash, ironwood, cottonwood, and other undesirable trees. These trees not only limit user access, but have also reached a height where they shade out a rare native submergent lake plant community in the shallows of Angler's Bay - a problem identified by DNR fisheries. Also, the preponderance of green ash in the stand may pose a safety risk in the future should the community be impacted by emerald ash borer.

To address these issues, DNR hired Blumer Excavating, LLC ($62,420.20; 35% Dickinson SWCD / 65% LRP) in 2021 to remove excess woody vegetation and undesirable trees from the shoreline and opening up the canopy to allow for understory vegetative growth, which stabilize the soil and reduces runoff to the lake (photo right). DNR plans to plant the understory in native prairie to return the area to an oak savannah.

Current & Future Work

The LRP continues to partner with the Dickinson County Water Quality Commission (WQC) to implement best management practices throughout the Great Lakes watershed. For the FY23 grant cycle, DNR contributed a total of $120,310 in projects that will enhance water monitoring at Silver Lake and construct several gully erosion structures. Additionally, the LRP continued to help fund water quality monitoring at Silver Lake through the FY24 grant cycle.

In 2020, LRP hired a research team at the University of Iowa to complete a water monitoring study that will produce a water and nutrient budget for the Iowa Great Lakes. The goal of the project is to utilize information to better target watershed BMPs and update the watershed management plan. Groundwater monitoring was completed in 2023 with the intention of continuing to collect watershed water quality monitoring data and begin building a water budget for the great lakes in 2024. Samples were collected throughout the summer 2024 growing season and a final report was completed in 2025 ($197k LRP). The study results indicate that groundwater plays an important role in nutrient and water volume contributions during dry years. Conversely, surface runoff has a stronger influence on nutrient and water volume contribution in wet years. This information will be used to prioritize future wetland restoration work around the Iowa Great Lakes Region.

The Iowa Great Lakes experienced record flooding in the summer of 2024, causing many bank slopes along the shorelines to collapse and contributing large quantities of sediment to the lakes, especially along the shores of West Okoboji Lake. In the fall of 2024, DNR hired Bolton and Menk to assess these bank collapses and complete engineering design to stabilize the toe of the slope at each of the sites where repair work had not already been completed by riparian landowners. Temporary construction easements were secured for many of the sites originally identified, and Midwest Lake Service has been contracted to complete this work at 33 sites, across four lakes (West Okoboji Lake, East Okoboji Lake, Big Spirit Lake and Silver Lake) ($537,304 LRP). Additionally, Bolton and Menk is working with project partners to design a stabilization project for the Pillsbury Point shoreline (LRP $1,085,077 for engineering). Construction for this project is estimated at $2.6 Million and is tentatively planned for the fall of 2026. Finally, the DNR completed engineering for the Triboji shoreline repair work and hired Laubes Backhoe and Hauling, LLC to complete the stabilization project ($65,871k LRP).

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Kent Park Lake, Johnson County

Background

Kent Park Lake is a 27-acre man-made lake in Johnson County that serves as a popular recreation destination for the surrounding communities. The lake has a 25 to one watershed to lake area ratio, and much of the land in the watershed is forested or grassland. The park is currently operated and maintained by the Johnson County Conservation Board (JCCB). Visitation at Kent Park Lake is in the top 25% of lakes statewide, and 2/3 of the watershed is in public ownership, including a number of remnant and restored prairies within the county park. Planning meetings began in early 2015 to develop a watershed plan for the lake and discuss future potential in-lake work to improve degrading water quality conditions. Prior to working with the Department of Natural Resources (DNR) Lake Restoration Program, the county worked to improve water quality in the watershed.

Restoration Work

In early 2016, Johnson CCB hired Stanley Engineering to design and oversee construction for in-park improvements that would help protect the lake. Stanley completed engineering design to renovate six existing sediment basins in the park and build six new structures that will capture nutrient and sediment run-off from entering the lake. Costs for engineering work were split 50/50 between the Johnson CCB and the DNR Lake Restoration Program. Construction began in 2016 and was completed in 2018 (see photo at bottom). Total costs for construction of this phase of the project were $1,184,460 (50/50 cost share between JCCB and DNR). Engineering costs for both the watershed and in-lake work at the park were $435,600 (50/50 cost share between JCCB and DNR).

The lake was drawn down in the summer of 2017 in preparation for in-lake work in 2018. A public meeting was held in the summer of 2017 to address the interested parties' concerns and comments on the project. Following the meeting, project partners worked to develop a comprehensive in-lake plan for restoration work.

Construction in the lake began in 2018, concluded in the spring of 2019, and included targeted removal of ~ 175,000 cubic yards of soft sediment from the main basin of the lake to re-establish depth in the lake, mitigate vegetation concerns following restoration, and remove excess nutrients from the lake bottom. Arms of the lake were also dredged and silt dikes created to reduce sedimentation in the main lake. Areas of critically eroding shoreline were hard armored, including the construction of a new limestone wall near the boat ramp and accessible fishing pier. A new boat ramp and kayak access was constructed to increase recreational opportunities at the lake. Additionally, numerous fish habitat structures were created throughout the lake to enhance angling opportunities. The lake was re-stocked with sport fish following the restoration project. In the summer of 2019, the Johnson County Conservation Board planted over 30,000 aquatic plants within the lake to encourage a native plant

community and provide fish habitat. Total costs for this phase were $1,268,526.00 (50/50 cost share between JCCB and DNR).

The restoration project resulted in a number of successes that will protect the park for years to come. Watershed improvements in the park include the construction of six new ponds to reduce sediment and nutrient pollution, as well as the rehabilitation of five existing ponds. Over 200 acres of timber stand improvement was completed throughout the park and over 50 acres of prairie was restored to stabilize soils and promote native vegetation.

The in-lake restoration project included the removal of over 11,743 dump trucks (176,743 CY) of sediment from the lake, reclaiming 4-6 feet of depth throughout the lake basin. Following restoration, the average depth in the lake is 12 feet (was 7.5 feet prior to restoration), which will allow for better water quality and recreation opportunities. Additional, about 1000 feet of shoreline was protected, including the addition of a 300-foot limestone stepping-stone wall near the boat ramp.

Finally, the CCB worked to improve recreational experiences for park users, including an observation deck at the lake's outlet, as well as an improved boat ramp and accessible fishing pier. Since the project was completed, the park has become a popular destination for kayaking, wildlife watching, and beach use.

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Lake Ahquabi, Warren County

Background

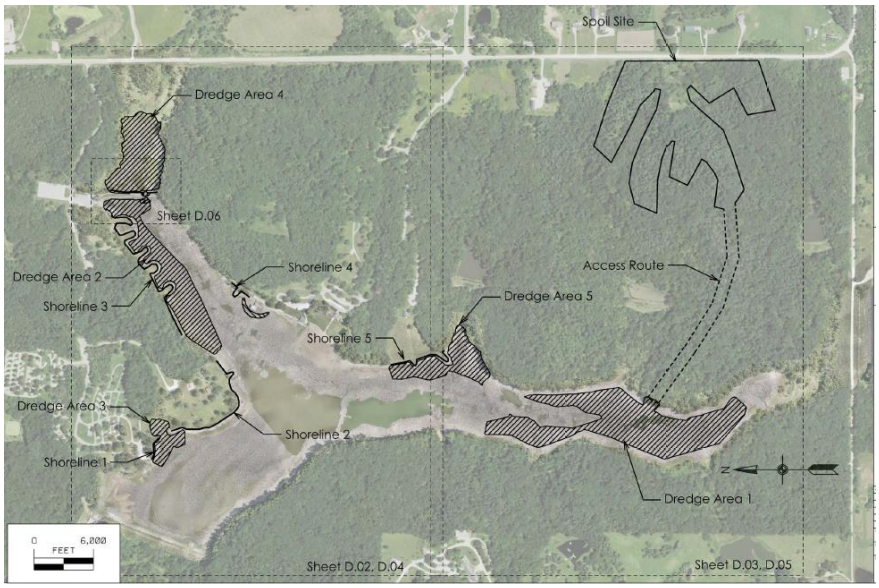
Lake Ahquabi is a 114-acre lake in Southern Central Iowa that serves as a popular recreation destination, drawing over 100,000 visitors to the lake annually (CARD 2014 Survey). The state park surrounding the lake is home to a large stone lodge, constructed by the Civilian Conservation Corps and boasts a popular swimming beach and campground. According to the 2014 CARD survey, the lake is a popular destination for camping, canoeing, swimming, relaxing, and trail use.

The lake restoration invested heavily in improving and protecting Lake Ahquabi in the late 1990s and early 2000s. Numerous ponds surrounding the lake in the park and throughout the watershed were installed to protect the lake from sediment and nutrient pollution. The outlet structure at the lake was upgraded, and eroding sections of shoreline were stabilized as a part of the project. The fishery was also renovated in the early 2000s to remove carp from the lake promote a healthy pan fish fishery.

Water quality in the lake improved from the early 2000s restoration, however; phosphorus concentrations in the lake have increased in the last five years, leading to a number of algae blooms within the lake. The quality of the fishery has also recently declined. Many of the ponds in the park have also reached their useful design life, and are in need of renovation. Finally, extensive trail maintenance is needed to removed invasive plant species from the park and address gully erosion within the park's trail network.

Current Restoration Activities

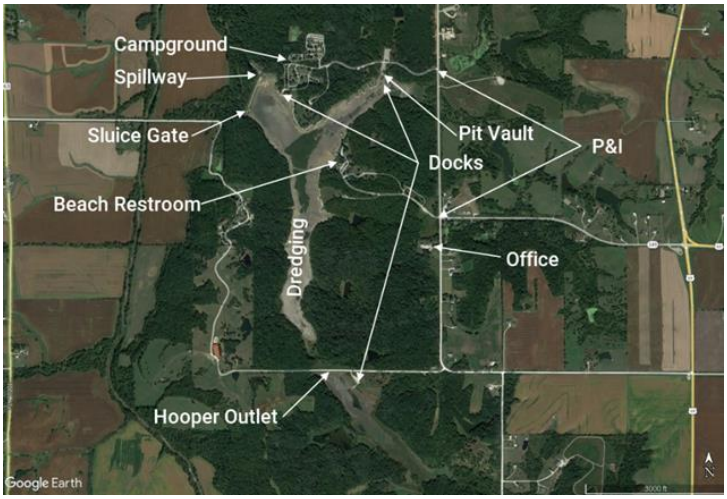
To address concerns in the lake and the watershed, a project technical advisory team was formed to formulate a restoration action plan for the park. The team began meeting in 2019 to discuss needed repairs to the lake, as well as timing for other planned projects within the park. With a planned campground renovation slated for 2022, partners worked to develop a more comprehensive restoration plan that will capitalize on completing construction projects in the lake while the campground and other facilities within the park are being renovated.



The lake was drawn down in the summer of 2021, and restoration work began park-wide in the fall of 2021. Lake restoration efforts were completed in the spring of 2023. Planned lake improvements included upgrading the outlet at Hooper Pond ($33K LRP) to allow for better water level management, timber stand improvement and removal of invasive species throughout the park, targeted sediment removal (178,000 CY), shoreline stabilization (5,100 LF), outlet repairs at Lake Ahquabi, a fishery renovation, road repairs in the park, and a campground and other infrastructure renovations. Shoreline, fish habitat, and dredging efforts cost $1.7M ($1.5M LRP, $200K REAP Open Spaces).

Wildlife staff began working in 2021 to remove woody debris and invasive vegetation throughout the park, utilizing equipment purchased from a US EPA Section 319 grant. The improved timber stands throughout the park will help minimize sheet and rill erosion by establishing ground cover. Work on the campground was completed in 2023 and additional work near the beach was completed in 2024. $11.8 Million has been invested in the park to date.

DNR is actively managing aquatic vegetation in Lake Ahquabi and nearby Hooper pond for enhanced water quality, habitat and recreational use.



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Lake Anita, Cass County

Background

Lake Anita is a constructed 159-acre Lake located ½ mile south of Anita, IA. The lake has a small watershed with numerous silt ponds that help to project the lake. The watershed also contains a significant number of acres in grass, pasture, or CRP that help to reduce the amount of sediment and nutrients entering the lake.

Restoration Work Completed

Restoration at the lake began with a fishery renovation in 2003 to eliminate an over-abundant and stunted population of yellow bass from the lake and promote vegetation growth in the shallow areas of the lake. While the lake was drawn down, additional fish habitat was also installed around the lake bottom. DNR wanted to take additional steps to improve the lake, however; so a restoration project was initiated to help protect the good water quality observed at the lake for years to come. Because the watershed already had a good number of conservation practices, efforts were focused on reducing sedimentation in the lake and promoting vegetation growth. Between 2013 and 2015, a sediment retention basin on the east arm of the lake was designed and expanded. The box culvert at the road was raised four feet and 8,000 CY of sediment was removed in an effort to increase the trapping efficiency of the pond. The total cost of the project was $41,000, funded by the DNR Lake Restoration Program.

Following the fishery renovation in 2003, four types of native aquatic plants were introduced to the lake to help promote healthy levels of vegetation, which is important for water quality and fish habitat. Vegetation was able to establish throughout the lake, and the lake has continued to meet Lake Restoration's goals for water quality. In 2013, Lake Anita had an estimated 64 acres vegetated (39% of the lake surface area) which falls within the goal of 10-40% coverage. Because vegetation was problematic in several bays, limiting anglers and boaters' access to the lake, several areas of the lake were chemically treated to remove excess vegetation, reducing the total coverage to about 28% of the lake's surface area. Aquatic plant management continued in 2025, with approximately 45 acres of American Lotus and lilies being aerial sprayed with herbicide.

Fishing continues to be excellent following the renovation in the lake, with abundant populations of 8+ inch bluegills and a sustainable population of largemouth bass. Crappie and catfish fishing are also excellent.

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Lake Darling, Washington County

Background

Lake Darling was initially impounded in 1950 and at that point was Iowa's largest constructed lake. By the mid-2000s the lake had a fair fishery and was plagued by severe in-lake siltation and poor water quality. Sedimentation had reduced the lakes original 302 surface acres to 267 acres. In response to water quality concerns, partners completed extensive watershed soil conservation work on state and private land, which reduced sediment delivery to the lake by 60% and laid the groundwork for a complete renovation of the lake and park.

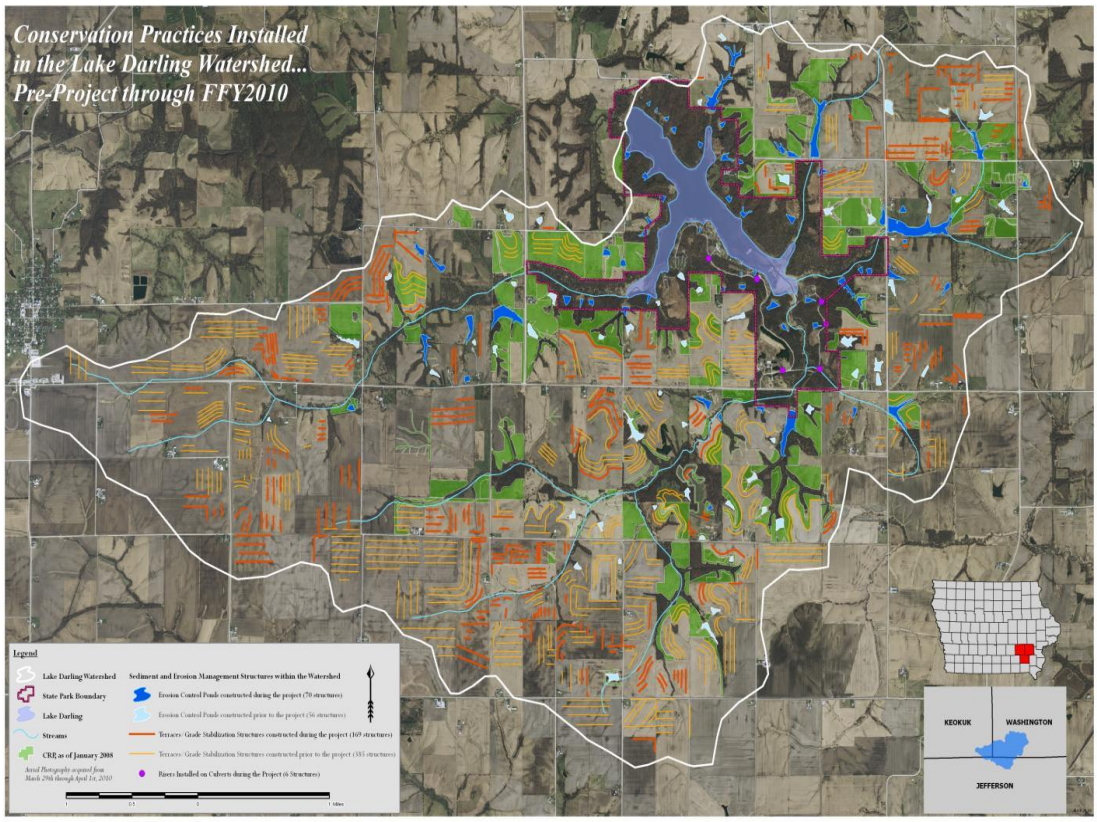
Lake Darling Gate Setting - September 17, 1950

Completed Restoration Activities

The park reopened in late July 2014 after being closed for renovation since 2010. In September 2014, more than 200 people gathered under a new shelter to officially rededicate Lake Darling State Park, 64 years to the day that the gate was formally set. The $13 million investment to improve and protect the lake and completely remake the campground and park roads is now complete, returning the park to its status as a destination for outdoor getaways. Speaker after speaker thanked the Lake Darling Friends Group, the Washington County Riverboat Foundation, the local chapter of the Izaak Walton League, the Iowa Department of Natural Resources, local landowners, the Washington County Board of Supervisors, the Brighton Chamber of Commerce, the Iowa Legislature and area residents for the role they played in the renovation.

Lake Darling Restoration Project Activities

- Replacing the dam
- New sediment catch basins in the watershed
- Two silt dams in the lake
- Lake level raised two feet to increase surface acres back to 305 acres
- Installed shoreline riprap, fishing jetties and piers
- New ADA fishing trail
- New roads, trails, and trail bridge
- New campground, with 50-amp service
- New boat ramps and fishing bridge
- New shelter at boat rental area and park lodge
- New sand on the beach
- New waterlines throughout the park
- Two new shower buildings and a new dump station
- Construction of a $1.0 million lodge was completed in 2015. (99% local and 1% State Parks & Infrastructure funds). In addition, a total of 6 cabins were constructed in 2015 and 2016 also with the help of local fund-raising efforts.



Landowners need to be recognized for their role in protecting the lake. Stan Simmons, the watershed coordinator played a significant role in working with over 80% of the landowners in the watershed to install more than 161 ponds, terraces, water control basins, soil-holding grasses and other conservation measures, accepted a water quality initiative leadership award on behalf of the project from Iowa Secretary of Agriculture Bill Northey.

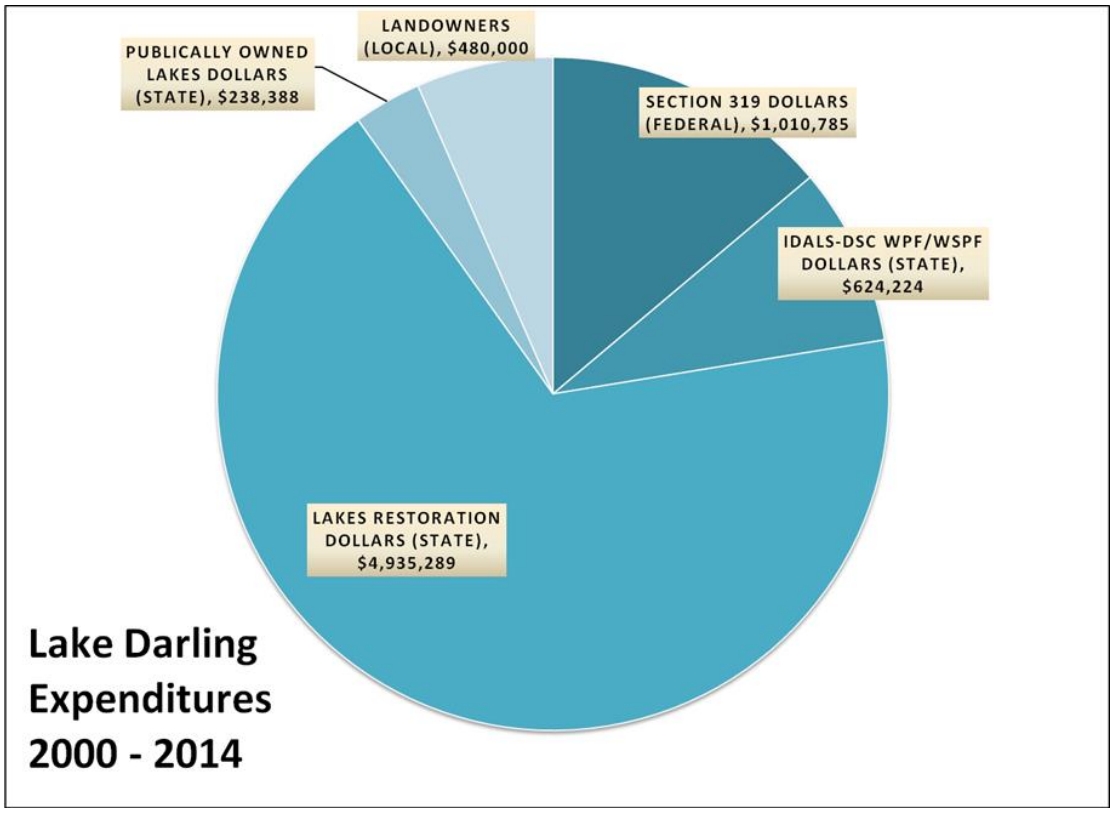
The new park will provide important health and economic benefits through visitation and outdoor recreation. An economic study by Iowa State University's Center for Agriculture and Rural Development, estimated the renovated park and lake would provide $8.7 million annual economic benefit to the area. This work complemented Iowa's improved quality of life initiative and continues to be a focal point of the community's effort to provide a healthy place to live, work and recreate.

- A Documentary titled, "Darling is Back" was created highlighting the partnerships and work completed in the watershed and at the park. Many members of the restoration project were interviewed during the filmmaking. The film premiered at Lake Darling State Park on December 12-13, 2015, and was released on PBS. The Lake Darling Restoration Project is sure to be a model for future projects in Iowa, and likely, the nation.

Funding Sources & Partnerships

Partners invested a total of $13 million to improve and protect the lake, and completely renovate the campground and park roads. Watershed and in-lake improvement costs totaled $7,288,686 (pie chart below), while park/campground improvement costs totaled $6 million. Contributing partners included DNR - Lake Restoration Program, Parks & Institutional Roads, Fish and Wildlife Trust Fund, REAP Land Management, and REAP Open Spaces; Sheldon Shoreline

Access Foundation; Washington Co. River Boat Foundation; Izaak Walton League; Friends of Lake Darling: Local Landowners: Board of Supervisors (Washington, Jefferson, Keokuk) and the Brighton Chamber of Commerce.



Over $7 million invested into Lake Darling Watershed and In-lake Restoration

Recent & Future Restoration Activities

DNR contracted with Drake University to analyze 2024 water samples and better understand how internal phosphorus recycling and oxythermal dynamics relate to harmful algal blooms in Lake Darling. Additionally, DNA source tracking was used to identify fecal contamination sources collected in 2025 (LRP $15k). Stratification was prominent at the deepest point in the lake during summer months. Bottom water lacked oxygen and exhibited a high concentration of phosphorus during the warm months as well. Course scale water quality monitoring (temporally and spatially) made it difficult to associate bottom water phosphorus release with surface water concentrations. Human and raccoon DNA dominated genetic samples, but did not correlate to high E. coli concentrations. A mixture of goose, cow, pig, deer, poultry, chicken, and dog DNA were also detected. The growth of cyanobacteria in the lake and E. coli in beach sands is likely being driven by nutrient loading from the watershed, therefore, implementation of best management practices would help to ensure long-term water quality improvements.

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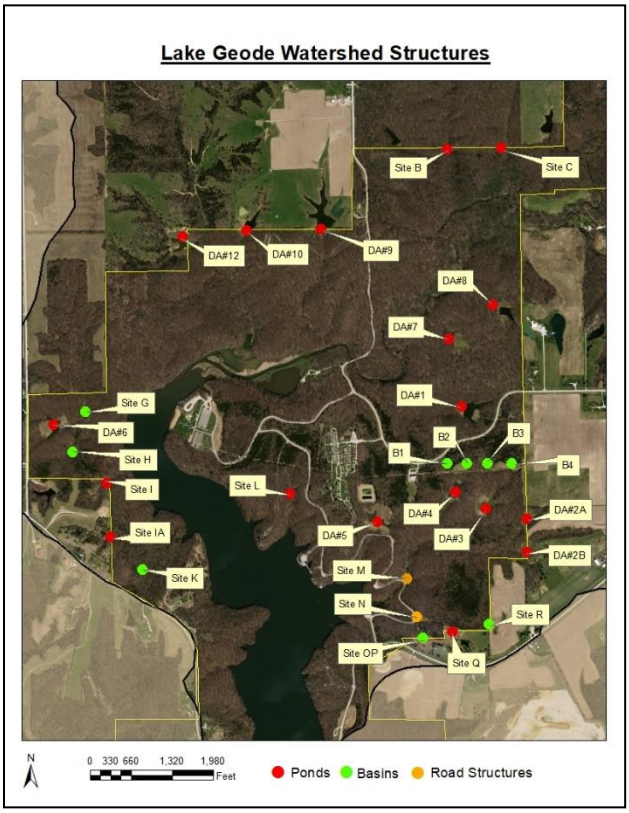
Lake Geode, Henry County

Background

Lake Geode, located in Henry and Des Moines Counties, is a 174-acre lake encompassed by a 1,640-acre state park. The entire Lake Geode watershed consists of approximately 10,327 acres. The watershed encompasses drainage from Cedar Creek and the lake outlets to the Skunk River. This scenic lake was constructed in 1950 and has historically been considered an excellent fishing lake. DNR estimates that Lake Geode State Park attracts approximately 180,000 annual visitors who camp, hike, fish, and boat within the park.



The goals of the Lake Geode Watershed Project are to reduce bacteria, sediment and phosphorus loading into Lake Geode. Project partners plan to achieve these goals through a combination of best management practices that will target identified source contributors from state and private land. The following agencies are working in partnership to achieve this goal, Iowa Department of Natural Resources (DNR), Iowa Department of Agriculture and Land Stewardship - Division of Soil Conservation (IDALS-DSC), Natural Resources Conservation Service (NRCS), Henry Soil and Water Conservation District and Des Moines Soil and Water Conservation District.

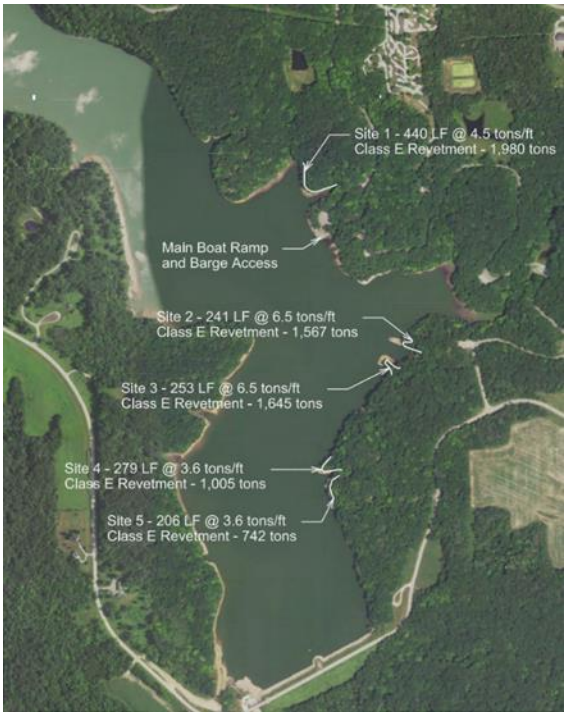
- Goal 1: Address bacteria impairment of Lake Geode in an effort to remove it from the 303(d) list.
- Goal 2: Reduce total phosphorus and sediment delivery from agricultural and non-agricultural sources by 6,351 lbs./ year and 2,499 tons/year, respectively.

The Natural Resources Conservation Service, Iowa Department of Agriculture and Land Stewardship and the Iowa Department of Natural Resources have been working together to install Best Management Practices (BMP's) on state property. The Lake Geode Watershed Coordinator also continues to make progress on private land in the watershed. For example, terrace projects have been completed and septic systems are being investigated in terms of leakage/upgrading.

Beginning in 2012, a series of watershed BMPs (above image) were constructed in Lake Geode State Park to reduce nutrient and sediment inputs to the lake. Between 2012 and 2018, a total of 29 structures were completed. These sediment/nutrient control structures were constructed at a cost of $864,060 (~ 50% DNR Lake Restoration Program; 50% DNR Watershed Improvement Section). Following construction of some ponds, fish have been stocked by the DNR to allow for additional angling opportunities at the lake. Several additional structures are being built as a part of the in-lake restoration project.

In addition to watershed improvements, a number of projects are underway in the park to improve recreational opportunities and provide better wildlife habitat within the park. Wood duck boxes were installed near the recently constructed ponds. Each of the wood duck boxes were donated by citizens from the community. New trail construction

is being planned to allow for better access to the recently constructed ponds in the park. Finally, multiple practices to help deter geese from living near the beach and contributing to beach bacteria problems (see above photo). Practices that have been used to date include wood-lathe snow fencing, pyrotechnics, and Mylar tape.



A public meeting was held in the summer of 2017 to discuss future restoration plans for the park and lake at Geode State Park. Over 100 people attended the meeting to learn about the project and share their comments and concerns about the park and lake. Fishing regulations were relaxed in preparation for a fall draw down at the lake to begin construction.

Lake Restoration Work

Work began in the summer of 2017 to open the valve at the lake and begin the draw down process. A dive crew was hired to investigate the condition of the lake's draw down structure, as the sluice gate (which usually prevents water from flowing out of the lake) was inoperable prior to draw down. In addition, the investigation revealed that a metal plate was covering the inlet pipe of the lake and needed to be removed for the lake to drain. Throughout the fall of 2017, DNR Engineering staff worked with several contractors to carefully and safely draw down Lake Geode. The lake was completely drained by November of 2017. Construction on the outlet was completed in 2019 for a total cost of $449k and included repairs to the spillway and a new gate valve structure.

Restoration work in the lakebed began in the spring of 2018 and concluded in the fall of 2020. Targeted dredging (191,832 cubic yards) removed excess soft sediment and re-established depth at the upstream end of the lake (see photo at left). An in-lake silt dike was constructed at the primary inlet of the lake to prevent sediment from entering the main basin of the lake. Additionally, 2,402 linear feet of shoreline was armored to minimize wind and wave erosion. Sediment from the lake was used to construct mounds and fish habitat within the lake bed. Two in-lake silt dikes were constructed near the upper end of the lake to prevent nutrients and sediment from entering the lake. Four new fishing jetties were created in the upper end of the lake to improve angler access. Finally, five areas of shoreline were armored via barge in 2020 and 2021 (see photo below). The total cost for the in-lake portion of the project was $2.79 million.

The fishery was also renovated as a part of the restoration project, and sport fish were re-stocked in 2021, following the completion of dredging and shoreline armoring.

Finally, the Parks Bureau also renovated the campground in the summer of 2018 to update bathrooms, shower houses, and electric sites to suit more modern RVs and campers. Construction was completed in 2019, and the park has been busy following the restoration projects, including a visit from Governor Reynolds to help local staff stock Bluegill into the lake.

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Lake Icaria, Adams County

Lake Icaria's clarity used to be measured in inches; it is now measured in feet. Before, you could only see down six inches in the murky waters of this southwestern 647-acre Iowa lake. Now, following work in the watershed and in the lake, you can watch your toes wiggle when standing in waist-deep water. Landowners set out in 1996 to improve the lake as part of the Adams County Three Lakes Project.

In the past decade, landowners have changed how they farm to improve water quality. Following work in the watershed, the DNR moved ahead with restoration efforts in the lake in 2004. At Lake Icaria, in-lake work has helped protect 10,000 feet of shoreline from erosion. Anglers will notice four new fishing jetties, repaired jetties and a repaired main boat ramp, as well as a renovated fishery and restocked lake. The DNR also placed 12 underwater rock mounds to attract fish for anglers. Since Lake Icaria completely refilled in the spring of 2007, the water is remarkably clearer - generally, a person can see three feet down in the water, sometimes up to six feet. With an improved lake, anglers, campers and other park visitors are taking notice. Starting in 2008, fishing and park visitations have improved.

- The DNR Lake Restoration Program cooperated with the Adams Soil and Water Conservation District by providing funding resources to repair and improve the main tributary wetland that was originally constructed in 2004. In 2013, the DNR contracted with Murphy Heavy Contracting Corp. to repair the wetland at a cost of $386,028 (Watershed Improvement Review Board grant to the SWCD paid $170,525 and the Lake Restoration Program paid $215,503). Construction was completed September 2013.
- In addition, Adams County Conservation Board applied for a fish habitat grant for four sediment control ponds above Lake Icaria. The DNR and Adams CCB coordinated planning for these structures during the winter of 2012/2013 and the ACCB constructed these ponds during the summer of 2013 at a cost of $67,221 (Fish Habitat Grant $34,871, SWCD $22,500 and Lake Restoration $9,850).
- In 2014, the DNR repaired the existing riprap shoreline along the point that surrounds the primitive campground at Lake Icaria.
- Good numbers of 14-20-inch largemouth bass have been recently caught as a part of DNR's fishery management monitoring. Good numbers of young-of-the-year walleyes were also captured, indicating that the future of the fishery looks bright.
- DNR Fisheries staff modified the wetland and silt dam structures above the lake in 2016 to reduce common carp abundance in the lake. Total cost for this project was $19,000. Fisheries staff is also evaluating two sediment retention ponds near the lake that could be used as fish rearing ponds. If plans are implemented, these ponds could supplement walleye populations in the lake by as much as 10-40%.
- DNR is actively managing American Lotus with herbicide spot treatments.
- Wildlife staff are working with the lake restoration to remove brush and invasive species in upland timbers in the watershed to minimize erosion associated with bare forest soils from excessive canopy cover ($45k LRP).

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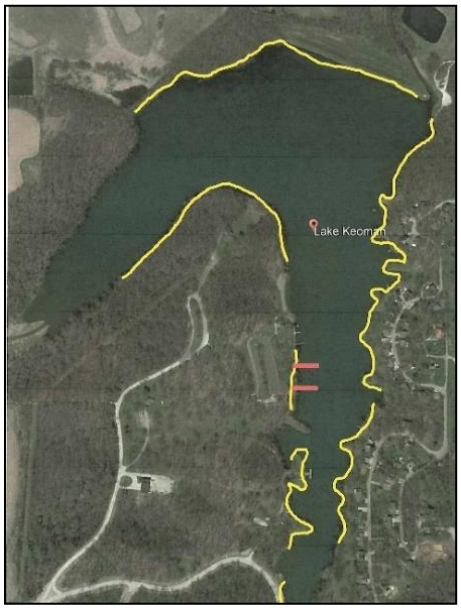
Lake Keomah, Mahaska County

Background

Lake Keomah is a highly valued 78-acre public resource within Lake Keomah State Park, attracting an estimated 36,000 visitors annually. The lake is currently designated as impaired due to poor water quality, specifically high bacteria levels, excessive algae, and periodic low dissolved oxygen concentrations. The DNR Lake Restoration Program identified Lake Keomah as a priority, necessitating a comprehensive restoration effort.

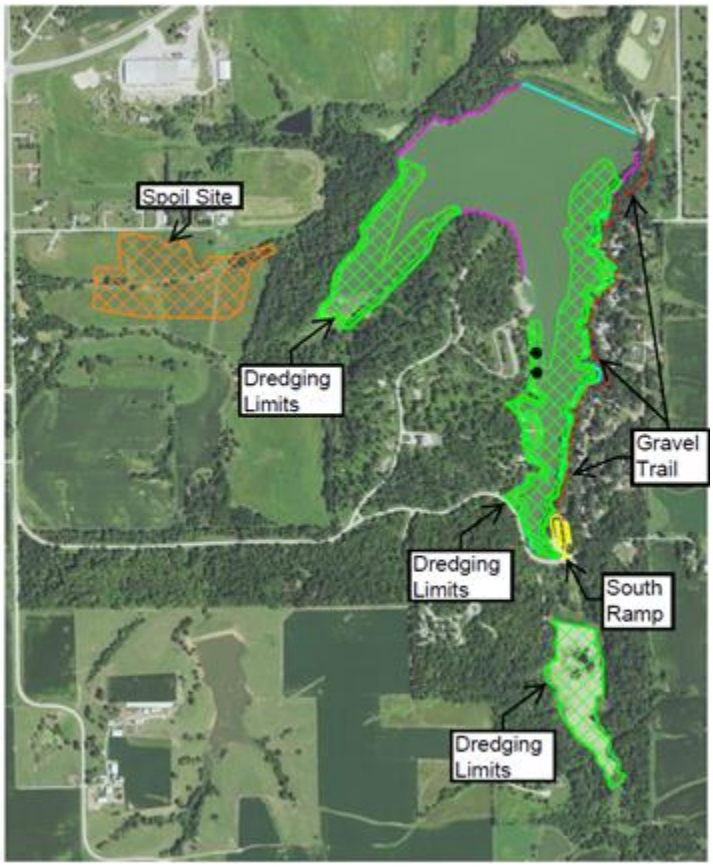


Planning

Planning initiated with a public meeting in 2009 and culminated in the 2012 Water Quality Improvement Plan to address impairment issues. Between 2012 and 2019, key groundwork was laid, including the creation of a local support group, a complete in-park watershed assessment by a part-time coordinator, and the start of woody invasive species removal within the park boundary to reduce erosion and to improve wildlife habitat. A new coordinator was subsequently hired in late 2019 to implement Best Management Practices (BMPs) on private land within the watershed.

Current and Future Restoration Efforts

Local park staff began restoration efforts by improving timber stands throughout the park to remove invasive species, allow sunlight to penetrate to the forest floor, and reduce erosion to the lake. In 2022, DNR acquired a tract of land adjacent to the park for use as a spoil site ($660,000 LRP). Following project design completion and a public open house in 2023, implementation began with the draining of the lake in late summer 2024.



DNR also hired a consultant in 2024 to survey the dam and spillway at the lake and make recommendations for repairing both structures. The spillway had considerable spalting and cracks, and repairs were needed to upgrade the existing infrastructure for the next generation. The gate valve ($81k), spillway walls ($324k) and floor ($77k) were replaced in 2025 ($482k; 90% LRP, 10% Parks Infrastructure).

The contractor constructed a dredge spoil site west of the lake. To date, 228,150 cubic yards of sediment and native soils (65% of the planned 351,000 cubic yards) have been excavated and hauled to the spoil site.

The contractor will remove the remaining sediment from the lake basin and Vivian's pond, an 8-acre watershed pond, during the winter of 2025/2026. This pond was constructed in 1992, so it has very little storage capacity remaining (see photo to the right). The control structure will also be retrofitted so managers have the ability to manipulate water levels of this pond in the future. The spoil site will be permanently seeded into prairie. Approximately, 11,000 linear feet of shoreline will receive

rock armoring to stabilize eroding shorelands. Two new fishing jetties will be constructed south of the beach area to improve angler access. Underwater fish habitat reefs will be constructed adjacent to shoreline-accessible fishing areas. The south boat ramp, gravel parking lot, and trail access will be replaced with a new concrete ramp, expanded lot, and gravel-surfaced trail connection. Construction is targeted for completion in early 2026 to capture spring snow melt and rain runoff, which will begin refilling the lake. Fish restocking efforts will begin in spring 2026, as soon as sufficient habitat is inundated. The project (except for the dam outlet/spillway repairs) is estimated to cost $3.9 million (LRP $2,603,000; MFT-Fisheries $558,000 for shoreline stabilization; REAP Land Management $275,000 for the surrounding trail; MFT $394,000 for a boat ramp, ramp parking & restroom; Parks Infrastructure was $70,000).

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Lake Manawa, Pottawattamie County


Background

Lake Manawa is a 785-acre oxbow lake with a watershed to lake area ratio of 4:1. Mosquito Creek supplies additional water to the lake during periods of heavy rainfall and high stream flow. The DNR contracted with Tetra Tech, Inc., in 2009 to provide a diagnostic feasibility study for Lake Manawa as part of DNR Lake Restoration Program planning activities. These studies include specifics on a suite of water quality improvement efforts, one of which is dredging. Dredging is a vital component of an overall restoration effort, as it would create additional depth and volume at Lake Manawa, both important to achieving long-term water quality goals. The studies also prioritized the lake areas to conduct dredging activities based upon potential effect of dredging on the overall lake seepage and quality of material. The unique quality of the sand material may provide an opportunity to recycle it for other uses such as road or other construction projects.

Past lake dredging work in the 1960s deepened significant portions of the lake. However, maximum lake depth still did not exceed 13 feet with large expanses of 6 to 7 feet deep water. Lake Manawa's final restoration goal includes an increase in mean depth to approximately 8.2 feet, with some regions of 20 feet water depth.

Current Restoration Activities

Due to the complexity, time commitment, technical expertise, groundwater monitoring, and sensitivity of leakage areas in the oxbow, the DNR contracted with FYRA Engineering to provide professional design and oversight on the project. FYRA monitored seepage throughout the dredging project and designed the project to maximize potential for sand removal that can be re-purposed for other construction projects and yield the best water quality results and recreational opportunities within the lake, while minimizing seepage to the surrounding ground water and Missouri River.

2016 Dredging - DNR contracted with J.F. Brennan to remove 519,506 cubic yards (CY) of sand/material from the lake and stockpile it at the state park. Sand removed from the lake met a variety of construction needs, and in 2018, Ames Construction Inc., working on behalf of Mid-American Energy, re-purposed the sand pile at the spoil site for Mid-American's construction needs. Total cost for this phase of dredging was $4,200,586. DNR recuperated $2.34 M through sand and gravel royalties generated from the material removed from the spoil site.

2020 Dredging - Beginning in 2018, DNR began working with the City of Council Bluffs to develop a second phase of dredging at Lake Manawa to achieve water quality benefits at the lake and produce material suitable for the City of Council Bluffs to utilize on levee construction projects. J.F. Brennan was hired to remove 519,805 CY of material from the lake and stockpile it at the same spoil site for the City's use. The overall project cost was $6,042,483. The City offset dredging costs, contributing $1.56 M to the project, consistent with the value of the materials removed. The City will remove sand from the spoil site by 2023; this will allow for future phases of dredging if needed.

Campground - DNR Parks broke ground on a new campground in 2020, with construction completed in 2021. The $3M campground will bring new recreational opportunities to the lake for years to come.

Vegetation Management - DNR staff have worked extensively over the past several years to keep American Lotus (emergent plant) populations from expanding too much across the lake's surface area. In 2025, an aerial herbicide application provided effective control across 105 acres. Lotus is a very aggressive plant, so DNR continues to work to maintain a healthy balance between enough vegetation to provide fish habitat and stabilize sediments while still allowing for boating access and recreation.

Mosquito Creek Diversion Repair & Rock Reef Fish Habitat - DNR suspected that the diversion structure responsible for directing water to Lake Manawa from Mosquito Creek to supplement water to the lake was obstructed. A diver has hired to inspect the 48" diameter pipe in 2025 and found that debris and sediment was blocking 83% of the pipe, decreasing flow to the lake. Jones Contractors & Associates was hired to clear the obstruction and install a 50 ft sleeve/extension from a barge (photo to the right). Half of the sleeve was inserted into the existing pipe, and the other half was left protruding into the lake. The extension will prevent rip rap and sediment from blocking the pipe in the future and improve flow. Park staff have already noticed a positive response in lake level post-project.

Submerged rock reefs were also installed to enhance fish habitat in Lake Manawa while the barge was onsite. Approximately 1,140 tons of Class D rip rap (76 rock piles) were placed at five locations, adjacent to the dredge cuts to provide refuge and spawning habitat for the fishery. The total project cost was $173,096 ($96,934 LRP 66%; $76,162 REAP Open Spaces 44%).

Future Potential Restoration Efforts

Dredging - 500,000 CY of the original goal remains for dredging within the lake basin. DNR will continue to explore options for dredging additional material from the lake once the current sand stock pile has been utilized by the City.

Mosquito Creek Improvements - The 2018 water quality improvement study (completed by FYRA Engineering) suggested that installing a sediment detention pond/wetland near the outlet of the creek to the lake would significantly reduce the amount of phosphorus pollution to the lake. Engineering staff met onsite to survey potential sites in 2022, but were unable to locate a site with a large enough drainage area, access, and slope for a wetland to be constructed. DNR continues to look for opportunities to reduce nutrient and sediment inputs to the lake.

Potential Future Work - DNR will continue to monitor water quality in Lake Manawa and determine if additional phases of dredging or other nutrient mitigation efforts, such as a phosphorus inactivation treatment, could be effective restoration tools.

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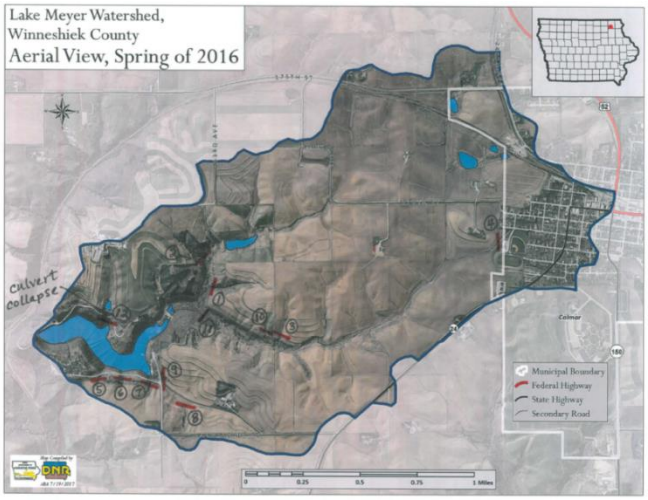
Lake Meyer, Winneshiek County

Background

Lake Meyer, located in northeast Iowa, is a 33-acre lake with a watershed to lake area ratio of 48:1. The bulk of the watershed (77%) of the drainage area is in working agricultural production. Lake Meyer, and the surrounding county park, provides a diversity of habitats for a variety of plants and wildlife, and the lake serves as a locally important recreation destination. The area is recreational hub that draws and estimated 18,000 visitors annually, resulting in an estimated $1.8 M in total spending. Popular activities at the lake include fishing, relaxing, wildlife viewing, trail use, and paddling. The park is also home to the Winneshiek County Conservation Board's headquarters, modern camping facilities, and a nature center.



The WCCB has worked with local partners for a number of years to preserve water quality at Lake Meyer. To date, numerous watershed practices have been installed to improve water quality in the lake and prevent future sediment and nutrient pollution. Practices installed include 66 acres of filter strips, 5 manure storage systems, over 35,000 feet of terraces, 8 grade stabilization structures, 5 sediment and water control structures, over 4,000 feet of grassed waterways, 3 bio-swales, and 4 wetlands. Additionally, about 11,000 tons of sediment (equivalent to about 700 dump trucks) have been removed from the lake. The WCCB petitioned the DNR to be included in the Lake Restoration Program in 2016 to complete restoration work in the lake and watershed.

Current Restoration Work

In 2018, a culvert under the road to the nature center collapsed and impacted a pond located above the park. DNR and the WCCB worked together to re-design the pond to better protect the lake. Plans were completed in the fall of 2018 to build a pond in the park that will treat 46.4 acres of the watershed. As a part of the project, the existing basin was excavated to regain sediment storage capacity and the height of the dam was raised to allow for a longer design for the pond. The sediment basin was constructed at the park boundaries and revitalized the existing road infrastructure within the park as a part of the dam construction. The proposed basin was designed by WHKS engineering and project oversight was administered by the WCCB. DNR reimbursed the WCCB for 75% of the total cost of the project ($103k), which was completed in 2019.

In the fall of 2020, the CCB completed some additional repair work at the dam to minimize seepage from the lake. Construction for the project included siphoning water from the lake and filling holes in limestone rock wall along the dam with blue clay, bentonite, and flowable mortar. The area was then shaped and covered with cloth and riprap to prevent additional seepage.

In 2025, the lake experienced seepage through the dam in two locations. Project partners are considering contracting geotechnical services to delineate seepage and provide potential solutions. Additionally, the next phase of watershed and in-lake improvements at the park are being discussed.

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Lake Miami, Monroe County

Background

Lake Miami is a 122-acre impoundment located on the 776 Miami Wildlife Management Area, approximately 6 miles northwest of Albia, in Monroe County. The lake, constructed in 1967, is owned by the Iowa Department of Natural Resources. The area is cooperatively managed by the Iowa DNR through a 28E agreement with the Monroe County Conservation Board, which operates a campground, cabin rental, and a nature center facility on 89 additional acres of adjacent County Park. The lake and park provide facilities for boating, fishing, camping, picnicking, and hiking. Park use, as determined in the recent Center for Agricultural and Rural Development (CARD) study is estimated at approximately 43,000 visits per year.

The Iowa Department of Natural Resources (DNR) has identified Lake Miami as impaired and has placed it on the Clean Water Act Section 303(d) list of impaired waters in the state. The identified pollutant is siltation from agricultural non-point sources (NPS) impairing aquatic life in the lake. Along with diminished water quality, angling and camping usage of the area also declined in the early 2000s. From 1971 to 1991 mean Secchi disk readings exceeded 25 inches eight out of 10 times (80%); since that time mean Secchi readings have exceeded 25 inches only four out of 10 times (40%). These data indicate a substantial decline in water transparencies in this time. Possible reasons for the decline in water quality include turbidity from sediment, nutrient delivery from sheet/rill and gully erosion in the watershed, shoreline erosion due to wind and wave action and the re-suspension of these bottom sediments and their associated nutrients from wave action, and re-suspension of sediments by rooting action of Common Carp.

Restoration Work

The Monroe County Soil Conservation District applied for and was awarded $17,000 ($15,000 from Division of Soil Conservation with $2,000 from DNR Lake Restoration Program funding) for an updated watershed assessment of the Lake Miami Watershed. This assessment was completed fall 2012.

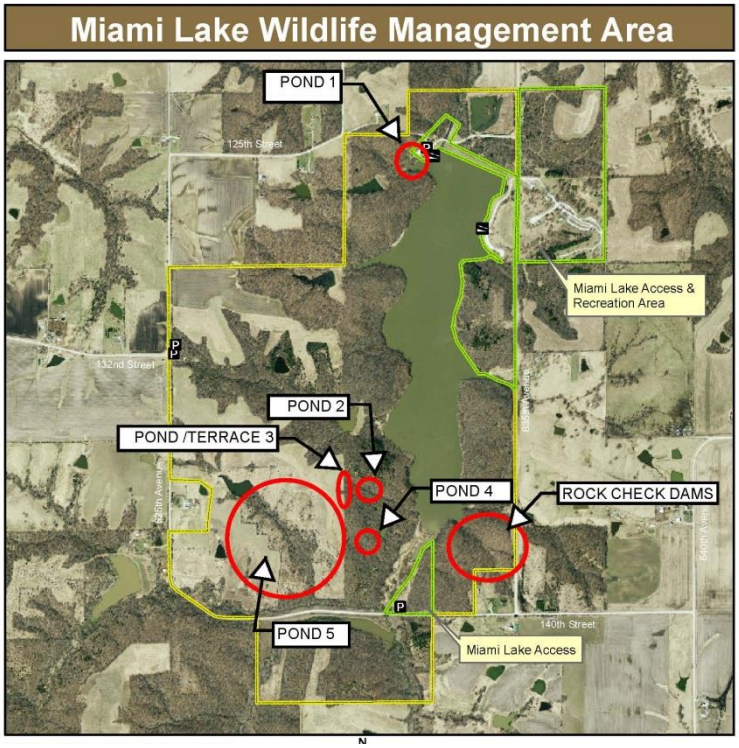
An assessment of the fishery indicated that common carp were present in excess of 400 lbs./acre while gamefish biomass was minimal. Angling quality had declined dramatically in recent years, mirroring changes in water quality. The fish population at Miami was renovated in late October 2013. Common carp and all other fishes were removed from the lake. The lake was restocked in the spring of 2015. Largemouth bass up to 20 inches and bluegills up to 9 inches are already available for anglers. Fishing will continue to improve, and water clarity has improved in the last couple of years with the removal of rough fish from the lake.

The Lake Restoration Program funded the design and construction of a carp barrier in the Lake Miami spillway. This structure (shown in above photo) will ensure that carp will not reinvade the renovated fishery and thus, negatively affect water quality. The total cost of this structure was $48,750 and was completed in May 2014.

Local fisheries staff completed a shoreline assessment in 2013, where they identified a total of 10,000 feet of priority shoreline for stabilization. Marine Fuel Tax funds (MFT) were available for a shoreline restoration project in winter 2014/2015.

The Lake Miami shoreline restoration project was awarded $676,580 in funding through MFT and $46,439 Lake Restoration Program funds. A total of 10,000 feet of shoreline were armored and the project was completed in March 2015. Rathbun Fisheries Management and the Monroe County Conservation Board jointly cut and placed several dozen cedar trees at 4 separate locations in the lake basin in the winter of 2014/2015 as fish habitat.

Monroe CCB also received Watershed Improvement Review Board funding for the construction of sediment control structures on State property to reduce gully erosion. A previously mentioned watershed assessment showed that whole state-owned land only represents 19% of the total watershed; it suggested that up to 73% of the total sediment load to the lake originated on state-owned land. Thus, these watershed structures are critical for reducing inputs to the lake.



Construction of five watershed improvement structures started in the fall of 2016 and concluded in the fall of 2017. Total cost for this project was $326,024 ($284,874 Lake Restoration Program; $41,150 WIRB). From 2018 to 2020, the Lakes Program continued watershed work by working with the DNR Wildlife Bureau to facilitate timber stand improvement on over 300 acres of the watershed.

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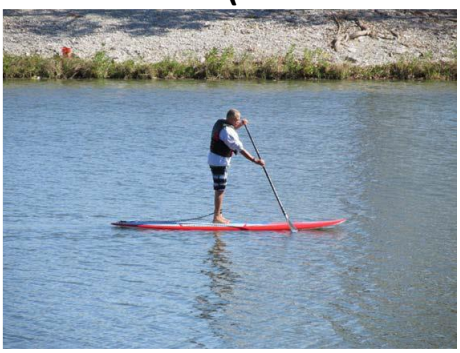
Lake of the Hills (West Lake Park), Scott County



Background

The Lake of the Hills complex of lakes encompasses four publicly owned lakes (Lake of the Hills, Railroad Lake, Bluegrass Lake, and Lambach Lake) within West Lake Park, which is owned and operated by Scott County Conservation Board. The park serves as an important recreation destination for eastern Iowa, with approximately 500,000 visitors to the park each year. During the summer months, the campground is filled most days and most park shelters are rented to capacity. The park is in the process of making additional infrastructure improvements, including building cabins to attract additional users. Additionally, West Lake Park is the home of the Quad Cities Triathlon, drawing approximately 700 athletes to the park. Other day uses include fishing, paddling, environmental education, hiking, photography, bird watching, and relaxation.

Lake of the Hills, located within West Lake Park, is a 54.6-acre lake with a watershed of approximately 1500 acres (28:1 watershed to lake area ratio). Thirty-eight percent of the watershed is located within the park's boundaries, including 98 acres of water and 521 acres of land. Lake of the Hills is surrounded by four smaller lakes, three of which are contained within the park and under public ownership. Until recently, the smaller lakes have protected Lake of the Hills; however high sedimentation rates and declining water quality in recent years have had a negative impact on overall water quality and recreational opportunities at the park.

Over the years, water quality at Lake of the Hills and the surrounding lakes has degraded due to increased nutrient and sediments from the watershed. Excess nutrients, especially phosphorus, have led to frequent algae blooms and low water clarity. Sedimentation in the smaller lakes surrounding Lake of the Hills has contributed to the decline in overall water quality at the park. Lake of the Hills is considered impaired by DNR and the EPA. Research conducted by DNR and others determined that phosphorus inputs to the lake needed to be reduced by 78% for Lake of the Hills to meet state water quality standards. A combination of restoration practices are needed to achieve this goal. In 2016, both a TMDL and Watershed Management Plan were developed for Lake of the Hills. In 2017, The SCCB hired FYRA Engineering to evaluate potential restoration strategies identified in the watershed improvement plan. Restoration strategies within the park (watershed) and in the lake were prioritized for water quality benefits to the lake and costs, and a conceptual design and planning budget for the overall project was completed as a part of a technical memo from FYRA.

Current Restoration Work

Reducing sediment and nutrient inputs to the lake from the watershed is the first step in improving water quality for the lakes in West Lake Park. In 2018 DNR and the SCCB partnered with FYRA Engineering to design a variety of park best management practices aimed at minimizing sediment delivery to the lake. Three new sediment ponds were constructed within the park, as well as rehabilitation of two existing ponds within park to restore capacity. Additionally, a bioswale was constructed near the beach to intercept storm water off the large parking lot located just above the beach. Finally, stream enhancement work was completed in several parts of the park to further reduce erosion. Construction for this phase of the project was completed in 2019 for a total cost of $622,077 (75% DNR, 25% SCCB).

Following the 4th of July holiday in 2019, the lakes within West Lake Park were de-watered by opening up the gate valves

at all lakes with a draw down capacity and through supplemental pumping. The cost to de-water the lakes was $46,550.

The in-lake portion of the restoration project was bid in the fall of 2019 and awarded to Legacy Corporation of Illinois for a total of $4.2 Million (75% DNR, 25% CCB). For this project, critical shoreline areas will be armored with rock and vegetation to prevent future bank erosion. Excess sediment will be removed from Bluegrass, Railroad, and Lambach lakes to improve water quality of those lakes and restore their recreational functionality. Sediment traps in the form of sediment ponds and forebays will be constructed above the lakes to prevent future sedimentation. Fish habitat in the form of tree piles, rock piles, and rock spawning beds will be placed throughout the lakes. Construction began in 2020 and concluded in 2021.

Shoreline stabilization along the banks of Lake of the Hills. Over 1000 feet of shoreline are being armored as a part of this project.

Finally, DNR and the CCB collaborated with local landowners to upgrade the outlet structure at Lake Canyada and restore the fishery in this privately owned lake that drains directly into Lake of the Hills. The new outlet structure will allow local landowners better water level control of the lake and the upgraded design with result in fewer storm events where water overtops the dam and passes over a CCB park road. With the lake drawn down, it will also allow DNR to complete a fishery renovation and ensure that no rough fish (carp) can populate Lake of the Hills when construction at all of the lakes is completed. Construction was completed in 2021. DNR is a 25% cost share partner on this element of the project, contributing $63,818 to the restoration efforts at Lake Canyada

Construction at one of the watershed ponds constructed in the part as a part of the restoration efforts.

In 2025, DNR fisheries staff and the aquatic vegetation management team developed aquatic vegetation management plans for Lake of Hills and Railroad Lake. Aquatic Control was hired to spot-treat overabundant Coontail with herbicide. The applications targeted high-use areas, such as boat ramps, accessible shorelines and fishing structures. DNR, in conjunction with the CCB, will finalize aquatic vegetation management plans to treat Lake of Hills, Railroad Lake and Bluegrass Lake in 2026.

Minor work was also completed on the lake's valve at Lake of the Hills in 2025. These repairs eliminated some leaking from the outlet structure that was causing lake levels to drop ($3k; LRP). Project partners will continue to monitoring infrastructure at the park and aquatic vegetation issues as warranted.

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Lake of Three Fires, Taylor County

Background

Lake of Three Fires is a 97-acre reservoir in, constructed in the late 1930s. The lake and surrounding state park offer diverse recreational opportunities, such as fishing, hunting, paddling, boating, camping/cabin rentals, picnicking, and equestrian trail riding. The lake is a popular destination, drawing in over 29,000 visitors annually.

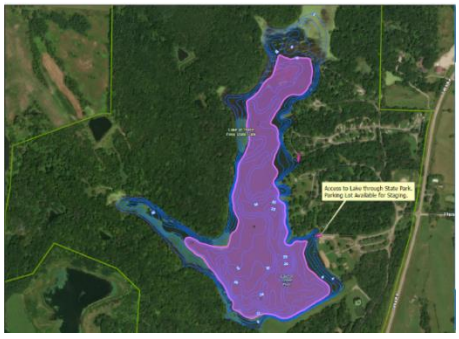
Restoration Activities

DNR and IDALS collaborated on a watershed project, working with landowners to reduce sediment reaching the lake and created wetlands to filter nutrients from runoff. Four watershed ponds were rebuilt and thirteen new wet/dry structures were constructed on public land gullies.

In 2004, DNR renovated the park and drained the lake to implement in-lake improvements. A 40-acre spoil containment site was constructed on adjoining DNR property, and dredging efforts increased the average depth by 4 feet. The fishery was renovated and the lake's spillway was modified to prevent undesirable species, like Common Carp, from reentering the lake post-restoration. Approximately 1,000 feet of shoreline was stabilized and fish habitat was installed. The lake was restocked in 2006 with Largemouth Bass, Bluegill and Channel catfish. Historical data indicates the lake suffered from poor water clarity, never exceeding 18 inches. Water clarity improved post-restoration, with clarity commonly exceeding 42 inches. The total cost of park and lake restoration efforts was $3.8 million. Approximately $2.3 million was spent to restore the lake/watershed, enhance fish habitat, stabilize shoreline and upgrade the boat ramp, while the park received $1.5 million in road, campground and shelter upgrades. In 2008, the DNR acquired an adjacent 80-acre parcel that was strategically located in the watershed (Simmons Tract Park). A 25-acre wetland was constructed within the Simmons Tract to improve water quality at the lake.

Current & Future Restoration Activities

DNR hired Barr Engineering to complete an alum study of nine Iowa lakes in 2023, which included Lake of Three Fires. The lake exhibited a high degree of internal phosphorus loading and was a good candidate for alum treatments, which can mitigate internal phosphorus loading and harmful algal blooms. Additional water quality monitoring was implemented in 2025 to ensure the lake was a quality candidate for alum, and the DNR signed a contract with Solitude Lake Management (LRP $475,520) to apply a split-dose (50% spring: 50% fall) of alum to the lake in 2026 (photo to the right). DNR plans to host a public meeting in the spring of 2026 to provide information about the alum treatments.



Additionally, TEK Builders was contracted in 2024 to stabilize 1,200 linear feet of shoreline that included five fishing jetties ($66,180 MFT-Fisheries). In 2025, the shoreline project was completed, and the DNR spot-treated American Lotus with herbicide.

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Little River Watershed Lake, Decatur County

Background

Little River Lake was created in 1985 as a multipurpose PL-566 structure to reduce flood damage, provide drinking water for the City of Leon and Decatur City, establish a fishery, and to provide recreational opportunities for Decatur County and neighboring areas. Little River Lake is a 788-acre lake with a 17:1 watershed to lake area ratio. For the first 15 years, the lake produced tremendous quantities of quality fish. However, common carp, an inadequately protected watershed, and unprotected shoreline problems had reduced water clarity, suppressed sport-fish abundance and growth, recreation opportunities, and increased water treatment costs. The lake had no shoreline protection in place at initial impoundment. Shoreline erosion, silt loading, and a common carp population had all adversely affected water clarity. Fish quality and angling activity had steadily declined since 2000 to a point where the lake no longer offered quality angling opportunities.

Restoration Activities

The Decatur County Soil and Water Conservation District (SWCD) and the Natural Resources Conservation Service (NRCS) completed a watershed assessment and developed a four-year plan to make needed watershed improvements. Cost share funding was made available for local landowners to accomplish soil and water quality improvement projects on their property.

- Decatur County, Southern Iowa Rural Water Association, Decatur County Conservation Board, Decatur County Soil and Water Conservation District, the City of Leon, and the Iowa Department of Natural Resources began planning water quality improvement efforts in 2008. Since that time, the group has worked to implement water quality improvement practices for the watershed.
- The Decatur County SWCD and NRCS personnel assessed the watershed's problems, quantified soil erosion, and identified best management practices, (BMPs). The Watershed Improvement Review Board (WIRB) awarded the Decatur SWCD a $423,900 grant to cost-share improvement efforts with landowners. The group also received a letter of support from the DNR Lake Restoration Program to consider Little River Lake for future funding for in-lake improvement projects; such as shoreline stabilization, rough fish management and silt basin improvements.
- The restoration process during 2011 involved WIRB funded implementation of remaining targeted watershed practices and re-assessment of the watershed to guide planners on any remaining areas of the watershed to address before potential work in-lake.
- The local NRCS District Conservationist has implemented $384,419 of WIRB funding, $214,359 of EQIP funds, $192,471 of Public Owned Lakes funding, $100,865 of State cost share funding, $14,793 REAP funding, and $316,439 of landowner commitments totaling $1.2 million to improve the watershed and complete approved soil and water quality improvement projects. Landowners in the watershed receive bonus points when competing for countywide funding from the Soil District and NRCS.
- Past fish population estimates had indicated a dense common carp population. Their feeding for bottom organisms suspends fine clay sediments causing poor water clarity. The DNR renovated the fishery in October 2011 and in 2012 restocked the lake with walleye, largemouth bass, bluegills, crappies, and channel catfish. Fish population surveys conducted during 2012 has found excellent growth and survival of all stocked species.
- The elevation of the dike and outflow chute of the wetland above Little River Lake was raised two feet to allow additional storage capacity. The additional area is expected to restore the wetland's sediment and nutrient trapping efficiency. Expansion of the wetland area above Little River Lake (completed spring 2012 at a cost of $207,340 and paid for by the Lake Restoration Program) doubled the area, improved sediment trapping capabilities above the lake and allowed for water level management of the wetland.
- In 2011, the DNR awarded a $1.1 million contract to TK Concrete of Pella for shoreline deepening, shoreline stabilization, and in-lake fish habitat. The Lake Restoration Program funds paid for $880,000 for shoreline improvements and Fish Habitat Stamp funds in cooperation with Federal Dingell-Johnson, Marine Fuel Tax funds paid for $220,000 in fish habitat improvements. Construction was complete in spring 2013.


Shoreline stabilization of regions with significant erosion

Little River now has water clarity of over 10 feet at times. This level of clarity has not been seen since the lake's initial impoundment in the late 1980s. Post restoration water clarity measurements at Little River Lake routinely exceed 36 inches and have been over 80 inches**.** The largemouth bass population had a very strong 2012 year class. Growth for bass increased from that found in 2012 and all sizes have good body condition. Bluegills of all sizes are present ranging from 1 inch to 8.5 inches with a lot above 7.0 inches. Little River Lake is becoming a popular destination for walleye anglers. Good numbers of 12-20-inch walleye were captured during recent sampling. The bluegill population is increasing with fish up to 9 inches available to anglers. Spring electrofishing also indicated a high abundance of largemouth bass up to 18 inches in length. Pan fish populations remain excellent, with phenomenal fishing reported throughout the 2017 open water recreational season.

Project stakeholders met in July of 2017 to discuss the status of the lake following major restoration activities. While water quality at the lake remains excellent, stakeholders want to address fencing issues and add additional ponds to reduce nutrients entering the lake from the watershed. Following the meeting, a new fence line was placed adjacent to the lake to keep cattle out of the county conservation board property. A new restroom was also constructed near the main boat ramp in 2017.

DNR staff met with local CCB staff in the summer of 2022 to discuss additional opportunities for watershed practices within the County Park. Local Natural Resource Conservation Service (NRCS) staff are working to complete an assessment to determine if additional structures are feasible and would be beneficial to the lake. DNR is actively managing American Lotus with herbicide spot treatments.

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IOWA | Department of Natural Resources

Lost Grove Lake, Scott County

Background

The Iowa Department of Natural Resources has completed work to construct Lost Grove Lake, Scott County. The project is an investment in Iowa's infrastructure; promoting long-term economic growth; is a watershed/water quality project; and will provide flood protection and soil conservation benefits. The Lost Grove Lake recreation site was selected in 1987. Land acquisition from willing sellers began in 1988 and completed in 2003. The state purchased a total of 1,701 acres of land as the site for this 400 surface acre lake. This recreation project has strong local support from groups such as; the Quad City Conservation Alliance, Pheasants Forever, the Izaak Walton League, Scott County Soil and Watershed Conservation District and the Quad City Bass Club. In addition, the Scott County Soil and Watershed District completed a watershed assessment and implemented water quality projects that have included filter strips, grass waterways, sediment basins and EQIP nutrient and pest management enrollments.

Lake Construction

- The Lost Grove Lake and Recreation Area project provided 60 to 75 jobs during the construction phase. Iowa State University Center for Agriculture and Rural Development (CARD) research supports that a lake of this size that exhibits good water quality will annually provide over 350,000 visits, create approximately $20 million in local spending and will result in supporting 175 jobs. This project will provide a high-quality recreational lake while at the same time providing immediate economic stimulus to the region.
- Project activities included dam construction, shoreline stabilization, boating and shore access, fish habitat enhancement and site access roads. Prior land acquisition, watershed improvements, utility relocation, dam design and road modification funding expenditures have totaled $4.495 million (Federal Sport Fish Restoration $2.610M, DNR Fish and Wildlife Trust Fund $1.00M, and State Marine Fuel Tax Fund $885,000).
- Langman Construction, Inc. was awarded the Fish Habitat, Riprap, and Shoreline Access phase of the project. The bid was for $1.17 million. Construction commenced the week of July 25 and was completed on October 7, 2011. J.B. Holland Construction was the lowest bidder ($4,341,437) on the Lost Grove Lake dam construction project. The DNR Natural Resource Commission approved the bid on June 10, 2010. Dam construction began in July 2010 and was completed summer 2012. Scott County Secondary Roads designed two road culvert risers on Utica Ridge Road. These risers will temporarily impound water to allow settling of sediment and nutrients, and thus, preserve the water quality of Lost Grove Lake. Arensdorf Excavating & Trucking, Inc., Anamosa, IA received the bid for $90, 090. The project was completed in December 2012.
- The boat ramp, parking lot, and pit-vault toilet construction phase of the project was bid in February 2013 and work on the $920,000 project began in late July 2013. These items were completed in fall 2014.
- Total project investment was $12.7 Million

The lake reached full pool in June of 2015 and has drawn numerous anglers and recreationists over the course of the past few years. Recent fish surveys show the development of an excellent fishery, with muskellunge up to 24 inches, many bluegills between 6 and 7.5 inches, and numerous largemouth bass in the 10-13 inch class sizes.

The lake was formally dedicated on October 7, 2015. Numerous speakers commented on the impact of Lost Grove Lake to the people of Scott County and beyond. Nearly a 100 people came out for the dedication of the lake. Prior to the formal dedication, many standup paddle boarders, windsurfers, swimmers, and even kite surfers were enjoying the lake, since it officially opened to the public in 2014.

Improvements continue to be made around the lake including:

- 911 addresses posted at the entrances to all infrastructure areas.
- Pit-vault toilets were installed at the middle and west boat rams in August of 2015 (Marine Fuel Tax $90,155)
- A maintenance agreement was established with DJ Laughlin (D&D LawnCare) to mow grass near infrastructure areas, maintenance of trails, trash removal, and snow plowing (at middle boat ramp); this was the second year a maintenance agreement with a private contractor.
- Efforts were continued to post wayfinding signage on the perimeter on the property.
- Established an agreement with Scott County Secondary Roads to complete maintenance of interior shoreline/boat ramp access roads.
- DNR fisheries and engineering staff are currently developing a shoreline stabilization plan that will protect banks, fishing jetties and the main boat ramp.

Water quality at this new lake looks excellent, with low nutrient and suspended solids levels promoting the healthy establishment of some aquatic vegetation and water clarity over 6 feet observed beginning in 2015. Water quality remains excellent since the lake was established.

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Lost Island Lake, Palo Alto County

Background

Lost Island Lake is a 1.162-acre natural lake located in northwest Iowa. The lake is connected to a >2,200-acre wetland complex, which includes the 780-acre Barringer Slough and the 150-acre Blue-wing Marsh. This shallow natural lake is a popular recreation destination, receiving an estimated 24,000 visits annually. Until recently, however, the lake suffered from poor water quality due to high levels of algae and turbidity. The lake is impaired for high turbidity attributed to sediment re-suspension.

Constructed electric fish barrier in the Lost Island Lake watershed.

Project partners began meeting in the mid-2000s to determine what was causing water quality issues in the lake and create a plan to address those issues. As sediment re-suspension was a principal concern in the lake the 2009 TMDL completed for the lake showed high levels of internal phosphorus loading, which contributed to the water clarity and algae problems in the lake.

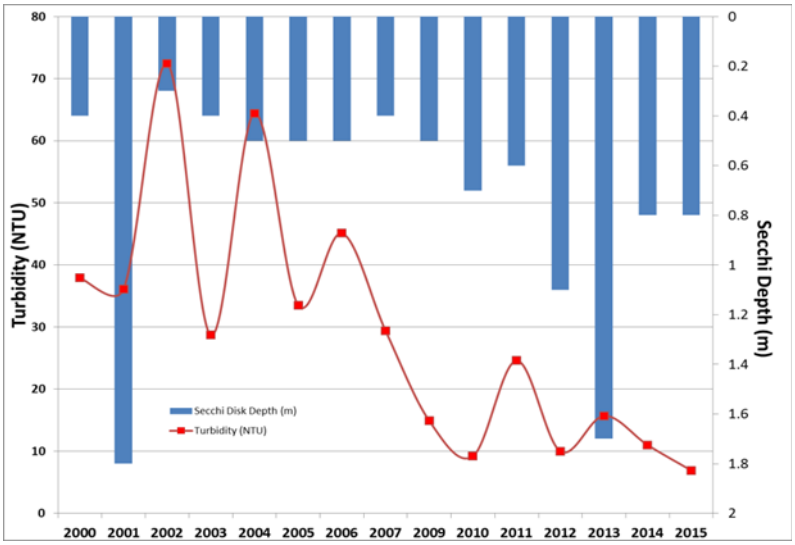
Restoration Work

Following the planning efforts, project partners worked to complete elements of the lake and surrounding wetland restoration, focused on restoring wetland function in Barringer Slough and Blue-Wing Marsh and removing carp from the system.

- The project included an innovative plan to allow for the removal of up to 75% of the existing carp biomass, aggressive stocking of predatory fish and new construction or rehabilitation of four water control structures and five fish barriers throughout the complex.
- Ducks Unlimited designed the effective water control and fish barrier structures. The survey and design work began during summer/fall 2009. Local support regarding the project has been high. Nearly 70 local stakeholders attended a December 2009 public meeting and voiced strong approval for the design work.
- The NRC approved Lake Restoration Funding toward the $834,263 bid from Landwehr Construction, St. Cloud, MN for the project. The Watershed Improvement Review Board awarded the Palo Alto County Conservation Board $180,000 to cover part of the cost (two water level control/fish barrier systems); construction began in the fall of 2010 and was completed summer of 2012. The $1.3 million project has been a partnership between the Iowa Department of Natural Resources, Palo Alto County, Ducks Unlimited, and the Lost Island Protective Association.
- Various basins within the complex were initially dewatered to eliminate rough fish and create favorable conditions for re-vegetation. All basins are now at full pool providing excellent habitat for wildlife species and much-improved recreational opportunities for Iowans.
- Over 1.27 million pounds of common carp and buffalo have been removed from Lost Island Lake since 2008 reducing the common carp density from nearly 400 lbs./acre to 55 lbs./acre. The lake has shown substantial increases in water quality and habitat.

The final infrastructure component of the Lost Island Lake restoration project (at Barrier Marsh) was completed fall 2013. An electric fish barrier was added to the water control structure that will prevent breeding common carp from reaching Blue-wing Marsh wetlands in the Lost Island Lake's watershed while allowing debris to pass during high water events.

The Barringer Slough and Blue Wing Marsh complexes have been brought back to pool elevation and water quality and habitat have greatly improved. Water quality, aquatic plant, and fisheries surveys and monitoring has continued since the project was completed, with lower levels of nutrients and better water clarity being reported annually as compared to pre-restoration levels.



Project partners began meeting again in 2019 to develop a 9-element watershed plan that will conform to US EPA's Section 319 guidelines in hopes of developing a watershed project for Lost Island Lake. Together with other lakes in Palo Alto County, the SWCD received a grant to develop watershed plans and hire a project coordinator to work with local landowners to implement watershed best management practices on their land and improve water quality in Lost Island Lake. The plan was completed in 2022 with the goal of implementing practices in the watershed to reduce nutrient inputs to the lake.

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Mariposa Lake, Jasper County

Background

Mariposa Lake, an 18-acre constructed lake in Jasper County, is a part of Mariposa Recreation Area and is owned and managed by the Jasper County Conservation Board. The lake and park serve as an important recreational destination and natural resource for Jasper County. According to the 2014 lake usage survey conducted by Iowa State University, Mariposa Lake sees approximately 26,000 visitors annually and accounts for about $2.5 million in annual spending. The lake has a 32:1 lake to watershed area ratio and the watershed is 22% in public ownership.

Large amounts of sediment entering the lake over the past 50+ years have decreased the surface area and depth, creating a significant water quality problem at Mariposa. In addition, phosphorus attached to the sediment has caused algal blooms, producing poor water quality and clarity, as well as impairing the aesthetic value and aquatic life of the lake. In 2006, the JCCB began their project development with the overall goal of improving the water quality and recreational potential at Mariposa Lake. This recreation area is a very important local resource to the residents of Jasper County, and was once a destination for excellent pan fishing.

Watershed work has been completed to reduce the amount of sediment and nutrients entering the lake and ensure that restoration practices implemented within the lake have a long lifespan. Work completed to date includes acquisition and construction of a wetland on the north end of the park (completed in 2011), timber stand improvements (2010) and shoreline protection (2008). Additionally, the JCCB has installed new restroom facilities. In 2012, Jasper County Conservation installed a 3.9-acre wetland to collect runoff from 368 acres in the watershed and to help trap nutrients and sediment to prevent them from entering the lake.

Description of Work Completed	DNR Contribution	JCCB Contribution
Engineering Design	$248,473.00	$11,078.00
Wetland on North End		$134,514.00
New Restroom		$20,000.00
Timber Stand Improvement		$2,596.00
Fish Habitat		$25,000.00
Shoreline Protection		$14,800.00

Restoration Work

In 2015 Jasper County hired Shive-Hattery to develop conceptual plans and engineering for a new outlet structure, sediment removal, wetland enhancement and park and angler access improvements. Shive-Hattery worked with the county conservation board to develop a sediment spoil site on their property. The lake was drawn down in the summer of 2017 to allow for in-lake restoration work to commence in the fall (below aerial photo of lake being drawn down).

In-lake restoration activities are helping to re-establish depth throughout the lake basin, protect the lake from wind and wave erosion, and improve the fishery at the lake through the installation of fish habitat. The infrastructure at the lake was updated so the park can be enjoyed for many years to come. Targeted mechanical dredging removed ~170,000 cubic yards of material from the lake and 20,000 cubic yards from the west forebay. As a part of this project, the lake's outlet structure was removed and rebuilt to include a minimum of 10 feet of drop in the spillway that will prevent rough fish from re-entering the lake. The lake inlet on the northeast tributary was also rehabilitated, restoring function and native species composition to this wetland. Angler access and park usability was improved by adding a new boat ramp and parking lot, and fishing jetties. Finally, the JCCB secured two fish habitat grants to install a variety of habitat structures within the lake bed. Following construction of the project, the sport fishery was re-stocked. Construction started in the fall of 2017 and concluded in late 2019. Total costs for this project were $1,682,264 ($1,483,257 DNR Lake Restoration Program; $199,007 JCCB).

In 2020, the CCB worked on installing a pedestrian bridge/observation deck, as well as incorporating educational interpretive panels throughout the park, including panels near the wetland and along the trail to highlight elements of the restoration project (see photo above). The JCCB also received a DNR County Fish Habitat grant in 2024 to stabilize 1,000 linear ft of shoreline and install five submerged rock piles to enhance fish habitat.

Interpretive sign near the wetland

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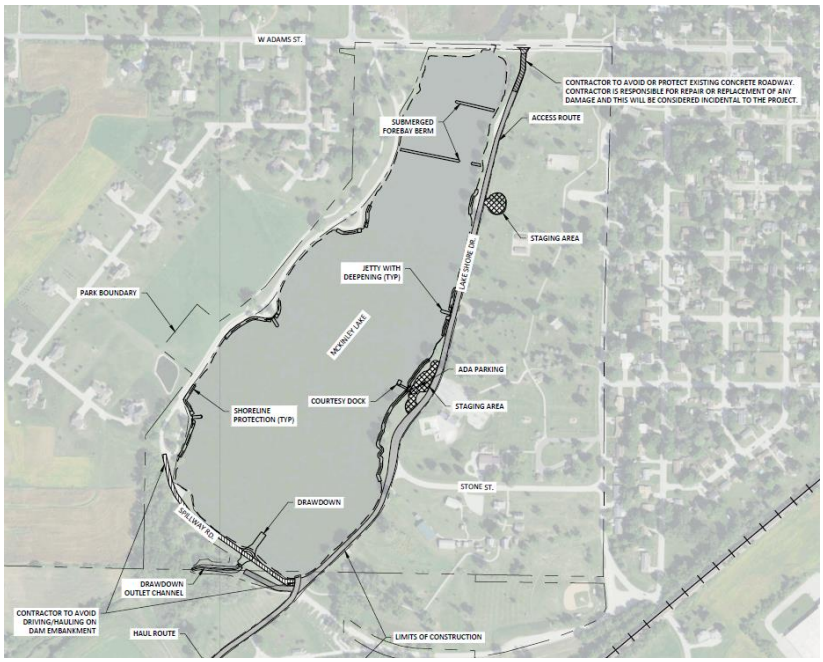
McKinley Lake, Union County

Background

Located in the city of Creston, McKinley Lake is a 54-acre lake that serves as an important local recreation destination. The lake is a central feature of McKinley Park, and has a 2115-acre watershed (watershed to lake area ratio of 42:1). Originally constructed in 1874, the lake was purchased by the City of Creston in 1901. The lake was briefly drained when nearby Summit Lake was constructed, however; the lake was refilled in 1919 and made a City Park. Since then, many amenities have been added to the park, including a swimming pool, shelter houses, and playground equipment. While the lake has served many generations, excessive sedimentation and high nutrient concentrations have limited the full use of the lake, and thus, restoration is needed to revive this lake and park.

Over the past 15 years, the City of Creston has worked extensively to improve conditions in the watershed and minimize nutrient and sediment delivery to the lake. Between 2008 and 2011, project partners worked to implement the Hurley Creek Watershed Restoration Project (the main tributary to McKinley Lake) and invested $370,000 in riparian buffers, stream stabilization, livestock exclusion, and other BMPs within the watershed. Additional opportunities for improvement are noted in the 2019 McKinley Lake restoration plan, developed by FYRA Engineering for the City of Creston.



The restoration plan also outlines work needed within the lake to improve water quality, principally, the removal of excess sediments through dredging. Additionally, extensive shoreline deepening and stabilization would improve water quality in the lake and recreational opportunities for the next generation. A conceptual restoration plan for the lake is outlined in the 2019 plan, and was used to support the need for a local bond to raise funds for restoration. The City of Creston passed the bond issue in 2021, and began working with DNR to design a restoration project for the lake.

Current & Future Restoration Efforts

The City hired HEI in 2023 to begin restoration design for the lake, and design was completed in 2024. The lake was drawn down in the summer of 2024 for construction. JNC was hired by the City to complete in-lake restoration work, which includes the targeted removal of 250,000 CY of sediment, 1400 LF of shoreline protection, new fish habitat and fishing/recreational amenities, dam/outlet structure improvements, and an ADA parking area, boat ramp, and courtesy dock ($3.6M: $1.8M LRP, $1.8M City).

As the lake was being dredged, the contractor discovered that the old creek channel was filled with soft, difficult-to-work-with sediment. Additional dredging is required (70,000 CY) to access and remove sediment from the southwest part of the lake basin. Partners reallocated some existing project funds (~$79k) and committed additional funding ($220k: $100k LRP, $100k city of Creston, $20k High Lakes Outdoor Alliance) to complete dredging and install fish habitat in the lake. In-lake construction will be completed during the winter of 2025/2026. DNR fisheries plans to renovate the fishery to eliminate Common Carp from the system during the winter of 2025/2026 as well.

The gate valve will be closed in the spring of 2026, and DNR fisheries plans to restock the lake with fish as soon as water levels provide adequate habitat. Hurley Creek Pond is a private/publicly owned pond, located in the McKinley Lake watershed. The DNR, City and IDALS staff are exploring potential funding opportunities to repair the Hurley Creek Pond dam.

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Otter Creek Lake, Tama County

Background

Otter Creek Lake, located within Otter Creek Lake Park, is a 74-acre lake has a watershed of approximately 969 acres, representing a watershed to Lake ratio of 13:1. The lake is one of the most utilized publicly owned areas in Tama County. The park estimates that approximately 45,000 visitors come to the park each year. During the summer months, the campground has high occupancy rates, the beach has is a popular local destination, and many groups utilize the nature center. Other daily uses include fishing, canoeing/kayaking, environmental education, hiking, photography, bird watching, and relaxation.

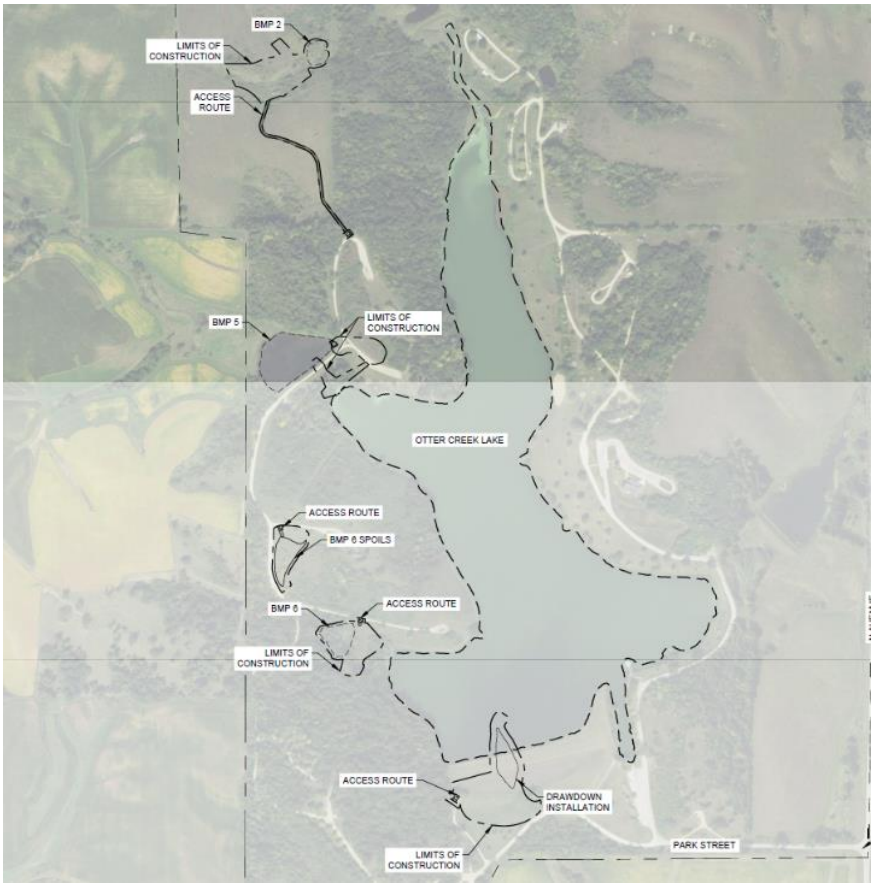
Otter Creek Lake is currently on the state of Iowa's impaired waters list for Chlorophyll-a and high concentrations of cyanobacteria, which has been attributed to high phosphorus levels in the lake. The Iowa Department of Natural Resources (DNR), Watershed Improvement Section, produced a Total Maximum Daily Load Report (TMDL) in 2014 to identify sources of pollution to the lake and suggest ways of improving water quality with the goal of removing the impairment at the lake. Ambient lake data from the DNR was also used in conjunction with other data collected for constructing the watershed plan for Otter Creek Lake that was completed in 2015. Both the TMDL and the watershed improvement plan identified phosphorus as the principal nutrient of concern, with a secondary goal of reducing the amount of sediment to the lake. High rates of sedimentation have occurred since the lake was built, and as a result, the upper arm of the lake has lost considerable depth. The majority of the phosphorus pollution appears to be originating throughout the watershed, so targeted efforts are taking place to reduce both phosphorus and sediment pollution from both within the park and outside of the park in the watershed. Excess phosphorus causes large blooms of algae which makes the lake aesthetically objectionable and can cause a number of other problems including low oxygen, stress on the aquatic community, poor water clarity, and in some cases, human health concerns associated with high levels of toxins produced by several genera of blue-green algae called cyanobacteria.

Current Restoration Projects

Local project partners completed a watershed plan in 2015 and updated the plan to conform to EPA's 9-element plan template, which made the project eligible for Section 319 funding for watershed practices. EPA approved the plan in 2019 and project partners are working to construct a large pond/wetland at the main intake for the lake as a part of the overall restoration project using funding from a US EPA Section 319 grant.

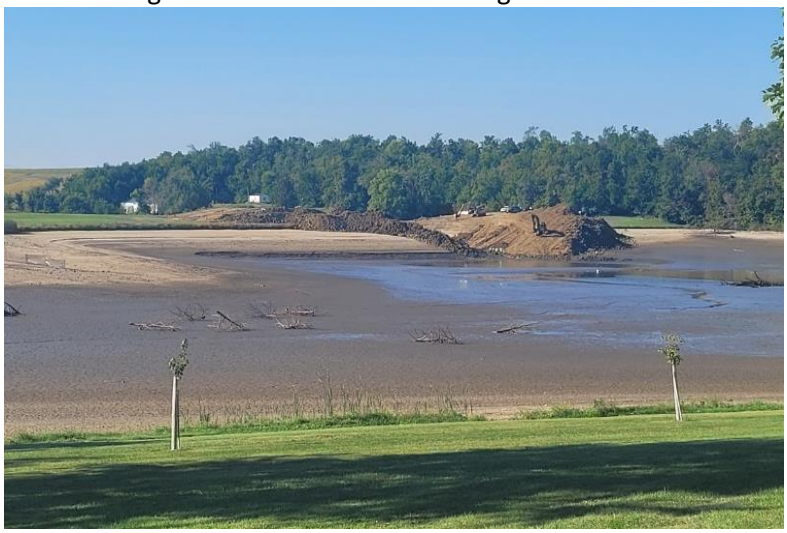
Tama CCB and DNR jointly issued an RFP in the fall of 2019 to complete evaluation and conceptual design of watershed improvements on public ground and in-lake restoration strategies. The contract was awarded to FYRA Engineering for an initial cost of $47K (75% Lake Restoration / 25% Scott CCB). FYRA wrapped up their initial assessment in 2020 and began design work on the project - developing two phases of restoration work to be completed at the park between 2021 and 2023. Engineering services for final design thru construction oversight from FYRA was contracted in July 2020 at a cost of $541K (75% Lake Restoration / 25% Scott CCB). The first phase of watershed practices, designed to reduce sediment and nutrient inputs to the lake, included the construction and rehabilitation of several ponds on public ground within the park. Additionally, park staff worked to improve timber stands throughout the park as a part of this phase of work. Otter Creek Lake Park was heavily damaged by the derecho in August of 2020, so tree removal has become a critical part of the overall restoration effort.

Phase two of the restoration project was completed in 2022 and 2023, which began with a drawdown of the lake in late summer 2021. This allowed for targeted dredging within the lake basin, shoreline stabilization, creation of new fishing jetties and placement of fish habitat, as well as updating the lake's outlet infrastructure to allow for better long-term draw down capabilities. A couple of the larger watershed pond projects, including the large wetland being funded by a US EPA Section 319 grant were also being included in the second phase of restoration work. Finally, the CCB worked with FYRA to renovate the beach area to improve drainage, recreational opportunities, and safety between the parking lot and the beach.



The first phase of work began in 2021 (photo below of dam infrastructure improvements), with the renovation and construction of several watershed BMPs, and improving the dam infrastructure of the lake by first drawing down the lake and installing a new pipe at the bottom of the lake to allow for better long-term management of water levels. This phase of the project was completed in 2022 (RW Excavating; $744,762; $640,495 LRP / $104,267 Tama CCB).

Construction for the in-lake portion of the project, as well as the large wetland above the lake began in 2022 and was completed in 2023. In-lake work included armoring 7,270 feet of shoreline, stabilizing approximately 1,000 feet of streambanks, removing 133,064 CY of excess sediment from the lake bottom, numerous fish habitat improvements, and drainage improvements at the beach ($3,852,368; $2,926,805 LRP; $456,888; Federal 319; and $468,675 Tama CCB).



DNR fisheries staff restocked the lake in 2024 with Bluegill, Redear Sunfish, Largemouth Bass and Channel Catfish. Standardized sampling of the fishery will begin in the spring of 2026.

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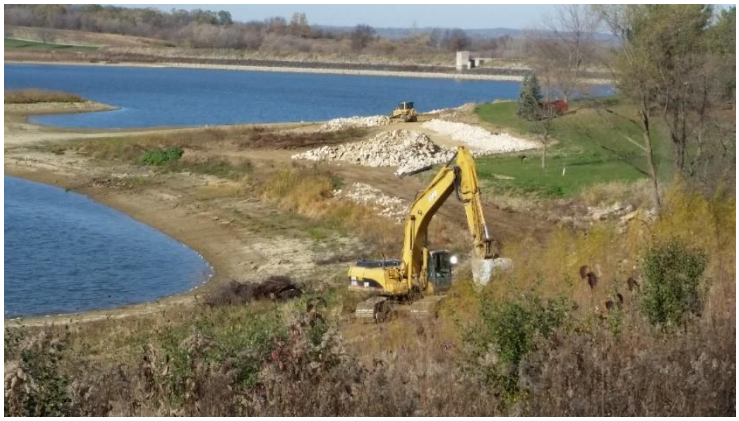
Pleasant Creek Lake, Linn County



Background

Pleasant Creek is a 410-acre lake owned by the State of Iowa with a watershed to lake ratio is 5:1. The State owns 90% of the 2,035-acre watershed. The other 10% is mainly in timber.

A meeting was held in October 2013 with DNR Parks, DNR Lake Restoration Program and the Iowa Department of Agriculture and Land Stewardship to develop a management approach and time line for restoring Pleasant Creek Lake. The plan was for DNR Fisheries and Parks to work cooperatively with IDALS to develop a watershed plan to address potential issues. Using information from the initial survey, there are some opportunities to build some gully control structures on park property and review/update land management approaches on state ground to improve water quality. In-lake restoration included shoreline riprap, shoreline deepening and fishing access improvement.

Lake Improvements

Pleasant Creek dam had a crack around the valve housing and was leaking water. Divers were hired in August 2015 to place a plate over the intake pipe so the gate valves could try to be opened. The two 10-inch valves opened, but the larger 24-inch valve was not functional; so, a new gate valve was ordered. Gate valve replacement was completed on October 2 (see photos right); divers removed the plate from the intake pipe and the valve was opened to begin the lake drawdown. The planned 15-foot lake drawdown was completed on October 23, 2015. The $50,974 cost to replace the gate-vale was paid for by the DNR Lake Restoration Program

Restoration work within the lake began in 2016, when Peterson Contractors was hired to complete shoreline, habitat and access work at the lake for $2.4 million.

This phase of the project consisted of placing riprap along the raw banks at Pleasant Creek. Select areas were deepened along the shoreline to enhance angling. Waste material generated by digging out along the shoreline remained in the lake bottom and was shaped to create variations in the lake bottom designed to attract fish. These variations will be both under water and above water, and will be armored with rock for structural protection. Additionally, two jetties were constructed to provide increased angler access to deeper water. They will also act as wave breaks sheltering a boat ramp and shoreline. The main boat ramp and the boat rental area ramp were also replaced. These are the most heavily

used ramps and needed replacement. Immediately adjacent to the main boat ramp, an ADA boat slip was installed to provide a stable platform for boaters to enter and exit their boats.

In-lake work was completed in March of 2017. Funding included: 79% Lake Restoration Program Funds, 12% Boat Access Grants, 6% Marine Fuel Tax Funds, and 3% REAP Land Management Funds.

In the fall of 2018, project partners met to discuss additional water quality improvements within the park, including water control structures that would stop sediment and nutrients from entering the lake and address gully erosion within the park. Storm water practices at the main boat ramp parking lot were also discussed through the installation of a bioswale. Project design for additional watershed practices in the park began in 2022. Construction of five in-park water control structures was completed in 2025 (see picture above; $540,000; 100% LRP). These structures are in the process of refilling, and DNR fisheries will stock them with fish in 2026 to provide additional angling opportunities.

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Prairie Rose Lake, Shelby County

Background

Prairie Rose Lake is a 173-acre constructed lake with a watershed to lake area ratio of 24:1. Low fish populations, siltation, and poor water quality plagued the lake in recent years, thus watershed and lake improvements were planned to bring this popular recreation destination back to life. Previous lake improvements included; jetties and fish structures (1998), sediment basin and shoreline riprap (2001) and sediment basins (2004); however, water quality in the lake remained poor. Prairie Rose was one of the initial list of 35 lakes prioritized for restoration by the program. The park is an important public resource and averages an estimated 41,000 annual visits and is a popular fishing and camping destination in Western Iowa.

Planning for Success

The DNR commissioned a study in 2007 to learn more about the lake and watershed and better understand what was causing degrading water quality at Prairie Rose Lake. The Shelby County Soil and Water Conservation District also conducted a watershed assessment followed by a joint Iowa Department of Agriculture and Land Stewardship / DNR Watershed Improvement Section grant to accomplish targeted soil conservation work in the watershed and reduce the amount of sediment and nutrients reaching the lake. The Shelby SWCD was awarded a $510,611 Water Quality / Watershed Protection Project Grant in 2008. Through the Prairie Rose Water Quality Project, over 225,000 feet (40 mi.) of terraces were constructed, and numerous grassed waterways and nutrient management plans were added to the watershed reducing sediment and nutrient delivery to the lake by 60%.

In 2010 the DNR, in partnership with Pheasants Forever, acquired a 77-acre parcel adjacent to the park to initially serve as a dredge spoil containment site needed for in-lake restoration work and after restored to prairie. Rock chute wetlands and road risers were constructed on public land on the four main drainages of the lake during fall 2011/spring 2012.

The 2008 Water Quality/Watershed Protection Project led the way by reducing sediment and nutrient delivery to Prairie Rose.

Project Implementation

With work in the watershed wrapping up, project partners looked to in-lake restoration to continue to improve water quality in the lake.

- The lake was dewatered in July 2011 to allow construction work in the above lake silt basin. Stabilizing the eroding shoreline and removal of 60,000 cubic yards of sediment was completed during the winter of 2011-12. The spillway modification to prevent rough fish re-entering the lake from below is now in place.
- Additional fish habitat and shoreline access has been added to the lake basin utilizing $150,000 of DNR Trust Fund dollars. In September 2012, Prairie Rose Lake began to re-fill following the treatment of the watershed to remove undesirable fish species (e.g. common carp). By June of 2013, the lake had refilled.
- Restocking Prairie Rose Lake began in April 2013 with largemouth bass, bluegill, and channel catfish. The development of the fish population in the lake is on track. In addition to the largemouth bass, bluegill, and channel catfish populations already established in the lake, adult black crappie (800) were stocked during the fall of 2014. Fishing activity at the lake increased dramatically by 2015.
- The NRC accepted a donation of a permanent easement for storage of water for a silt retention pond adjacent to Prairie Rose State Park above the campground arm of the lake. The DNR accepted the low bid of $109,966 to build a grade stabilization pond at this location. Construction was completed in 2015.
- The in-lake dredging project started removing sediment in mid-July of 2015. The contractor used a barge mounted excavator dumping into a slurry box because of the amount of terrestrial and aquatic vegetation. Approximately 185,000 CY of sediment was removed from Prairie Rose Lake at a cost of $1.4 million.
- In 2021, project partners began decommissioning the dredge spoil site and returning it to native vegetation. Construction was completed in the spring of 2023 with the goal of restoring the space to wildlife habitat.

Water Quality Improvements

Water quality has improved since the project was completed, with increased water clarity being observed throughout the summer months. Aquatic vegetation has also started to establish in the shallow areas of the lake, providing excellent habitat for fish and removing additional nutrients from the water. Total phosphorus concentrations (the limiting nutrient in most freshwater systems) have decreased dramatically since the projects' completion. Additionally, measures of algal biomass have also decreased, suggesting that algae blooms in the lake are less frequent and intense than previously observed.

Prairie Rose Lake was included in an alum study of nine lakes in 2023 to better understand internal phosphorus recycling in the lake and determine if alum (aluminum sulfate and/or sodium aluminate) could be a useful tool to treat phosphorus being released from the lake sediments. The lake was identified as a good candidate, and SOLitude was contracted to apply a split-dose of alum (spring & fall; total 183,989 gal) for $649,744k in 2025 address internal nutrient recycling in the lake and minimize algae blooms. Shortly following the spring treatment, water clarity improved from 5 to 20 ft. Park and lake users enjoyed improved water clarity and a reduction in algae blooms throughout most of the summer. Anglers were even able to "sight-fish" for bass, and over Bluegill spawning beds (photo to the right).

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Rathbun Lake, Appanoose County

Background

Rathbun Lake, a federal flood control reservoir located in Appanoose County, is currently listed as impaired for its Class A1 (primary contact uses) due to high levels of algal and non-algal turbidity in parts of the lake. The lake frequently experiences water transparency of less than 1 meter, and the arms of the lake frequently experience dense algae blooms in the summer.

A watershed improvement project for Rathbun Lake began in the late 1990s. The Rathbun Land and Water Alliance (RLWA) has spearheaded efforts in the 6-county, 354,000-acre watershed and partnered with the Iowa Department of Natural Resources (DNR), the United States Army Corps of Engineers (USACE) and others to monitor streams in the watershed and several points in the lake. Watershed best management practices have been completed through key partnerships each year to protect water quality in Rathbun Lake. Water quality in the lake has remained relatively constant since monitoring began in the late 1990s in spite of considerable land use change in the watershed due to increasing crop prices and changes to CRP contracts. The Rathbun Land and Water Alliance has been successful in assisting 400 farmers with BMP application for priority land in 24 targeted sub-watersheds; they helped apply BMP on 16,500 acres (goal: 60,000 acres); these practices will reduce sediment delivery to Rathbun Lake by 25,600 tons per year (goal: 84,000 tons). In addition, these BMPs will reduce phosphorus delivery to Rathbun Lake by 110,400 pounds per year (goal: 360,000 pounds).

Current Restoration Activities

Lake Restoration also entered into a partnership with the Rathbun Land and Water Alliance to provide an additional $250,000 to fund proposed activities in the Rathbun Lake watershed. These funds are being matched with $70,000 contributed by cooperating landowners and $64,160 to be provided by the Rathbun Land and Water Alliance. Construction was completed in 2017 and practices installed will help reduce nutrient and sediment pollution to the lake from priority sub-watersheds. In 2018, the LRP initiated a second round of watershed practices with the Rathbun Land and Water Alliance to construct large sediment and debris basins within the watershed to reduce sediment and phosphorus loading to the lake, through an investment of $250,000. Construction started in the fall of 2019 and continued through 2022.

The Iowa DNR Lake Restoration Program has been an active partner with the U.S. Army Corps of Engineers Kansas City District since the program came into existence. In 2013 a Section 1135 Habitat Restoration Project was completed with the Corps at Rathbun Lake. This project included the stabilization and restoration of habitat at nine shoreline sites. Sites were chosen based on data developed from previous Iowa DNR studies that identified the critical locations for water quality improvement. A post-construction research study has indicated substantial water quality improvements, as well as improvements in plankton production in these treated locations. Cost share for this project was awarded on a 75% Federal: 25% State basis (which included in-kind costs). The total cost of the project cost exceeded $6 million.

The DNR currently has two active 1135 ecosystem restoration projects at Rathbun Lake.

- The Rathbun Lake Aquatic Ecosystem Restoration Project, which includes the installation of an electric fish barrier at the lake outlet structure to limit fish out-migration and addressing regions of severe bank erosion to improve water quality and protect fish spawning sites by rock placement and vegetation enhancement to stabilize restored areas at Rathbun Lake The total cost estimate for this project is $8,341,000 (75% USACE; 25% DNR) The DNR contribution will be cost-shared between the LRP (63%; $1,310,000) and Marine Fuel Tax (37%; $775,000).

- Walker Branch Restoration Project - the purpose of this project is to restore degraded wetland habitat and adjacent vegetation in the Walker Branch Wetland area. The plan includes the construction of two embankments in the Walker Branch floodplain to form two wetland pools that would have independently controlled water levels. The plan restores 125 acres of wetland habitat, and an additional 52 acres of adjacent vegetation that is currently heavily infested with invasive reed canary grass. The design work is estimated to cost $1,660,000 (75% USACE; 25% non-federal sponsor). The non-federal sponsor contribution is being split among several partners as follows: DNR LRP ($500,000), Fish and Wildlife Trust Fund (in-kind; $370,000), Iowa Department of Agriculture and Land Stewardship ($580,000), Rathbun Rural Water Association ($150,000), Southern Iowa Development & Conservation Authority ($50,000) and the Wayne Soil & Water Conservation District ($10,000).

Both feasibility reports for the fish barrier/shoreline and the Walker Branch wetland 1135 projects were approved in 2023. Design is underway for the fish barrier, shoreline work, and the wetland. Construction on the shoreline and wetland are anticipated to begin in 2026 and 2027.

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Rock Creek Lake, Jasper County

Background

Rock Creek Lake is a 491-acre lake constructed in 1952. The lake has a watershed to lake area ratio of 54:1. Iowa State University, in a 2000 Diagnostic/Feasibility Study, indicated that over the last 50 years the lake has lost almost 40% of its lake water volume and 102 lake surface acres. Local efforts have accomplished some work in the watershed; however, it has been difficult to continue to make progress in the watershed.

- A technical working group met in 2008 to discuss the necessary reductions in sediment from the watershed to make the in-lake work feasible.
- During fiscal year 2009, landowners completed some small practices such as waterways and small basins in the Rock Creek Watershed as part of the funded Watershed Project. Implementation of these practices resulted in a sediment reduction of 1,439 tons/year and 750 acres protected from June 2008 to September 30, 2009.
- Work on the Rock Creek Watershed Project at this time is limited to five grade stabilization structures in the state park. The project coordinator had selected sites for the placement of three ponds and two large dry basins to address critical areas of gully erosion. The construction of these structures is completed and the DNR has stocked three of the ponds.
- DNR invested in a new sediment catch basin at Rock Creek State Park in 2014 to help reduce sedimentation in the upper arm of the lake.
- DNR met with the local friends group in the summer of 2015 to discuss options for addressing the in-lake sedimentation and reducing sediment and nutrient inputs to the lake from the watershed. The need for a watershed management plan and considerable watershed work was discussed in order for in-lake to be considered for additional restoration work.

Current and Future Restoration Work

Shoreline erosion was directly contributing to sediment and nutrients to the lake, which was negatively impacting water quality. To address this challenge, fisheries, parks and engineering staff collaborated on a shoreline assessment in 2023 with the goal of stabilizing the shoreline. Design work and construction was completed in 2024, stabilizing over 17,685 LF of shoreline (see photo right; $1.23 Million; $125k 319 funds; $439k MFT; $662k Lake Restoration).

DNR is implementing an access improvement project, which includes upgrades to the northwest, beach, and southeast boat ramps and parking lots. Engineering is currently in design phase and construction is slated for 2026.

Partners plan to meet in 2026 to discuss developing a comprehensive lake restoration project that would likely include targeted removal of sediment and wetland restoration in tandem with a proposed campground renovation project. Construction for the proposed project would likely begin in 2031. In the meantime, extensive repairs are slated in 2027/2028 to improve boat ramps and parking lots around the lake (Estimated Cost: $415k MFT).

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Silver Lake, Delaware County

Background

Silver Lake is a small natural lake, located in northeast Iowa in Delaware County, and is one of the priority lakes listed under the Lakes Restoration Program. This 39-acre lake, which was enlarged at one point by the construction of a dam on the southeast shore of the lake, has a maximum depth of 18 feet and a mean depth of 7 feet. Silver Lake has a small watershed (watershed to lake area ratio of 5.4:1) and is surrounded by Silver Lake County Park, the community of Delhi, a locally-owned private campground, and farmland. Silver Lake is a locally important resource for recreation. Located on the outskirts of the City of Delhi, the lake draws an estimated 18,000 visitors annually, and is a popular destination for camping, wildlife watching, relaxing and fishing. Given that it is one of only a handful of lakes in Northeast Iowa (and the only natural lake), it is an important lake to preserve and protect.

Historically, Silver Lake has flipped between two relatively stable states, either being dominated by algae blooms when high abundances of rough fish were observed in the lake, or being dominated by submerged aquatic vegetation and filamentous algae with relatively clear water when rough fish populations are low. The lake has a history of winter fish kill events, which has pushed the lake between these two stable states. As the lake has experienced periods of low water clarity and frequent, intense algae blooms, water quality in the lake remains a concern for local residents and visitors. Similarly, excessive submerged aquatic plant growth had caused concerns and impacted recreation. To address water quality challenges, the University of Northern Iowa completed a diagnostic feasibility study in 2001 and the DNR completed a Water Quality Improvement Plan analysis in 2001, focusing on reducing nutrient and sediment inputs to the lake. Additionally, Team Services completed a Subsurface Exploration Report in 2001 to explore the possibility of dredging. Lake depth maps and sediment borings indicated excessive lake sedimentation depths ranging from 0.5 to 4 feet. The two studies offered different opinions on whether dredging was advisable at Silver Lake due to its karst topography, unstable water levels, and potential for seepage. The 2009 TMDL indicated that internal phosphorus loading contributes substantially to water quality challenges at Silver Lake. Dredging and/or phosphorus inactivation are commonly proposed tools for addressing internal loading.

The 2001 lake watershed assessment documented high phosphorus inputs from the watershed that contribute to algal and plant growth in the lake. This assessment also identified excessive manure application levels as a problem. Since these assessments were completed, many of the producers in the watershed have adopted a variety of Best Management Practices (BMPs) to reduce nutrient inputs to the lake. Today, extensive watershed BMPs have substantially reduced watershed inputs to the lake, yet, Silver Lake still faces some water quality challenges. While the studies completed in the early 2000s are valuable, they do not provide a clear direction for where dredging is feasible and if dredging the lake would yield better water quality and recreational benefits.

Additionally, Silver Lake has had challenges with maintaining water levels in the lake due to seepage/leakage at the dam. As a result, the dam was improved in 2007 to stabilize water levels and eliminate leakage. Prior to construction in 2007, water had not overtopped the dam since 1993 and water frequently leaked from the dam, causing unstable water levels within the lake. Since the dam has been repaired, the lake has remained at full pool during periods of normal rainfall.

The DNR has worked with local partners for several years to improve water quality and stabilize water levels within Silver Lake. Major projects include:

- Dam seepage repair (2007): Installed a sheet pile wall at the dam of the lake to eliminate seepage and stabilize water levels. Total cost: $294,489.07 DNR LRP (100%)
- Water quality improvement project at the School/Lake (2020; see photo below): Partnership between the Delaware County Conservation Board and DNR to construct an erosion control structure that drained from the school property to the lake to minimize erosion and sediment/nutrient pollution to the lake. Total cost: $17,076.00 (DNR LRP (75%) $12,806)
- Aquatic vegetation management (2020): Vegetation management at the lake to minimize excessive rooted and filamentous plants. Several treatments were completed throughout the summer of 2020 to control vegetation and bind small amounts of phosphorus. Total cost: $6,925.00 (DNR LRP funding plus Fisheries staff time to apply the treatment and monitoring vegetation at the lake).

Current Restoration Activities

To address concerns in both the lake and the watershed, a partners group was formed and began meeting regularly in 2018. Members of the team included representatives from the City of Delhi, the county conservation board, lake users, the campground owners, and representatives from conservation groups (SWCD and NRCS), along with DNR staff. Together, they determined that vegetation management in the lake was the most immediate goal for improving water quality and the recreational experiences at Silver Lake. Thus, DNR began a more aggressive vegetation management plan in 2019.

DNR hired a consultant (Shive Hattery) in 2020 to complete a Dredging Feasibility Study for Silver Lake (Delaware County), including monitoring and modeling to build a water and nutrient budget for the lake and to make recommendations for water quality improvements at Silver Lake. The study worked to determine if dredging is a feasible option for this lake, and if dredging operations would improve overall water quality in the lake by reducing internal nutrient loading. The study determined that dredging was feasible and would help to reduce internal loading; however, additional work in the watershed and alternative nutrient reduction strategies (e.g. alum application) should also be explored as options to meet water quality goals. Project partners are now working to locate a potential spoil site, should they move forward with dredging, as well as identify additional opportunities for watershed improvement.

Project partners met again in 2024 to explore options for improving water quality. As a part of the dredging feasibility study, Shive Hattery also collected sediment cores from the lake to determine if alum (aluminum sulfate and sodium aluminate) could be a useful tool to reduce internal phosphorus recycling within the lake. An alum treatment strategy is currently being developed for the lake, in addition to some hydrological modelling to determine levels of risk associated with a potential dredging project. Results from this study are due in 2025 ($120k; 100% LRP), and an alum treatment is tentatively planned for 2026. A boating and fishing improvement project is also slated to be constructed in 2026/2027.

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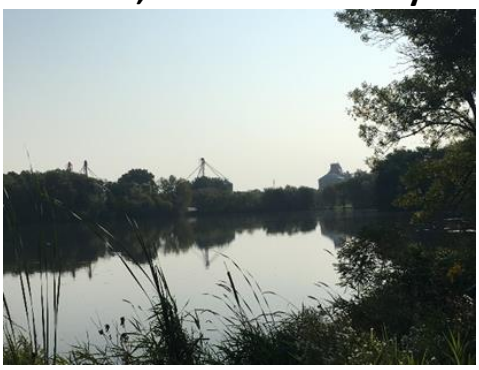
Silver Lake, Dickinson County



Background

Silver Lake (Dickinson County) is a 1,032-acre natural lake located in Northwest Iowa and serves as an important regional asset. This shallow lake has at 17:1 watershed to lake area ratio and a mean depth of 7ft. According to the 2014 CARD survey, the lake receives over 40,000 visitors annually and is a popular destination for boating, fishing, and wildlife watching. Silver Lake is bordered by the City of Lake Park and Trappers Bay State Park. Water quality at the lake has declined in recent years, and the lake is currently listed as impaired for turbidity. A TMDL (Total Maximum Daily Load) report was prepared and approved for Silver Lake in 2009. Shallow water conditions, coupled with rough fish, shoreline erosion, and pollutant loading have led to frequent algae blooms and high nutrient concentrations. The local community worked to develop and began implementing a watershed management plan in 2011. The lake is currently on the priority list of lakes for restoration within the Lake Restoration Program.

Planning for Restoration

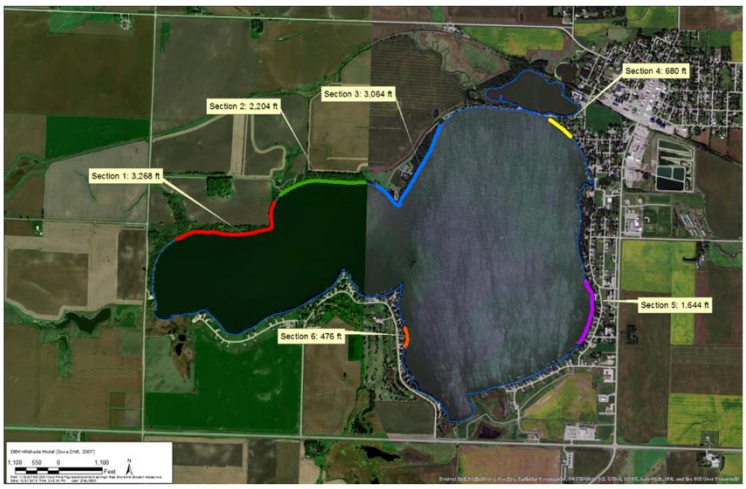
DNR began planning for restoration with the City of Lake Park, working together to develop and jointly fund a diagnostic and feasibility study to improve water quality at Silver Lake. Together, project partners hired Wenck Engineering to take a comprehensive look at the lake and watershed and determine what the sources of pollution to the lake were causing water quality issues and to develop a suite of restoration alternatives for project partners to consider. The study was completed in late 2018 and cost project partners $130,985.00 (75% DNR, 25% City). Results from the study are being used to guide project partners on developing a comprehensive restoration plan.

A study examining rough fish (carp and buffalo) populations was also commissioned through Iowa State University to better understand how rough fish are impacting water quality in the lake. Rough fish have a detrimental impact on water quality as they disturb lake sediments to feet and uproot vegetation. To date, the study has tagged several hundred fish in the lake and is monitoring populations and population densities of these undesirable fish. Commercial fisherman removed over 120,000 lbs. of rough fish from the lake in the fall of 2018. Reducing population numbers of these types of fish has improved water quality in other Iowa lakes. The long-term goal of this project is to determine how we can be effective at managing fish populations to promote good water quality in our lakes.

Current Restoration Activities

In 2020, the Silver Lake Park Improvement Association (SLPIA), the City of Lake View, and the DNR hired Wenck (now Stantec) Engineering to design shoreline stabilization improvements for six segments (see map below) of shoreline that were identified in the Diagnostic and Feasibility Study as a high priority for restoration. SLPIA received a grant from the Dickinson County Water Quality Commission to fund the majority of the design work for this project.

DNR intends to address erosion at publicly owned sections of shoreline (Sections 1-3). Armoring these areas will reduce erosion and improve water clarity in the lake. The first phase of construction planned for 2022 will focus on Sections 1 &2 (estimated cost of $825,000 ($750K LRP, $75K MFT)). Local partners will continue outreach to landowners in sections of the privately owned sections of shoreline to determine next steps for restoration at these sites. Construction on



Section 1 was completed in 2022. Along with stabilizing a large section of shoreline with native fieldstone, numerous trees were removed along the banks to create an oak savannah. Selective removal of trees allows more light to reach the understory of the savannah and promotes ground vegetation, which will help stabilize the steep bank slopes.

Stantec Engineering also developed conceptual design of sections of shoreline owned by local residents. Project partners met with interested local shoreline owners in 2021 to explore options for restoring sections of shoreline in private ownership. SLIPA applied for an additional grant from the Dickinson County Water Quality Commission to secure funds to assist local landowners with construction in 2023 and beyond.

Design for sections 2 and 3 of the public shorelines was finalized in 2023 and construction was completed in 2024 ($737,255; Three Oaks Construction; $300 Watershed Infrastructure Fund grant; $437,255 LRP).

Future Restoration Efforts

In 2025, DNR discussed the need for additional assessment and design work for the next phase of shoreline improvements. Local staff prioritized the city-owned shoreline, and from the boat ramp up through the west end of the WMA. DNR will continue to work with local landowners on privately-owned shoreline and the Trapper's Bay wetland project.

Finally, SLPIA recently received a WQC grant to install several rock barriers to prevent carp from reaching quality spawning habitat.

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Smith Lake, Kossuth County

Background

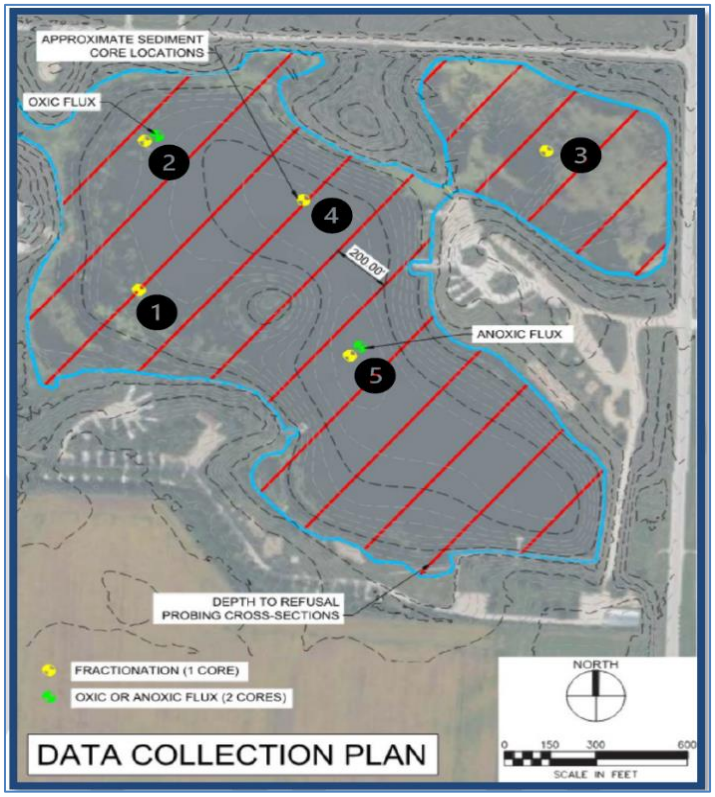
Smith Lake, located in Kossuth County just north of Algona, and owned and operated by the Kossuth County Conservation Board, is a 57-acre lake with a 22:1 watershed to lake area ratio. The lake has lost considerable depth since the dam was constructed in 1965, and water quality has declined in recent years, with periods of low water clarity due to algae blooms observed throughout the summer months. In spite of some water quality challenges, the lake remains a popular destination for a variety of outdoor activities, boasting two campgrounds and two beaches. The park is also home to the Kossuth County Conservation Board's headquarters and nature center.

The Lake Restoration Program (LRP) began meeting with the County Conservation Board (CCB) in 2022 to determine if the lake was a good fit for the program and outline a series of next steps to learn more about the lake and watershed. DNR's watershed improvement section completed a watershed assessment in 2023, and the Kossuth County Conservation Board then constructed a bioswale to capture runoff from the parking lot at the nature center in 2024 ($23,934: LRP $5,000, IDALS $11,967, KCCB $1,967 & Others $5,000).

Current & Future Restoration efforts

Project partners developed an RFP in 2025 and the CCB and DNR hired Shive Hattery to evaluate park and in-lake restoration best management practices (BMP's) for feasibility, provide BMP cost-benefit analysis, and develop a model to estimate internal and external phosphorus loading (required sediment coring, photo to the right), along with implications for dredging ($114.5k; 75% LRP, 25% CCB). Shive Hattery finished the preliminary lake restoration plan that includes conceptual engineering design for draining the lake, mechanical dredging, shoreline stabilization, fish habitat, and upgrades to the dam and outlet structure.

CCB and DNR plan to continue working with Shive Hattery to complete design and permitting over the next year with the goal of beginning construction in late 2027 or early 2028. Engineering and construction costs are estimated at $5.6 million.



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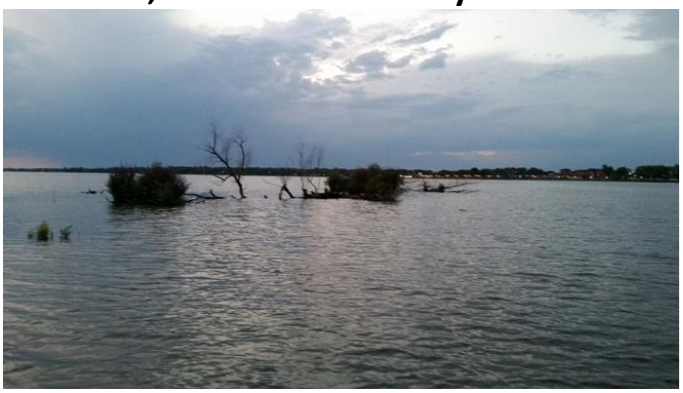
Storm Lake, Buena Vista County




Shorty's Island (Small Island) before and during construction. LRP re-built islands within Storm Lake to reduce wind and wave erosion and prevent re-suspension of bottom sediments that cause turbidity issues in Storm Lake.

Background

Storm Lake is a shallow natural lake (4th largest natural lake in Iowa) with a surface acreage of 3,104 acres and a watershed to lake ratio of 5:1. The Diagnostic/Feasibility Study and the Impaired Water's Assessment both indicated that internal loading from re-suspension of bottom sediment is the primary source of nutrient availability and water turbidity, which supported dredging as an approach to improve water quality in the lake. Recently, the project has started to shift focus to use other restoration alternatives to improve water quality in the lake.

- DNR constructed a dredge spoil site at Storm Lake in 2001 and began dredging activities in 2001/2002. Lake dredging removed 1.32 million cu./yds. of sediment at a total project cost of approximately $4.0 million during this first year of operation. Funding limitations restricted this initial dredging activity to 180-acres of the lake.
- Between 2003 and 2017, the DNR and the City dredged 5.71 M cubic yard of sediment from the lake. As of end of year 2017, mean depth was estimated at 8.8 feet.

Lake Restoration Activities

In 2015, the City hired Dredge America to operate locally owned equipment for the final phase of dredging. Only ~170,000 cubic yards of sediment were removed in 2016 due to numerous challenges throughout the season with equipment. Repairs to the containment site, including the installation of a cross-over system between the two spoil site cells were also completed. 2017 was the final year of dredging at Storm Lake. Once again, the City partnered with DNR to remove 328,325 cubic yards from Storm Lake, resulting in an overall mean depth of 8.8 feet for the lake. An additional booster pump was added to the dredging operation in 2017 to maximize efficiency with the aging equipment. The total cost for dredging in 2017 was $1,157,524 ($834,021 DNR Lake Restoration Program / $323,503 local).

ISU Storm Lake Dredging Analysis Study

Iowa State University, under the direction of Dr. John Downing, completed a study aimed to determine which areas of Storm Lake and to what depths Storm Lake could be dredged in the immediate future to yield the most reduction in sediment resuspension. In addition, this project explored alternative management scenarios that may further improve water clarity in Storm Lake.

Key take-home points from ISU Storm Lake Dredging Analysis Study

1. Current dredge only strategy will not be able to obtain water clarity goals unless stakeholders are willing to commit to dredging an additional 13.1 million cubic yards of sediment.
2. Dredging a larger surface area by removing less sediment in each location produces greater water clarity gains than dredging to deeper depths in a limited footprint.
3. Allowing degradation of the "big island" will have negative impacts to water quality.

4. If able to be successful in protecting existing islands, establishing islands independent of dredging may be a useful strategy to improve water clarity in Storm Lake.

Break Waters and Alum Treatment Analysis

FYRA engineering also completed a study that determined the composition of suspended particles in the water and what potential treatments could be used following dredging to remove those suspended particles from the water column. They also researched different compounds that could be used to settle phosphorus and sediment that was re-suspended due to dredging and wind/wave action. FYRA concluded that treating the lake with alum would help settle suspended solids when dredging at the lake was finished and improve water clarity in the lake. Finally, they proposed the installation of a number of break waters near the shoreline around the lake that would minimize shoreline erosion and re-suspension due to wind and waves. The DNR and the City of Storm Lake view these restoration alternatives as potential future phases of the project depending on observed long term water quality trends. Alum is frequently used in lake systems to remove phosphorus from the water column and floc and settle fine sediment particles to improve overall water clarity. An alum treatment at Storm Lake would improve water clarity and promote vegetation growth in the shallow waters around the lake's edge. Aquatic plants are vital for a healthy sport fishery, help minimize sediment re-suspension, and remove nutrients from the water that would otherwise be used for algae production.

Rebuilding the Islands in the Lake

DNR Engineering worked to re-design the small island lake (Shorty's Island) along the eastern shore of Storm Lake. The re-built island will help prevent shoreline erosion and help reduce sediment re-suspension due to wind and wave action by acting as a breakwater. The project was bid out in the summer of 2017, with the majority of the construction being completed during the summer and fall months. Low water conditions and wind prevented some of the work from being completed on schedule, thus some minor finish work was completed in 2018. Shekar Engineering was hired to re-build and enhance the island for a total cost of $545,702. The boat ramp and staging area used for the island rebuilding projects was enhanced and repaired in 2021 ($20,515 LRP). Re-building the large island in the lake was bid in 2018 and constructed over the summer months. The total cost for the project was $389,025.00. Additionally, the Fisheries Bureau secured funding in 2018 to re-build the Chautauqua jetty.

Additionally, DNR initiated at study with Iowa State University in 2017 to better understand how rough fish (carp and buffalo) populations are affecting water clarity at Storm Lake. This five-year study is establishing a population biomass for rough fish and determining if commercial fishing to reduce these population sizes can be an effective way at improving water quality. Rough fish are not desirable to most anglers and stir up bottom sediments in lakes, releasing sediment and nutrients into the water column. In shallow lakes, they can be particularly detrimental, eliminating vegetation that stabilizes the sediments and increasing turbidity. Removal of these fish can help improve overall water clarity. Commercial fishing is one way to target these groups of fish in the lake. This method for improving water quality has been applied at Lost Island Lake successfully in the past.

Since the dredging project was completed, water clarity in the lake has improved in Storm Lake. For the first time in years, recreational users are seeing aquatic plants establish within the lake, which will stabilize lake sediments and improve clarity. DNR fisheries staff, lake restoration staff, city officials, and other project partners continue to meet regularly to discuss other alternatives for improving water quality and decreasing long-term sediment mobility in Storm Lake. DNR staff met in 2021 to discuss potential options for improving the Little Storm Lake pump and dike system, which would further reduce nutrient and sediment inputs to the lake. Design was completed in 2024 and the project was completed in 2025 ($370k; 100% LRP). Upgrading the pump structure will allow managers better water level control of Little Storm Lake, minimizing carp access to the wetland and promoting aquatic vegetation.

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Swan Lake, Carroll County

Background

Swan Lake has a long history of water quality challenges, flipping between clearer water states with abundant vegetation to intense algae blooms (see photo right), fueled by excess phosphorus in the lake and lots of internal nutrient recycling. DNR fisheries staff has been working closely with the Carroll CCB in efforts to re-establish emergent vegetation around the perimeter of Swan Lake through manipulating water levels at this lake. In addition, partners attempted an experimental removal of grass carp with a commercial angler using trammel nets. Through these efforts, 40 grass carp were removed from Swan Lake. Three hundred grass carp were originally stocked in Swan Lake since the renovation in 2004 and none have been stocked since. In addition to the CCB's in-lake efforts, project partners have worked to restore a 4-acre wetland in the watershed through a WIRB grant. The lake currently has a watershed management plan, however; A comprehensive in-lake plan is needed to move forward with this project and improve water quality. The DNR and Iowa State University partnered with the county in 2017 to monitor the lake to better understand oxygen dynamics and nutrient cycling in this lake. DNR installed a buoy for several summer months to learn how and when oxygen is being depleted within the lake. Iowa State and DNR to use this information to develop a more long-term strategy for managing algae blooms in the lake and preventing summer fish kills from low oxygen concentrations.

Current Restoration Efforts

The lake has experienced low-water conditions over the past several years, due to the drought. Fisheries is developing an aquatic plant management plan to control American Lotus in the lake basin, and DNR engineering is designing a hybrid pump/gravity drain system that will allow Carroll CCB to manage water levels in the shallow western basin of the lake in the future. Construction of the water level management system will be completed in 2026 and allow for better water level control to establish vegetation in the future ($100k LRP).

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Three Mile Lake, Union County

Background

Three Mile Lake is an 880-acre reservoir in Southern Iowa that serves as a popular recreation destination and drinking water source for the Southern Iowa Rural Water Association. Impounded in 1995, the lake has nearly 24 miles of shoreline that draws over 77,000 estimated annual visits for a variety of different types of recreation, including: fishing, boating, wildlife watching, and public hunting. There is a well-developed camp ground with cabins and a lodge near the lakeshore. With a 26:1 watershed to lake area ratio and steep slopes with highly erodible soils in the watershed, sedimentation in the lake and high turbidity levels are of concern. While the lake has excellent water quality relative to many other Iowa lakes, the Lake Restoration Program began meeting with project partners in 2015 to discuss ways to preserve its water quality and make needed infrastructure improvements to the lake, as well as initiate a watershed improvement project to minimize sediment and nutrients being delivered to the lake.

Recognizing the potential for agricultural nonpoint source pollution risks to Three Mile Lake, local sponsors and natural resource agency staff initiated a watershed project in 1991 to assist watershed producers in implementing best management practices that would protect the lake once construction was complete. While conservation efforts did a lot to protect the then-new lake, recently, water quality in the lake has begun to decline with dramatic increases in the suspended solids concentration, thus additional watershed and in-lake restoration and protective measures are needed.

Past Restoration Activities

To address concerns both in the lake and the watershed, a project technical advisory team was formed. DNR hired the Soil and Water Conservation District to complete a watershed assessment to determine where additional best management practices would most benefit the lake. DNR also completed a fishery renovation in September of 2016 to attempt to eliminate the yellow bass population in the lake. Yellow bass can have a detrimental effect on the sport fishery in man-made lakes. Unfortunately, the bass were found again shortly following the renovation.

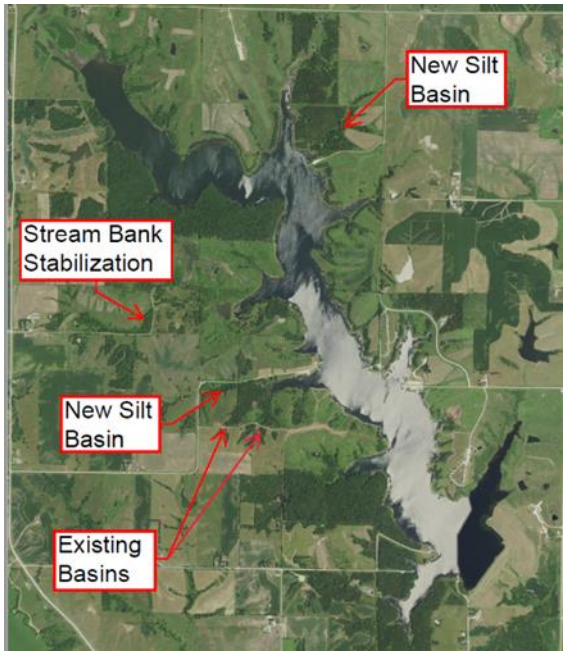
While the lake was partially drawn down to complete the fishery renovation, DNR worked to armor critical sections of shoreline that were eroding to prevent suspended sediment pollution and additional erosion. Tri-Smith Construction, LLC, was hired to shape and armor shoreline with rip rap for $716,287.04 using Marine Fuel Tax Funds.

Current and Future Restoration Activities

The DNR plans to perform in-lake improvements within the next 2 years, as the project partners continue to work together to implement additional best management practices in the watershed. Proposed restoration activities include some shoreline deepening and armoring, installation of fishing jetties and habitat, and installation of a break water near the main boat ramp to protect the shores from wind and wave action. The local SWCD has been working with land owners/operators in the watershed to prioritize areas for additional watershed practices that will protect the lake.

In 2020, FYRA Engineering Inc. was hired to assess and design elements of the Three Mile Lake restoration project. The project is currently being developed in two phases for construction - one to complete some watershed practices that was contracted in 2021 (see map at right) and a second phase for in-lake work and remaining nearshore watershed work. Total costs associated with the engineering design of this project is $410,703 (LRP funded with a $45k contribution

from the Southern Iowa Rural Water Association). The first phase of construction includes the mechanical excavation of two existing silt basins on park property and construction of two new BMPs. Additionally, a section of stream bank will be stabilized to mitigate for future stream impacts within the total scope of the project. The contract was awarded to Keller Excavating, Inc. for $387,868.20 and was completed in 2022.



JNC was hired to complete the second phase of construction, which began in fall 2023, and was completed early spring 2025. Phase two included targeted shoreline deepening and stabilization, several additional watershed BMPs and in-lake forebays, fish habitat and improved access, and extensive work on the in-lake silt basin on the main arm of the lake ($3,522,106; $2.0 Million LRP; $500k Watershed Infrastructure Fund Grant; $500k MFT; $246,386 Bass Pro Grant; $40,000 National Fish Habitat Partnership Grant; $155,720 REAP Open Spaces; $40,00 DNR Fish Habitat Grant; $30,000 Local sponsors (Union County and SIRWA). The lake is currently in the process of refilling (photo below).

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Twelve Mile Creek Lake, Union County

Background

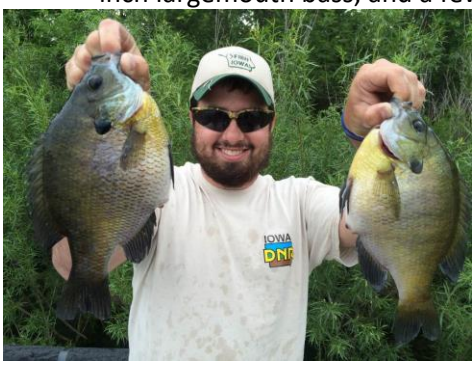
Twelve Mile Lake is a 595-acre lake with a 17 ft. mean depth and 42 ft. max depth. This multi-use resource (Wildlife Management Area) has a 14,080-acre watershed and 24:1-acre watershed to lake ratio. During its peak in the late '90s Twelve Mile held nearly 30 fishing tournaments per year. By 2004, that number dropped to two. There were problems with common carp, decrease in water quality and drinking water required additional treatment.

40-acre wetland structure above 12-Mile Creek Lake.

Restoration Activities

Work began in 2005 to improve water quality. Work included shoreline protection, terraces, buffers and sediment structures placed in the watershed. DNR renovated the fishery and re-stocked the lake. Since these restoration efforts, Twelve Mile still has above average water quality compared to other IA lakes. Rooted vegetation has re-established in some areas with a recent trend of stable water quality. DNR is currently managing American Lotus with herbicide spot treatments on the north end of the lake. Twelve Mile continues to be in the top 1/3 in visitation. Over 50% of the anglers recently fishing 12-Mile are from >50 miles away (twice what we normally see). Tournaments once again are scheduled throughout the open water season.

- A 40-acre wetland was constructed on the north end of Twelve Mile Lake in 2014 to retain nutrients and sediment. The project was delayed several times in 2014 due to record summer rainfall in southern Iowa. The wetland was constructed at a cost of $447,291 ($297,291 Lake Restoration Program / $75,000 North American Wetlands Conservation Act funds / $75,000 State Duck Stamp).
- Lake Restoration Program and DNR Wildlife funds were used to help survey the Twelve Mile Lake watershed and implement three grade control structures in the watershed.
- 12-Mile Creek Lake has developed into a popular fishery since renovation. There are good numbers of 14-16-inch largemouth bass, and a few bass exceed 16 inches. Bluegills up to 10 inches are available to anglers at 12-Mile Creek Lake as well as moderate numbers of yellow perch and crappies in the 9-11-inch length range.



The wetland will further protect this valuable resource and add additional recreational opportunities for the community. Located at the upper end of permanent pool, the wetland is expected to remove and store sediment/nutrients in runoff and compliments continued work in the watershed, which is important to the goal to improve/maintain water quality for the main lake.

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North and South Twin Lakes, Calhoun County

Background

North Twin Lake and South Twin Lake are two natural, glacial lakes located 4 miles north of Rockwell City. Together, the two lakes form a natural lake complex, in which the outflow of North Twin serves as the primary inflow into South Twin Lake. The two lakes have a relatively small watershed to lake area ratio of 4.6:1 for North Twin and 6:1 for South Twin. The majority of land in both watersheds is row crop agriculture. Both lakes also have high visitation rates, with an estimated visitation of over 44,000 visits annually.

To address water quality problems in the lake, Iowa State University completed a diagnostic and feasibility study in 2016. The study called for extensive efforts in the watershed to improve water quality, as well efforts within the lake to reduce internal loading. In 2019, commercial anglers removed over 180,000 pounds of rough fish (carp and buffalo) from North Twin Lake to reduce internal loading within the lake. As a result, water clarity improved dramatically in 2020. A contract was let for South Twin Lake for 2021 to reduce populations of rough fish, which can negatively impact water quality.

Current & Future Restoration Efforts

Drought throughout most of 2022 and 2023 led to very low water levels at both North and South Twin Lakes (see photo below; South Twin Lake in Summer 2024). South Twin lake's entire fishery was frozen under ice in early 2023, and water levels remained very low throughout the summer. We anticipate that when the drought ends and water levels return to normal, the lake will fill with native aquatic vegetation, which will stabilize sediments, provide excellent habitat, and help preserve water quality benefits associated with changes in water levels. However, low water levels led to a large spawning event in North Twin Lake in 2023, with many juvenile carp observed during spring netting operations. Carp survival is low from juvenile to adulthood, so DNR Fisheries staff plans to supplement with existing bass population through stocking efforts. Fisheries will continue to monitor the carp population and work with the LRP to determine if additional fish management is warranted.

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Union Grove Lake, Tama County

Background

Union Grove is a 105-acre shallow constructed lake owned by the State of Iowa, with a watershed to lake area ratio of 63:1. It has 6,640 acres in the watershed with the vast majority is in private ownership. In the late 1980s, the state dredged the lake and installed an in-lake silt and nutrient dike on the north end of the lake. The DNR also purchased an additional 60-acre parcel on the southwest side of the park and constructed a 10-acre pond. Union Grove Lake dredging, from 1988-1990, involved removal of 275,000 cubic yards of sediment accumulated since the lake was built in 1936.

Spillway water seepage had been an on-going problem at Union Grove Lake and past attempts to repair the problem had limited success. DNR hired a geo-tech firm in 2005 to evaluate the problem and contracted a firm in 2006 to repair the structure. The DNR completed the project in July of 2007 and successfully addressed the water seepage issue. Total project cost for the spillway repair was $178,572, with the Lake Restoration Program as the funding source. The construction firm also made several recommendations for additional future spillway modifications that will preserve the integrity of the system at an estimated cost of $40,000.

Union Grove Lake is on the Iowa's impaired waters list because of four limitations: pH, bacteria, algae, and turbidity. The Union Grove Lake Watershed Project has been underway since April of 2008. The project aims to reduce the soil and phosphorus reaching the lake, as well as reduce the effects of livestock on streams in the watershed.

As progress continued in the watershed, a 116-acre parcel at the top of the lake went to auction. This strategically important piece of land that filters 40 percent of the watershed was purchased by the Iowa Natural Heritage Foundation and held until the DNR's watershed improvement section, using EPA section 319 funds, and local supporters could purchase the $695,000 parcel. This acquisition will be seeded with perennial prairie grasses and an existing wetland will be expanded providing permanent water quality protection for the lake.

Local partners, with the DNR have updated the plan to improve the lake and water quality conditions. The Tama SWCD Watershed Project Coordinator worked to revise and approve the Management Plan. In addition, the Tama County Sanitarian completed a report on a septic plan for the lake community.

In-Lake Restoration Work

In 2015, Union Grove Lake was drawn down to prepare for many in-lake renovations (see photo below). DNR engineering worked to survey and plan for extensive shoreline stabilization at the lake, modification of the spillway, installation of an effective fish barrier, and dredging to restore depth to the lake, especially in many near shore areas. Fisheries staff also worked to plan a complete renovation of the fishery and installation of fish habitat around the lake.

Throughout the winter of 2015/2016, shoreline stabilization was completed around the perimeter of the lake to prevent future shoreline erosion and establish additional fish habitat around the lake. Most of the actively eroding areas of the shoreline were armored, costing a total of $339,769 (25% Lake Restoration Program; 75% Marine Fuel Tax). Work was completed, save for one area that was not easily accessible. This remaining section was completed February 2016. In

spring of 2016, the watershed was chemically renovated to eliminate rough fish (carp) from the lake and watershed. Following the fishery renovation, the valve was closed and the lake was allowed to re-fill.

Hydraulic dredging (see photo on previous page) was completed in 2016 following construction of the containment site on the Northwest side of the lake. Construction was completed on the containment site throughout the 2015 and 2016 construction seasons for a total of $130,001 by the Kinman Company Inc. Dredging was the final phase of the active restoration project. Southwind Construction Corp. was hired to dredge 250,000 CY from the lake bottom, increasing the mean depth of the lake from 7.5 to 9.5 feet. This included removing sediment from above the existing in-lake silt dam which restored the effectiveness of the silt dam. Increased depth throughout the lake will help limit excessive aquatic vegetation growth, increase water clarity, and improve the health of the fishery. The total cost for hydraulic dredging was $1,591,531 (100% LRP). The DNR Fisheries bureau began re-stocking the lake after it reached full pool, with the expectation that pan fish will reach 8-10 inches within the next two years.

Vegetation following the restoration was a concern in 2017. DNR worked with local partners to chemically remove excess vegetation throughout the lake over the summer. An active vegetation management plan was developed and has been used since to guide management decisions. Today the vegetation management teams meets with the local friends group annually to develop an aquatic vegetation management plan annually that balances the environmental benefits of vegetation with challenges with boating and shoreline angling.

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Viking Lake, Montgomery County

Background

Viking Lake is a 137-acre man-make lake, located within a 1,000-acre state park that was initially impounded in 1957. Historical water quality at the lake had always been average, however following periods of heavy rainfall turbid water conditions could persist for up to two weeks and persistent algae blooms had also been an issue at the lake. Viking has historically been an above-average fishery, but introduction of yellow bass in the mid-90s led to a dramatic decline in the quality of the fishery. According to the 2014 CARD survey conducted by Iowa State, Viking Lake has an estimated 53,000 visitors annually, which is a little below the statewide average for visitation (average of 65,000) and accounts for about $3.2 million in direct spending.

Using a Secchi disc to show excellent water quality following the 2006 restoration project.

Starting in the mid-2000s, a watershed coordinator worked with partners to implement corrective measures within the watershed. Examples of some of the work in the watershed (both in the park and on private land) and other past projects, included:

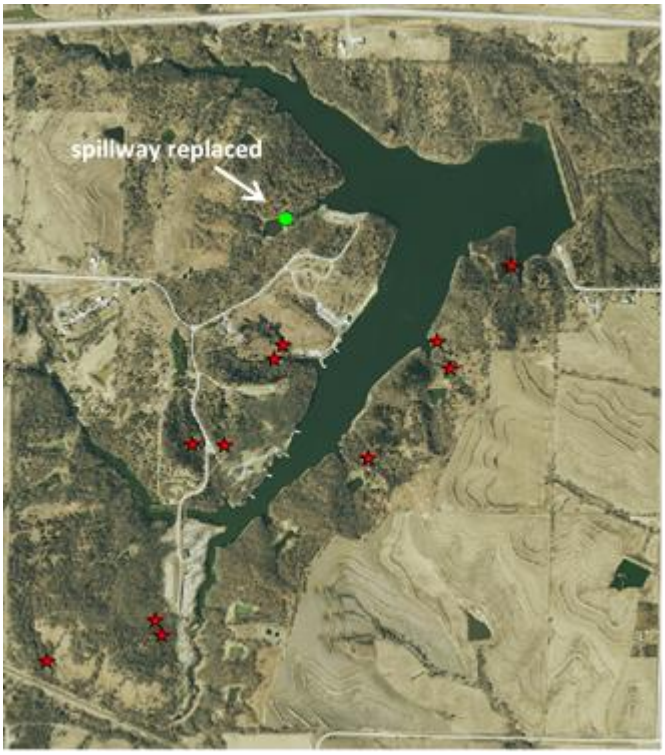
- DNR constructed twenty sediment control ponds / grade stabilization structures to control soil erosion and improve water quality.
- A new 5.5-mile trail was built to connect most of the ponds in the park.
- Landowners built wetlands and terraces, and fenced cattle out of streams that feed the lake.
- The watershed project coordinator worked to move a small housing development from outdated individual septic systems to a community system.
- DNR drained the lake after Labor Day (2006) and renovated the fishery to eliminate the problem yellow bass population; and, after lowering the lake, they repaired the dam gate structure, deepened and protected regions with shoreline erosion (8,000 feet), constructed jetties, and improved angler access and fish habitat.

Water quality improved following the restoration in 2006. Because of reduced algae levels and better water clarity (below the impairment threshold), DNR removed Viking Lake's algae impairment from Iowa's 2014 impaired waters list. The purpose of this work is to protect past investments and current condition of the lake. In 2017, a field visit to Viking by the NRCS and Parks staff identified new critical gully erosion sites that were not present when the prior work was completed.

Within the last couple of years, however, higher values for both algae and nutrients have been observed, which is why the additional ponds addressing gully erosion are especially important. The Lake Restoration Program works to sustain water quality benefits in all of the projects previously completed, although it can be very challenging with limited control of the watershed.

Restoration Work

To address the formation of new gullies in the park, DNR staff worked together to address new issues at Viking Lake State Park in 2019. In 2017, a field visit to Viking by the NRCS and Parks staff identified new critical gully erosion sites that were not present when the prior work was completed.



DNR worked to repair one existing pond and construct eleven new sediment ponds within the park (red stars on map to left) to address the existing gullies and reduce erosion damage to the lake. Additionally, the spillway was replaced at one of the basins that connects to the main lake, removing the existing corrugated metal drop-inlet structure and replacing it with a smooth steel principle spillway and smooth steel drain pipe. Total cost for this project was $163,220 and was completed in the fall of 2019.

In 2019, Viking Lake was drawn down 8 feet in an attempt to improve the struggling bluegill fishery at the lake. The lake was lowered after the July 4th holiday, removing approximately half of the water volume from the lake. While the lake level was lowered, 1,900 feet of shoreline was stabilized with riprap and four pea gravel fish spawning beds were installed to improve fish habitat. During the construction process, the gate valve was damaged. The stem was replaced in 2020 ($30,018 LRP) so lake levels could to return to normal pool. Dry weather in 2020 meant water levels remained low, however; the lake returned to full pool in 2022. The photos below show the lake at full pool and during the draw down period.

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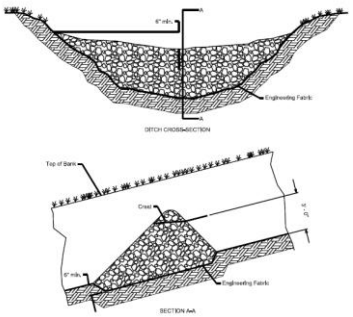
Volga Lake, Fayette County

Background

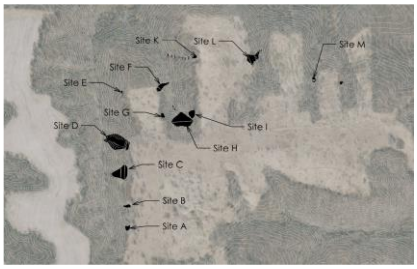
Volga Lake is a 132-acre impoundment located in Volga River State Recreation Area. The lake was constructed between 1978 and 1979 and encompasses a 6,038-acre watershed, which results in a watershed to lake ratio of 46:1. Currently, the lake is 23.0 feet at the deepest point, with an average depth of 10.8 feet. The state recreation area is a popular destination for fishing, boating, hiking, equestrian trails, camping, hunting, and has two canoe access points to the Volga River, in additional to lake access. According to the 2014 CARD survey, Volga Lake has an estimated 66,000 visits annually.

To identify causes for high levels of algae and turbidity of the lake, several watershed surveys were conducted in 2015 in cooperation with the Fayette Soil and Water Conservation District. It was determined that one contributing factor to the impairment was external loading of phosphorus and sediment from the watershed. Within the surveys, a review of gullies on public property highlighted areas of critical erosion that could be addressed by implementation of stabilization practices.

Rock Check Dam Image



Terrace Locations



Current Restoration Activities

Project partners began meeting in 2018 to prioritize areas of the park for restoration, starting with addressing gully erosion in the park by proposing a series of rock check dams to minimize erosion and stop sediments from entering the lake (see diagram at right).

DNR Engineering staff designed a series of rock check dams and terraces to stabilize gullies in the park. The first round of construction was completed in 2020 for a total of $50,268. Earthen terraces and rock check dams will slow the water down to prevent continued head cutting and gully erosion. As an additional benefit, these terraces will create small wetlands, thus improving the diversity of the area's habitat. Additionally, small nuisance trees were removed from the park in 2020 ($14,200) to facilitate erosion control and promote understory vegetation growth.

Future Restoration Efforts

In 2025, project partners met to provide project updates and discuss restoration strategies to improve water quality in the lake. Three additional rock check dams are being designed to stabilize remaining gullies in the park (photo of eroding gully to the right) and will be constructed in 2026. The local RC&D staff will pursue 319 Water Quality Initiative (WQI) funding to hire a watershed coordinator. The coordinator will work with watershed landowners and within the park to implement best management practices that reduce sediment and phosphorus loading to the lake.

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Appendix A. Iowa Code and the Framework of the Lake Restoration Program

The DNR modeled the Lake Restoration Program after the Federal Clean Lakes Program established in the 1970s and follows the directives to the department under Iowa Code 456A.33B regarding Project Goals, Process and Criteria, and Restoration Plan Guidelines for the Lake Restoration Program. For the purpose of Iowa's Lake Restoration Program, Iowa code defines "significant, publicly-owned lakes" as those lakes that meet all of the following criteria:

- is owned by the federal government, the state of Iowa, a county, or a municipal government, and is maintained principally for public use;
- is a multi-use system capable of supporting diverse wildlife, fish, or recreational opportunities;
- has a surface water area of at least ten acres;
- does not have a watershed-to-lake surface area ratio of greater than two hundred to one;
- is not an on-stream impoundment that emulates riverine habitat rather than a lake environment;
- and, is not used solely as a water supply reservoir.

For the purpose of Iowa's Lake Restoration Program, Iowa code defines "publicly-owned shallow lakes/wetlands" as those water bodies that meet the following criteria:

- is owned by the federal government, the state of Iowa, a county, or a municipal government, and is maintained principally for public use;
- is a multi-use system capable of supporting diverse wildlife, fish, or recreational opportunities;
- has a surface water area of at least ten acres;
- does not have a watershed-to-lake surface area ratio of greater than two hundred to one;
- is an open freshwater system where maximum depth is typically less than six to eight feet at its deepest spot and is under four and one-half feet mean depth;
- and, is typically fringed by a border of emergent vegetation in water depth less than six feet and when clear is dominated by both emergent and submergent vegetation and provides important wildlife and fish habitat.

Project Goals, Water Quality Targets, and Measures of Success

The department recommends funding for lake restoration projects that are designed to achieve the following goals:

- Ensure significant improvement in water clarity, safety, and quality of Iowa lakes.
- Provide for a sustainable, healthy, functioning lake system.
- Ensure a cost effective, positive return on investment for the citizens of Iowa.
- Ensure local community commitment to lake and watershed protection.

In-lake, along with watershed management, will meet or exceed the following water quality targets:

- A1) Water Clarity - A four and one half foot secchi depth will be achieved fifty percent of the time from April 1 through September 30.
- A2) Water Safety - Beaches will meet water quality standards for recreational use.
- A3) Water Quality - Removal of the lake from the impaired waters list.
- B1) Sustainable lake system - The benefits of the restoration efforts will be sustained for at least fifty years.
- B2) Healthy/Functioning lake system - Biota. Maintain a diverse, balanced, and sustainable aquatic community.

Translating program goals and water quality targets to measures of success:

- A1) Water Clarity - Improve clarity to achieve goals outlined in the restoration plan (i.e. better post vs pre-restoration water clarity).
- A2) Water Safety - Increase frequency of beaches meeting water quality standards for recreational use.
- A3) Water Quality - Remove any listed impairment from the lake.
- A3) Water Quality - Meet other water quality goals as defined in the restoration plan.
- B1) Sustainable lake system - Maximize design life of tools implemented for restoration. Sustainability may include maintenance improvements, major repair/replacement of existing infrastructure, new infrastructure, and addressing the age of our typical lake impoundment systems.
- B2) Healthy/Functioning lake system - Biota. Improve aquatic community to achieve goals outlined in the restoration plan.
- C) Achieve a positive return on investment for public benefit in a cost-effective manner.

- D) Develop local partnerships and resources that contribute to restoration efforts.

Process and Criteria

The process and criteria to recommend funding for lake restoration projects are:

- The department, with input from stakeholders, maintains a list of not more than thirty-five significant publicly owned lakes and not more than five publicly-owned shallow lake/wetlands prioritized for funding based on the feasibility of each lake (water body) for restoration and the use or potential use of the lake, if restored. The department recommends these lake projects as a priority for funding so long as progress toward completion of the projects remained consistent with the goals of the program.
- The department meets with stakeholders and representatives of communities where prioritized lakes are located to provide an initial lake restoration assessment and to explain the process and criteria for receiving lake restoration funding.
- Communities with lakes not included on the current list may petition the Director of the department for a preliminary assessment of the lake for inclusion in the program (i.e. does the lake meet the program definition of significant, publicly-owned lake or publicly-owned shallow lake/wetland and does it rank well relative to other lakes in terms of potential for meeting program goals) and an explanation of the funding process and criteria.
- Projects need to follow the directives to the department regarding Project Goals, Process and Criteria, and Restoration Plan Guidelines from 2006 State Legislation (81st GA, HF2782) and 2016 State Legislation (86th GA, SF2324).

Water Quality Improvement Plan Guidelines

The department works with stakeholders and communities to develop a joint lake restoration action plan.

- At a minimum, each joint action plan documents the causes, sources, and magnitude of lake impairment, evaluates the feasibility of the lake and watershed restoration options, establishes water quality and fishery and wildlife goals and a schedule for attainment, describes long-term management actions, assesses the economic benefits of the project, identifies the sources and amounts of any leveraged funds, and describes the community's commitment to the project, including local funding.
- The stakeholders' and community's commitment to the project may include moneys to fund a lake diagnostic study and watershed assessment, including development of a Water Quality Improvement Plan.

Each joint lake restoration plan complies with the following guidelines:

- Biologic controls will be utilized to the maximum extent, wherever possible.
- If proposed, dredging of the lake will be conducted to a mean depth of at least eight feet (to gain water quality benefits) unless a combination of biologic and structural controls is sufficient to assure water quality targets will be achieved at a shallower average water depth.
- The costs of lake restoration will include the maintenance costs of improvements to the lake.
- A strategy for reasonable control of the delivery of phosphorous and sediment from the watershed or via in-lake management will be developed before lake restoration begins.
- The department will evaluate the joint action plans and prioritize the plans based on the criteria required by the program.

Iowa Code 2025 - 456A.33B Lake restoration plan and report.

1. For purposes of this section, unless the context otherwise requires:
   a. *"Lake"* includes a significant public lake and a public shallow lake or wetland.
   b. "*Public shallow lake or wetland"* means a water body that meets the following criteria:
      (1) Is owned by the federal government, the state of Iowa, a county, or a municipal government, and is maintained principally for public use.
      (2) Is a multi-use system capable of supporting diverse wildlife, fish, or recreational opportunities.
      (3) Has a surface water area of at least ten acres.
      (4) Does not have a watershed-to-lake surface area ratio of greater than two hundred to one.
      (5) Is an open freshwater system where maximum depth is typically less than six to eight feet at its deepest spot and is under four and one-half feet mean depth.

(6) Is typically fringed by a border of emergent vegetation in water depth less than six feet and when clear is dominated by both emergent and submergent vegetation and provides important wildlife and fish habitat.

c. *"Significant public lake"* means a lake that meets all of the following criteria:

(1) Is owned by the federal government, the state of Iowa, a county, or a municipal government, and is maintained principally for public use.

(2) Is a multi-use system capable of supporting diverse wildlife, fish, or recreational opportunities.

(3) Has a surface water area of at least ten acres.

(4) Does not have a watershed-to-lake surface area ratio of greater than two hundred to one.

(5) Is not an on-stream impoundment that emulates riverine habitat rather than a lake environment.

(6) Is not used solely as a water supply reservoir.

2. *a.* It is the intent of the general assembly that the department of natural resources shall develop annually a lake restoration plan and report that shall be submitted to the joint appropriations subcommittee on transportation, infrastructure, and capitals and the legislative services agency by no later than January 1 of each year. The plan and report shall include the department's plans and recommendations for lake restoration projects to receive funding consistent with the process and criteria provided in this section, and shall include the department's assessment of the progress and results of projects funded with moneys appropriated under this section.

b. The department shall recommend funding for lake restoration projects that are designed to achieve the following goals:

(1) Ensure a cost-effective, positive return on investment for the citizens of Iowa.

(2) Ensure local community commitment to lake and watershed protection.

(3) Ensure significant improvement in water clarity, safety, and quality of Iowa lakes.

(4) Provide for a sustainable, healthy, functioning lake system.

(5) Result in the removal of the lake from the impaired waters list.

(6) When restored, will contribute to the department's fish and wildlife conservation plans.

3. The process and criteria the department shall utilize to recommend funding for lake restoration projects shall be as follows:

a. The department, with input from stakeholders, shall maintain an annual list of not more than thirty-five significant public lakes and not more than five public shallow lakes or wetlands to be considered for funding based on the feasibility of restoring each lake and the use or potential use of the lake, if restored. The list shall include lake projects under active development that the department shall recommend be given priority for funding so long as progress toward completion of the projects remains consistent with the goals of this section.

b. The department shall meet with stakeholders and representatives of communities where lakes on the annual list are located to provide an annual lake restoration assessment and to explain the process and criteria for receiving lake restoration funding. Communities with lakes not included on the annual list may petition the director of the department for a preliminary lake restoration assessment and explanation of the funding process and criteria. The department shall work with stakeholders and representatives of each community to develop a joint lake restoration action plan. At a minimum, each joint action plan shall document the causes, sources, and magnitude of lake impairment, evaluate the feasibility of the lake and watershed restoration options, establish water quality and fishery and wildlife goals and a schedule for attainment, describe long-term management actions, assess the economic benefits of the project, identify the sources and amounts of any leveraged funds, and describe the community's commitment to the project, including local funding. The stakeholders' and community's commitment to the project may include moneys to fund a lake diagnostic study and watershed assessment, including development of a TMDL (total maximum daily load).

c. Each joint lake restoration action plan shall comply with the following guidelines:

(1) Biologic controls will be utilized to the maximum extent, wherever possible.

(2) If proposed, dredging of the lake will be conducted to a mean depth of at least eight feet to gain water quality benefits unless a combination of biologic and structural controls is sufficient to assure water quality targets will be achieved at a shallower average water depth.

(3) The costs of lake restoration will include the maintenance costs of improvements to the lake.

(4) Delivery of phosphorus and sediment from the watershed will be controlled and in place before lake restoration begins. Loads of phosphorus and sediment, in conjunction with in-lake management, will meet or exceed the following water quality targets:

(a) Clarity. A four-and-one-half-foot Secchi depth will be achieved fifty percent of the time from April 1 through September 30.
(b) Safety. Beaches will meet water quality standards for recreational use.
(c) Biota. A diverse, balanced, and sustainable aquatic community will be maintained.
(d) Sustainability. The water quality benefits from the restoration efforts will be sustained for at least fifty years.

d. The department shall evaluate the joint action plans and prioritize the plans based on the criteria required in this section. The department's annual lake restoration plan and report shall include the prioritized list and the amounts of state and other funding the department recommends for each lake restoration project. The department shall seek public comment on its recommendations prior to submitting the plan and report to the general assembly.

2006 Acts, ch 1179, §26; 2007 Acts, ch 22, §81, 82; 2011 Acts, ch 25, §143; 2012 Acts, ch 1023, §63; 2016 Acts, ch 1133, §15 - 19; 2017 Acts, ch 29, §128

Referred to in §456A.30, 461.38

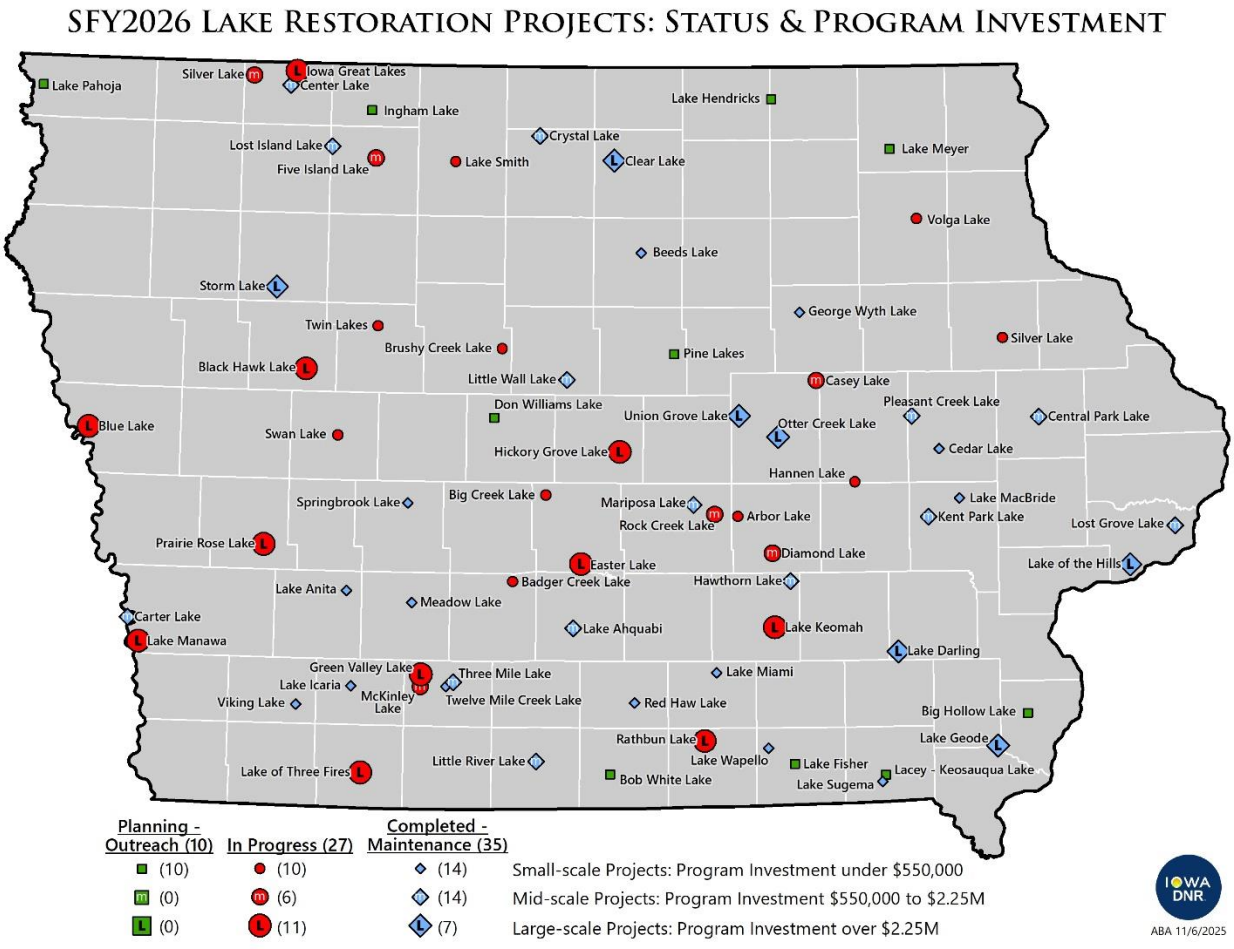
Appendix B. Significant, Publicly-owned Lakes Prioritized for the Program

The intent of the program is to develop and administer lake restoration projects that ensure a cost-effective investment for the State of Iowa; foster a community commitment to lake and watershed protection; and provide significant improvement to the quality of Iowa lakes. Major restoration activities are completed or near completion at thirty-four lakes. These may include smaller scale maintenance type work items are taking place at twelve locations. Current program activities are in progress at twenty-seven lakes throughout the state, typically projects with significant FY25 spending or FY26 obligations. In addition, ten lakes are in the initial community outreach, evaluation or planning stage.

Timelines for many of these projects usually fall within a three to five-year period. However, major construction projects may take even longer. Contractors face substantial costs to mobilize and set up lake improvement operations and this critical work needs multiple year commitments to secure contactors and develop cost-share agreements with local stakeholders and community groups. As such, the most practical and efficient way to complete these undertakings are as continuous projects. The Lake Restoration Program has matured to the point where a number of multi-step projects are concurrently at the implementation phase.

Iowa has completed restoration work or conducting maintenance items at **35 lakes**, with **27 projects** underway, and **10 projects in** the initial planning stages.

The below map and tables include significant publicly-owned lakes (lake systems) prioritized for the program based on the feasibility of each lake for restoration and the use or potential use of the lake, if restored. The list included lake projects under active development by the department so long as progress toward completion of the projects remained consistent with the goals of the program.



Small-scale projects (<$50K program investment)

Lake	County	Activity
Lake Macbride	Johnson	Completed
Lake Sugema	Van Buren	Completed
Hannen Lake	Benton	In Progress
Smith Lake	Kossuth	In Progress
Swan Lake	Carroll	In Progress
Beeds Lake	Franklin	Maintenance
Lake Anita	Cass	Maintenance
Meadow Lake	Adair	Maintenance
Springbrook Lake	Guthrie	Maintenance
Big Hollow Lake	Des Moines	Planning-Outreach
Bob White Lake	Wayne	Planning-Outreach
Don Williams Lake	Boone	Planning-Outreach
Fisher Lake	Davis	Planning-Outreach
Ingham Lake	Emmett	Planning-Outreach
Lacey Keosauqua Lake	Van Buren	Planning-Outreach
Lake Hendricks	Howard	Planning-Outreach
Lake Pahoja	Lyon	Planning-Outreach
Pine Lakes - Upper/Lower	Hardin	Planning-Outreach

Small-scale projects ($50K - $199K program investment)

Lake	County	Activity
George Wyth Lake	Black Hawk	Completed
Red Haw Lake	Lucas	Completed
Arbor Lake	Poweshiek	In Progress
Badger Creek Lake	Madison	In Progress
Brushy Creek Lake	Webster	In Progress
McKinley Lake	Union	In Progress
Twin Lakes - North/South	Calhoun	In Progress
Volga Lake	Fayette	In Progress
Lake Meyer	Winneshiek	Planning-Outreach

Small-scale projects ($200K - $550K program investment)

Lake	County	Activity
Lake Miami	Monroe	Completed
Lake Wapello	Davis	Completed
Twelve Mile Lake	Union	Completed
Viking Lake	Montgomery	Completed
Diamond Lake	Poweshiek	In Progress
Silver Lake	Delaware	In Progress
Lake Icaria	Adams	Maintenance
Big Creek Lake	Polk	In Progress

Mid-scale projects ($550K - $1.25 million program investment)

Lake	County	Activity
Hawthorn Lake	Mahaska	Completed
Little River Lake	Decatur	Completed
Lake Keomah	Mahaska	In Progress
Rock Creek Lake	Jasper	In Progress
Silver Lake	Dickinson	In Progress
Center Lake	Dickinson	Maintenance

Mid-scale projects ($1.25 million - $2.25 million program investment)

Lake	County	Activity
Carter Lake	Pottawattamie	Completed
Central Park Lake	Jones	Completed
Crystal Lake	Hancock	Completed
Kent Park Lake	Johnson	Completed
Lake Ahquabi	Warren	Completed
Little Wall Lake	Hamilton	Completed
Lost Grove Lake	Scott	Completed
Lost Island Lake	Palo Alto	Completed
Mariposa Lake	Jasper	Completed
Three Mile Lake	Union	Completed
Casey Lake	Black Hawk	In Progress
Five Island Lake	Palo Alto	In Progress
Cedar Lake	Linn	Maintenance
Pleasant Creek Lake	Linn	Maintenance

Large-scale projects ($2.25 million - $5 million program investment)

Lake	County	Activity
Lake Geode	Henry	Completed
Lake of the Hills	Scott	Completed
Otter Creek Lake	Tama	Completed
Union Grove Lake	Tama	Completed
Blue Lake	Monona	In Progress
Green Valley Lake	Union	In Progress
Hickory Grove Lake	Story	In Progress
IA Great Lakes	Dickinson	In Progress
Lake of Three Fires	Taylor	In Progress
Prairie Rose Lake	Shelby	In Progress
Rathbun Reservoir	Appanoose	In Progress

Large-scale projects (over $5 million program investment)

Lake	County	Activity
Black Hawk Lake	Sac	In Progress
Easter Lake	Polk	In Progress

Lake	County	Activity
Lake Manawa	Pottawattamie	In Progress
Clear Lake	Cerro Gordo	Maintenance
Lake Darling	Washington	Maintenance
Storm Lake	Buena Vista	Maintenance

*Note - IA Great Lakes (Dickinson) includes Big Spirit Lake (incl. Little Spirit Lake), East Okoboji Lake, Lower Gar Lake, Minnewashta Lake, Upper Gar Lake and West Okoboji Lake

Definitions for this table:

In Progress:	Significant work in progress (FY25 spent; FY26/FY27 obligated)
Planning-Outreach:	Project development (assessment, planning activities), implementation of watershed BMPs
Maintenance:	Current smaller scale maintenance type work items
Completed:	Past restoration activities completed