Park Lake Restoration Implementation Plan

A recommended course of action
in accordance with
the Park Lake
Comprehensive Management Plan

Produced

By the

Park Lake Implementation Team

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IMPLEMENTATION TEAM MEMBERS

Pardeeville Lakes Management District

Jack Paulson – Chair

Village of Pardeeville

George Grimsrud

David Tracey

Town of Wyocena

Doug Cole

Columbia County Land and Water Conservation Department

Chris Arnold

Kurt Calkins

Wisconsin Department of Natural Resources

Susan Graham

David Rowe

Catherine Bleser

INTRODUCTION TO PARK LAKE MANAGEMENT

In 1974 the Wisconsin legislature enacted legislation enabling the creation of inland lake protection and rehabilitation districts (Wis. Statues Chapter 33.21). *"Districts may be created for the purpose of undertaking a program of lake protection and rehabilitation of a lake or parts thereof within the district."*

In August of 1985, under the provisions of Chapter 33, the Columbia County Board created the Park Lake Management District. The District later adopted the name the Pardeeville Lakes Management District in recognition of its responsibilities to both Spring and Park Lakes.

Beginning in January of 2007, the Columbia County Land and Water Conservation Department in conjunction with the UW-Extension initiated a series of eleven community based planning meetings to develop a Comprehensive Management Plan. As a part of that process the Lake District developed a Mission Statement and a Vision Statement:

Pardeeville Lakes Management District (PLMD) Mission Statement

> *The Pardeeville Lakes Management District is a non-profit, special taxing, governing organization committed to preserving and protecting the integrity of the Pardeeville Lakes through education, conservation, water quality control and rehabilitation methods. It is our intent through innovative leadership, planning and utilization of factual and scientific data to form solid partnerships with our citizens, resource professionals and state/county/local representatives in fulfilling this Mission.*

Pardeeville Lakes Management District (PLMD) Vision Statement

> *PLMD leadership, along with community involvement and education, will provide a healthy, functioning ecosystem, promote recreational use of our lakes and insure sound lake management practices for future generations.*

The Management Plan developed through this series of public meetings was submitted to and adopted by the Pardeeville Lakes Management District and forwarded to the Wisconsin Department of Natural Resources for review and comment in December of 2007 and was approved by the DNR in January of 2009.

Resolutions passed by the Village of Pardeeville, the Town of Wyocena, and the PLMD resulted in the creation of a team of individuals charged with the responsibility of creating a plan to implement the provisions of the Lake Management Plan. Experts from the DNR and Columbia County Land and Water, along with representatives from the Village of Pardeeville, the Town of Wyocena and PLMD met beginning in September of 2010.

This plan is the result of those efforts.

Introduction to the Implementation Plan

Consistent with the vision of the Pardeeville Lakes Management District this Implementation Plan, in furtherance of the Comprehensive Lake Management plan, consists of four primary elements. They are a temporary lake drawdown, aquatic plant management, fish eradication and reestablishment, and recreational use management.

The temporary drawdown is used to reduce the volume of water to a level to permit the most cost effective and efficient use of rotenone to kill the remaining fish population which, consists of a significant and disproportionate number of carp and gizzard shad. The drawdown and its duration aid in the compaction and consolidation of sediment, and aid in the establishment of aquatic plants.

The established submergent, emergent, and floating-leafed plants aid in creating habitat for zooplankton and fish species. Zooplankton feed upon algae and creates a food source for small fish. In this food chain phosphorous, in the form of suspended algae (phytoplankton), is ultimately converted to bio-mass. However, undesirable and invasive plants are also expected and, therefore, aquatic plant management to maintain and promote desirable plants while controlling other plants is a key component of this plan.

Removal of the currently abundant gizzard shad and common carp are critical to lake and water quality restoration. Both species of fish act to increase suspended sediments and in-lake nutrient cycling as part of their feeding behaviors. This creates turbid conditions that are disadvantageous to native sight feeding fish and beneficial to carp and shad. A healthy fishery abundant in northern pike, largemouth bass and panfish will be reestablished to assist in the future control of carp and gizzard shad. It will also contribute to additional recreational use of Park Lake. And, perhaps, though outside the scope of this plan, contribute to the economy of the extended lake community.

Trends associated with recreational uses seem to shift with time and the state of lake and fishery; although fishing once was a dominate past time, Park Lake currently is used for recreational boating more than any other present use; including on-plane boating. The need to continue this use is a key to the success measures of the plan. That said needed plant life must be protected. In addition, due to depth limitations and the sensitivity of shoreline and shore land areas, a new no wake area needs to be established in the northern area of the lake. In addition, enforcement of no wake rules must be maintained. Also to protect and maintain the reestablished fishery increased size limits and reduced bag limits for predator fish species will be implemented.

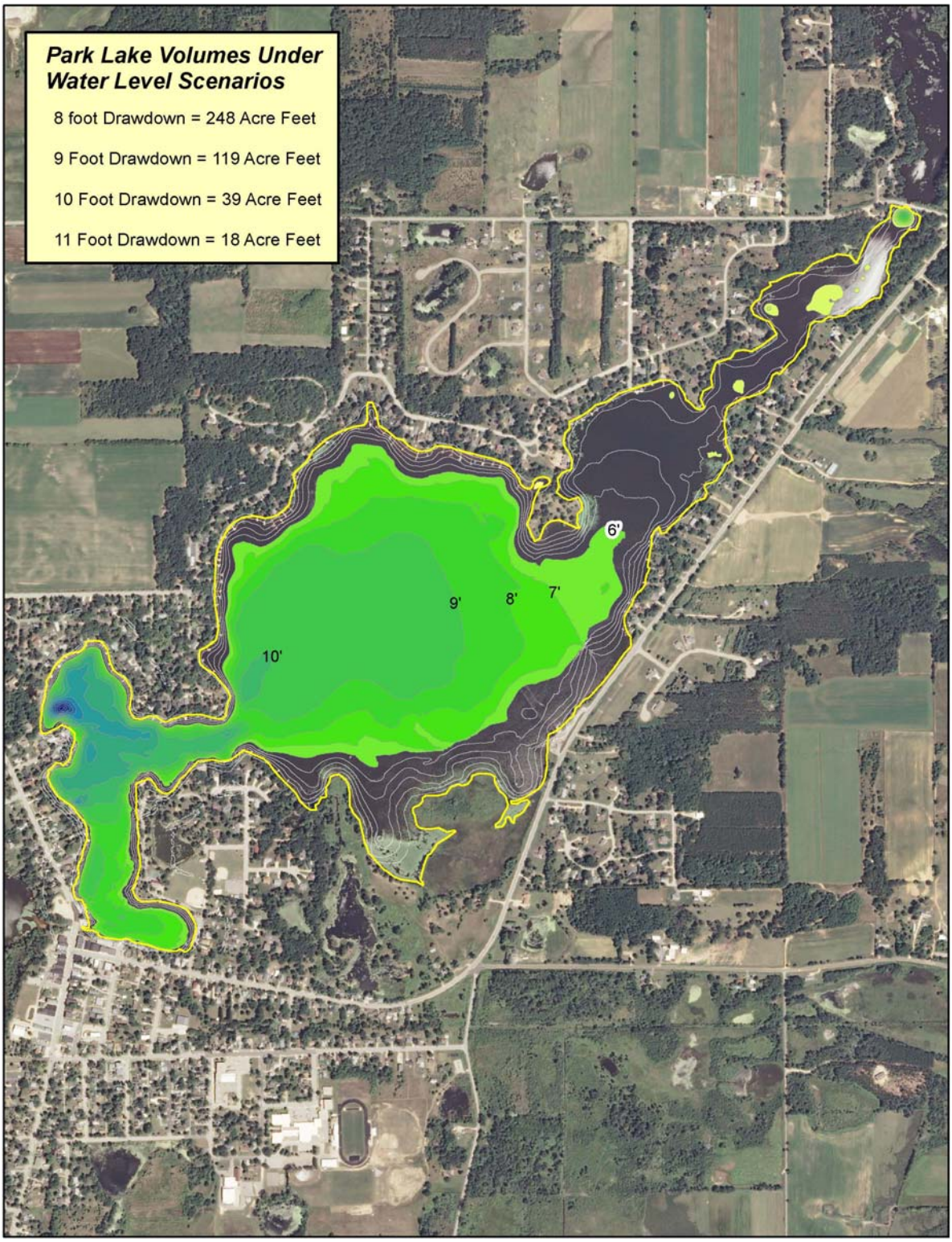
Drawdown

In order to restore Park Lake to a shallow water impoundment with a balanced ecosystem it will be necessary to reduce the volume of water via a drawdown. By reducing the current water volume of 2,187 acre-feet the cost to chemically treat the current fish community will be dramatically reduced. De-watering of the exposed sediment on the lake bottom will occur. This will create a firmer substrate allowing for aquatic plant root establishment, as well as, adding more increased depth in areas of deeper organic sediments.

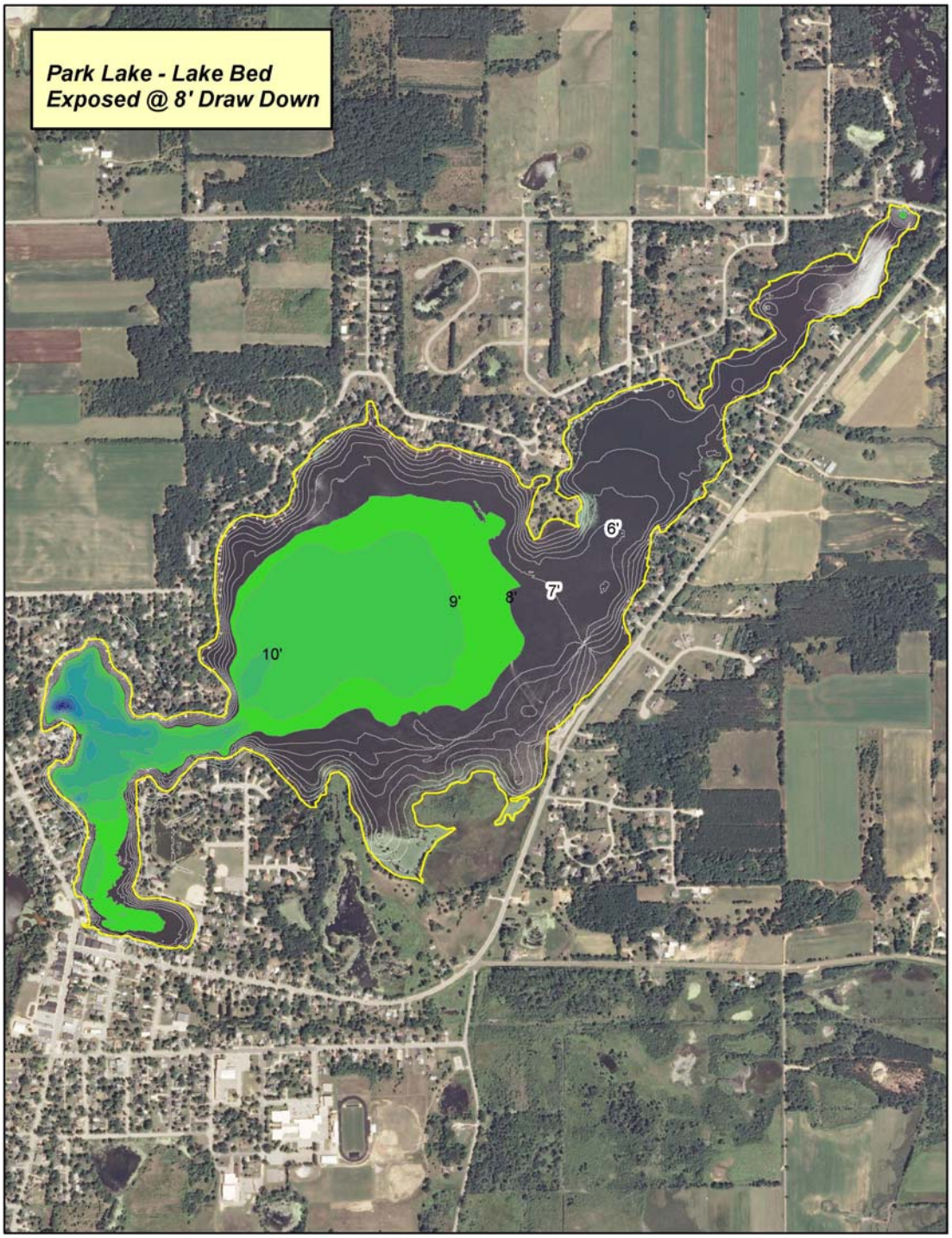
Currently the Hydro Electrical Dam (south dam) will allow for an 8' reduction in water surface elevation. The outlet on the North end of the dam will allow for a 5' reduction in water surface elevation. Also it is possible to further lower the levels of water through siphoning or pumping over the dam.

The 1971 WDNR Bathometric map references a bronze tablet marked "Public Service Commission of Wisconsin" stating the water level to be 806.69 ft. and the dam elevation is 809.89.

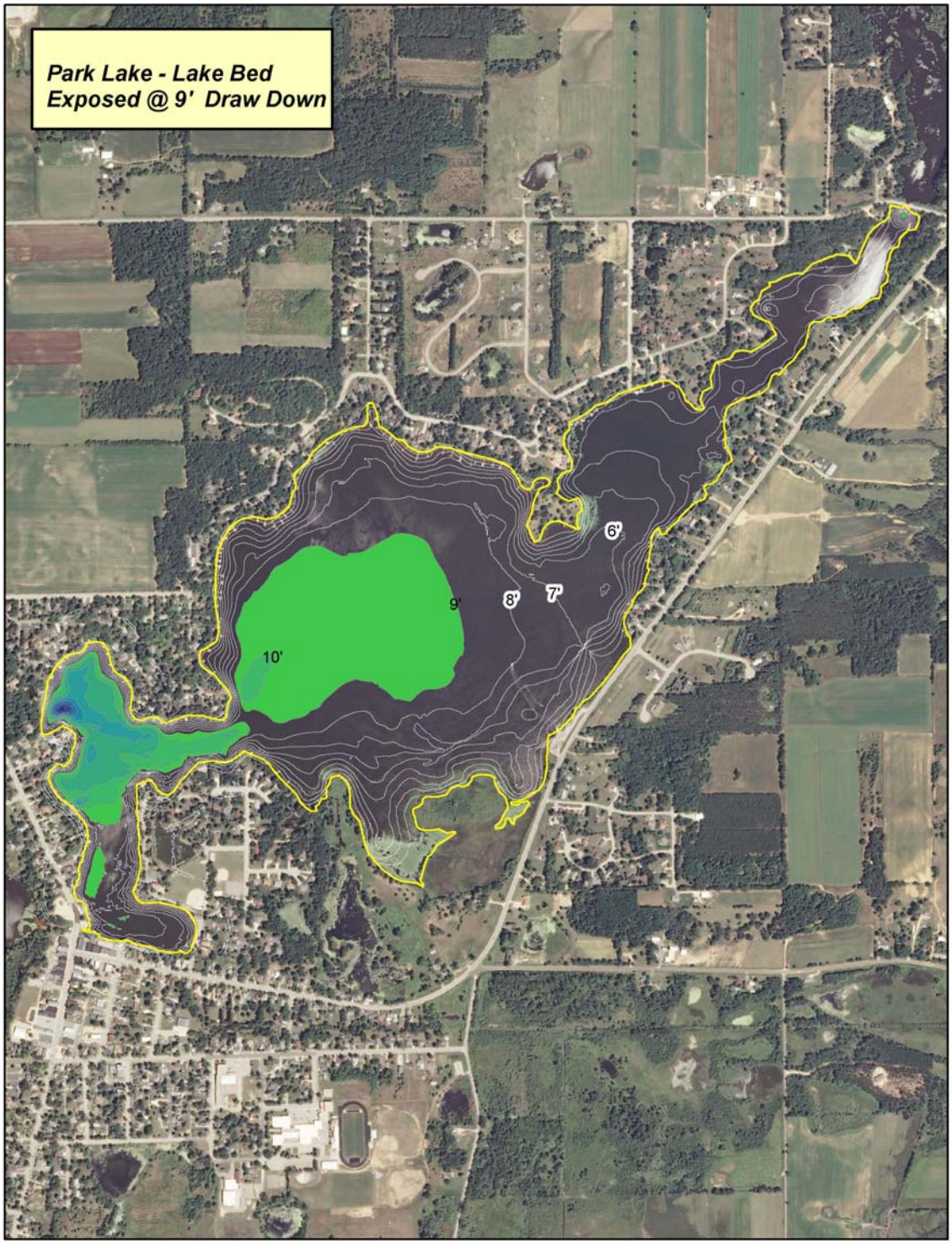
Recent measurements were taken for the purpose of estimating the lake area and water volume remaining under various scenarios. These scenarios and their corresponding estimates are presented in the following illustrations. With this data the implementation planning group was able to evaluate certain costs of the implementation project to help find least cost and most effective methods of achieving certain specified objectives.


Park Lake Volumes Under Water Level Scenarios
8 foot Drawdown = 248 Acre Feet
9 Foot Drawdown = 119 Acre Feet
10 Foot Drawdown = 39 Acre Feet
11 Foot Drawdown = 18 Acre Feet
6'
7'
8'
9'
10'

The eight foot drawdown is the level that can be obtained by lowering the water level to the lowest level on the south dam. At this level the volume is reduced in Park Lake by 89% to 248 acre/ft.



The nine foot drawdown is the level that can be obtained by lowering the water level to the lowest level on the south dam and then supplementing with siphons or pumps, to obtain an additional one foot reduction. At this level the volume is reduced in Park Lake by 95% to 119 acre/ft.



The ten foot drawdown is the level that can be obtained by lowering the water level to the lowest level on the south dam and then supplementing with siphons or pumps, to obtain an additional two foot reduction. At this level the volume is reduced in Park Lake by 98% to 39 acre/ft.

Temporary Drawdown Goals, Objectives, Action Items, Costs

1. Goal: Allow for effective removal of rough fish.

Objective: Lower water volume to chemically treat fish community of Park Lake

Timeline: Best if done in fall as to reduce probability of precipitation events diluting effects of treatment. Fall also provides best chance to maintain reduced pool levels.

2. Goal: Provide de-watered substrate allowing for plant germination

Objective: Lower water volume to expose Lake Bottom sediments in one growing season

Timeline: Through a growing season (spring and summer)

3. Goal: Provide de-watered substrate allowing for sediment consolidation

Objective: Lower water volume to expose lake bottom sediments thus consolidating substrate.

Timeline: Through a winter and growing season (spring and summer)

4. Goal: Protect herptiles through the drawdown process

Objective: Lower water level to reach final pool level by October 1

5. Goal: Provide sound plant community data related to the impacts of the drawdown

Objective: Conduct a point intercept Aquatic Plant Inventory pre and post drawdown

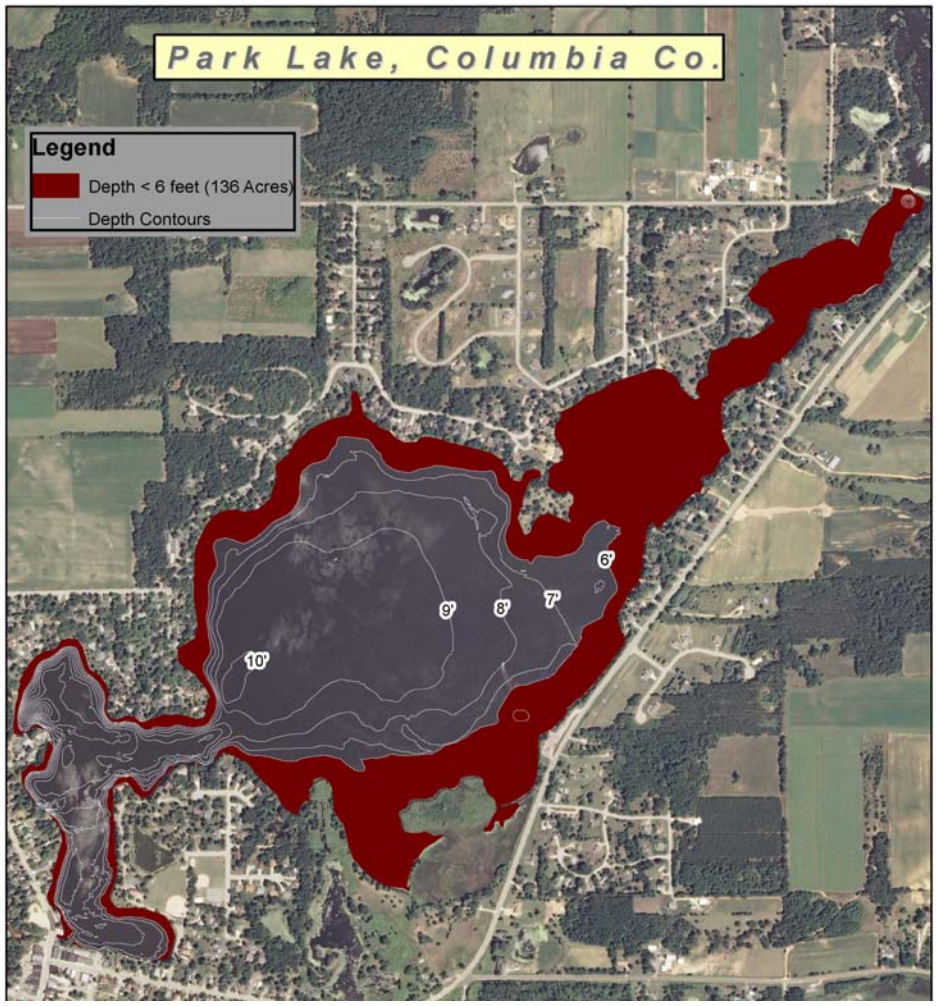
- Action: Reduce Park Lake water surface elevation by 8 feet for:
  Duration: 15 months (could be extended during second winter for Village of Pardeeville sewer and water project)
  Time Line: Drawdown water in September, reach full pool by October 1, begin to refill December of following year
  Amplitude: 8, 9, 10 feet depending on siphon costs that are being worked on

Cost: No direct cost to lowering water surface elevation. Indirect cost of lost power generation on Village of Pardeeville Hydroelectric unit. This is estimated at $25,000 for the proposed duration of the drawdown.

Aquatic Vegetation Reestablishment

Aquatic Vegetation is the foundation of the Park Lake ecosystem. Establishing and maintaining aquatic plants are essential for recreating a "clearer" water state and maintaining a balanced sport fishery. The plants will store a portion of the phosphorus as organic phosphorus making it unavailable for the blue green algal blooms currently common place in Park Lake. The plants provide habitat for zooplankton, which consume phytoplankton, thereby reducing its abundance, again making phosphorus less available for algal blooms. Based on past conditions of the lake it is believed aquatic plants must be established at a minimum of 39% of the area of Park Lake (136 acres); as a result, this equates to the area less than 6 feet in depth . A pre-restoration aquatic plant inventory will be done in June and July. The aquatic vegetation reestablishment will be monitored once a year for two years following the completion of the restoration. The data compiled will be used as the basis for the Aquatic Plant Management Plan.

Using the inverse of the 6 foot contour line established through the measurements taken to create the drawdown scenarios, the area of the lake bottom that will have rooted emergent, submersed and floating-leafed plants can be approximated. In the deeper regions of this area we would expect to visualize more submersed than emergent plants, along with other floating leafed plants. This condition is illustrated below.



Goal: Reestablish the native aquatic plant community in Park Lake
Objective:

1. Develop aquatic plants in depths less than 5'
2. Manage plant community to obtain N ≥ 12 native species

Goal: Quantify current plant community
Objective:

1. Conduct aquatic plant inventory using protocol for water bodies with curly leaf pondweed prior to restoration

Goal: Quantify post restoration plant community
Objective:

1. Conduct aquatic plant inventory using protocol for water bodies with curly leaf pondweed once a year for two years after restoration

- Action: WDNR and Columbia County LWCD Staff will perform pre and post restoration plant inventories

Estimated Cost: $2000

Future Management of Aquatic Plants

A restored Park Lake will have a reestablished plant community. Submersed vegetation will be necessary to provide the stable environment necessary for Park Lake ecosystem. Aquatic Plants will need to be actively managed allowing for navigation in certain area, and for various recreational opportunities to occur.

Goal: Monitor and Manage Plant Community

Objectives:

1. After restoration, Park Lake will need to be monitored on a regular interval (3-5 years) using the point intercept method
2. Create a Aquatic Plant Management Plan
    a. Manage native plant species in greater than 3' of water
    b. Manage native plant species in less than 3' of water
    c. Manage non-native plant species (curly leaf pondweed and Eurasian water milfoil) in greater than 3' of water
    d. Manage non-native plant species (curly leaf pondweed and Eurasian water milfoil) in less than 3' of water
3. Maintain appropriate navigation in the wake and no wake areas of the lake
4. Create and maintain a cooperative aquatic plant management effort with riparian owners to further prudent aquatic plant management and best practices while managing total cost

Practice	Benefits	Drawbacks	Example	Costs	Grants
Active Aquatic Plant Management	Receive multiple year cutting permit, sound management, specific intentional approach, increased efficiency, community driven plan with local buy in	None	Silver Lake, Fox Lake	$3,000-$9,000 annually	WDNR Lake Planning Grant
Mechanical Harvesting with own Equipment	Removes Plants, immediate relief, no use restrictions, chemical free, nutrient removal	High Equipment capital investment costs, cannot cut <3' of water, not species selective, can spread invasive species	Silver Lake, Lazy Lake	$125,000-$175,000 for equipment, $3,000 annually for maintenance, $300 for 5 year Harvesting Permit	Wisconsin Water Way Grant for 43% of the cost of a cutter, barge and/or trailer
Mechanical Harvesting with Contractor	Removes Plants, immediate relief, no use restrictions, chemical free, nutrient removal	High Equipment capital investment costs, cannot cut <3' of water, not species selective, can spread invasive species	Fox Lake cuts 11.7 acres a year for navigation purposes only $4,320/annually	$300-$800 per acre	None
Chemical Control	Quick Relief, Species Specific, cost effective (scale Dependent)	Repeat treatments required, No nutrient removal, promotes aggressive species, can increase algal blooms, impacts to aquatic organisms not clearly understood	Fox Lake operates a residential chemical application Program (1 contractor, 1 permit & everything is documented)	**Diquat** = $300-$400/ac. **Endothol** + $650-$1200/ac. 2-4D $300-$700/ac. **Permit Fee** = $20.00 + $25.00/ac.	WDNR Early Detection and Rapid Response Grant (75% of early detection and response projects up to $20,000, established population control projects up to $200,000)
Biological Control Agents	Cost Effective over long term, long term relief, EWM species specific	Oscillating Cycle of control, does not address nuisance natives, susceptible to near shore vegetation	Springville Pond, Lake Thomas	$300-$3,000	WDNR Early Detection and Rapid Response Grant (75% up to $150,000 for education, prevention and planning projects)

Practice	Benefits	Drawbacks	Example	Costs	Grants
Seasonal Water Level Manipulations	Cost effective chemical free, control in < 3' of water, addresses littoral fringe, creates more natural conditions in lake, stimulates other native species	Impacts biological community, impacts fishery	Springville Pond	Social cost due to losing depth of water during winter to allow for plant crowns to freeze	WDNR Early Detection and Rapid Response Grant (75% up to $150,000 for education, prevention and planning projects)

Based upon the foregoing, and the types of plant life that is expected to establish itself in the lake post-drawdown, some measure of chemical aquatic plant control will be necessary. Other means may also be employed. The species specific nature of certain chemical applications provides advantages over other methods in shoreline regions and other sensitive areas.

Spring Lake

It is expected that the clearer water state in Park Lake will contribute to a clearer water state in Spring Lake. In this state plant germination in areas similar to those we expected in Park Lake are expected in Spring Lake. Aquatic plant management practices will be equally important to the future management of Spring Lake.

Fishery

As well as providing a recreational opportunity fish play a major role in the lake ecosystem. This restoration is intended to restore the fishery that existed on Park Lake during the 1980s and early 1990s. This was a fishery comprised mostly of panfish, largemouth bass and northern pike, walleye were stocked as a secondary species. The panfish consisted of bluegill, yellow perch, black crappie and pumpkinseed sunfish. After the loss of abundant aquatic vegetation in the 1990s, the abundance of these popular sportfish declined and the abundance of gizzard shad and common carp increased. Both of these species reduce water quality through their feeding behaviors and maintain turbid conditions detrimental to sight feeding fish like bluegill and bass. Once the fish community is chemically removed and the lake is stocked with desirable sportfish it is critical to maintain high predator densities to prey on undesirable and rough fish, prevent major recruitment of carp and shad and reduce the abundance of rough fish specifically carp and shad so they do not re-suspend sediments and nutrients, and impact water clarity.

Goal: Reduce undesirable fish (carp and gizzard shad) densities; increase the number of predator fish and panfish.

Fish Community Objectives

1) Abundance
    a) Largemouth bass CPUE during SE2 of 30-50 bass >8"/mile
    b) Northern pike PE of 3-5 fish >20 inches per acre
    c) Walleye PE of 2-3 fish >15 inches per acre

d) Combined panfish CPUE of > 100/mile of fish > stock length during SE2
e) Gizzard shad CPUE during fall electrofishing < 10/mile
f) Common Carp CPUE during fall electrofishing < 5/mile

2) Size structure
a) Largemouth bass size structure of RSD 14" >40, during SEII
b) Walleye RSD 15" >50 during SNI
c) Northern pike RSD 30" >10 during SNI

These objectives should be achieved within ten years of implementation

- Actions
  - Fish kill to remove/reduce fish

Prior to fish kill
After the lake has been drawn down inventory work of fish community composition and abundance will need to be completed during the late summer of 2013. This inventory work will consist of one crew of DNR Fisheries Management Staff (2FTE and 1LTE). This crew will assess the upstream distribution of gizzard shad and common carp as well as desirable fish species that should re-colonize the lake after refill. Between 10 and 15 locations in the watershed should be electrofished using a stream tow barge electrofishing unit. The cost of this inventory work will be around $206.00 dollars a day for LTE wages, mileage and supplies.
Timeline July-Aug 2013
Total $1648.00

A rotamine dye test will need to be completed to understand the flow rate and time of chemical dispersion through the system. After drawdown in late summer or early fall the dye will be added to an upstream location and the concentration be monitored as it travels downstream. Concentration values will be used to predict flow rates and determine number of drip barrels needed for flowing water.
Timeline Aug-Sept 2013
Total $1500.00

Perform Fish Kill
The fish kill will occur in October /November of 2013 and is intended to kill all fish remaining in the standing water in the lake basin, the flowing portion of the lake/river upstream to a predetermined location based on feasibility and fish distribution. The Fish kill will have four components; set up, chemical treatment of flowing water portion, chemical treatment of standing water portion, and monitoring and detoxification of outflow from Park Lake into Spring Lake. The DNR staff time and associated staffing costs for the set up work and executing the fish kill will be around $9000.00. This is calculated using 5 crews of 3 staff including one LTE on each crew; costs are LTE wages, mileage, hotel and meals. The chemical application will occur for up to 5 days and the lake will remain "hot" for up to 21 days.

The amount of liquid rotenone needed to establish and maintain lethal conditions for fish will be dependent on the amount of water that is in the residual pool. One gallon of liquid rotenone cost $60.00 and will treat one acre foot of water. Depending on the magnitude of the drawdown the costs for the standing water are shown below.

Amount and Cost of Liquid Rotenone for Treatment of Standing Pool			Up to $14880.00
Height of Drawdown (feet)	Residual Volume of water (acre feet)	Cost of Rotenone /gallon	Estimated cost of liquid Rotenone
8	248	$60	$14880.00
9*	119	$60	$7140.00
10*	39	$60	$2340.00
11*	18	$60	$1080.00

*To achieve greater than an 8 foot drawdown siphons or pumps will need to be established or operated to reduce the water below the dam sill elevation. There will be additional costs to operate a pump or establish siphons if possible. These costs will offset the savings by reducing the pool volume.

It may be necessary to hire a helicopter to apply the liquid chemical to the standing water in the lake, depending on the height of the drawdown at the time of the fish kill. In shallow water, if a boat is used the mechanical suspension of sediments will prevent the effective diffusion of the chemical into the water and reduce the effectiveness of the treatment. The cost of helicopter application is around $40 an acre. If the pool is drawn down ten feet then there should be no need for a helicopter since the standing pool should be small enough and deep enough to apply liquid chemical with a boat. The cost of helicopter application is estimated in the table below.

Helicopter Application to Standing Pool			Up to $6440.00
May include mobilization costs depending on bid.			$2000.00
Height of Drawdown (feet)	Residual surface area	Cost per acre	
8	111	$40	$4440.00
9	70	$40	$2800.00
10	Eliminate need		$0

The flowing portion of the water will also need to be treated with liquid rotenone and the concentration must be maintained for the length of the kill for it to be effective. The base flow discharge of the Fox River upstream of Park Lake is historically around 12-15 cubic feet per second during the time of the proposed fish kill. Up to eight drip barrel stations will be used to dose the chemical into the river above

the lake. The chemical cost for liquid rotenone should be around $16,000.00 to treat this amount of water.

During and after the fish kill, the water coming out of Park Lake will have a toxic concentration of rotenone and will need to be neutralized using potassium permanganate. At the outfall of the lake a drip station will be set up in a secure location and the appropriate amount of potassium permanganate solution will be added to the water. To assess the effectiveness of the detoxification, biological specimens will be deployed in cages in Spring Lake or the Fox River. The detoxification drip station will operate until the water coming out of Park Lake is no longer toxic.
Estimated cost $4000 for chemical, staff time and expenses.

Timeline October – November 2013
Total Cost $50,320.00 at an 8 foot drawdown
$40,940.00 at a 9 foot drawdown
$31,340.00 at a 10 foot drawdown

- Re-establish fish community post fish kill. Stock appropriate game fish and pan fish.
  - Spring stocking of fry, NOP available,
  - Private option only

To re-establish the fish community of Park Lake desired game fish and pan fish will need to be stocked soon after refill. Some fish will migrate downstream from the untreated portion of the Fox River to re-establish populations in the lake. This will include desirable native species including suckers and minnows but may include some common carp. To prevent any remaining carp from producing numerous offspring it is very important to create an abundance of predator fish immediately. Northern pike fry are not available from the DNR hatchery system, but are available from private aquaculture facilities and should be stocked as soon as available in the spring of 2014. An estimated cost to purchase these fish is $25.00 per 100. Stocking at a rate of 1000 fry per surface acre results in a cost of $8750.00.

- Possible replacement of adult fish through field transfer.

Also the transfer of adult fish into the lake as soon as possible can produce large amounts of offspring in the “empty” lake conditions after the refill. Fish can be captured in Spring or Swan Lake in the previous fall and transported to a holding facility and maintained over the winter. The fish would need to be held in a Type 3 licensed fish farm and then health tested prior to transfer into Park Lake in accordance with DATCP requirements. To capture, transport, perform the required health testing and overwinter the fish should cost around $2750, depending on travel distance and operational cost of fish farm.

Additional fish will be stocked as available through DNR Quotas system, which can include panfish species from Genoa federal Hatchery. This includes largemouth bass, walleye, bluegill, yellow perch, and black crappie. DNR stocking will be provided as part of routine fish management and does not represent an additional cost.

Fish Restocking Costs		
Practice	**Provider**	**Costs**
1st year Adult Field Transfers	Swan Lake	$2,750
1st year Northern Pike Fry	Private	$8,750
1st Other Species	Federal Fisheries/WDNR	$0
Future Years of Stocking	WDNR	$0
Total		**$11,500**

Fish habitat Improvements

To increase the value of the project and take advantage of an opportunity to enhance the lake's habitat in a reduced pool state, a fish habitat project will be conducted during the summer period of 2013. To increase the littoral zone habitat coarse woody debris will be added to the lake bed and secured in place. This course woody structure can be in the form of whole trees, root wads, or other natural wood structures. The greatest benefit will be from whole trees added to shoreline areas to replicate natural tree falls. Riparian owners will need to give permission for these structures to be anchored in their riparian zone of influence. The steeper shoreline along the village park creates an opportunity for whole trees or the placement of upside down tree root wads pushed into the lake substrate. Trees are available from DNR Lands in Columbia County including the Peter Helland Wildlife area. The cost to perform the habitat project would be the transport of materials and equipment time.

Goal: Increase the amount of coarse woody habitat in the littoral area of the lake to benefit fish and wildlife.

Objective: Install 10-30 pieces of large woody structure to lake during drawn down condition.

- Action: Identify willing riparian owners and perform fish habitat improvement by addition of coarse woody structures to lake bed.

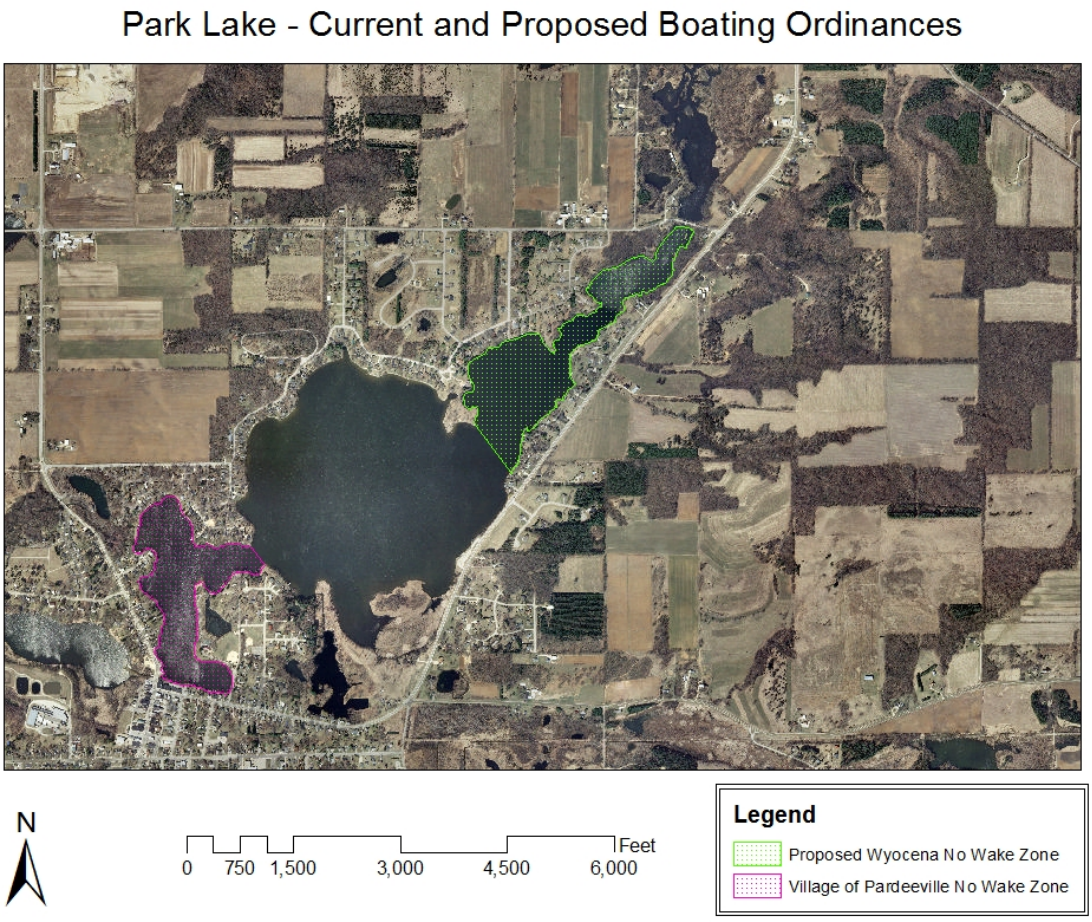
Estimated cost $7,500

Recreation

Boating Ordinances

Boating Ordinances in Park Lake will need to be adjusted to protect the financial and time investments associated with a restored Park Lake. The lake as listed by the WDNR currently covers 312 acres; however, if the inlet of the river up to the Haines Bridge is included the lake area equates to 345 acres.

The current "No Wake" ordinances are in effect on the lake for the 44 acres within the area southwest of the narrows at Chandler Park covering 12% of the lake. The area northeast of Turtle Island (Sheep Island) will need to be added to the current "No Wake" ordinances by the Town of Wyocena, and the Village of Pardeeville. All "No Wake" areas will need to then be passed by the Columbia County Board of Supervisors allowing for enforcement by the County Sheriff and the WDNR Game Wardens. This will impact 108 acres, leaving 237 acres of 69% of the lake open to wake or plane boating.



Goal - Protect aquatic plants and Lake Bottom sediments from the negative impacts of boating.

Objectives – Establish "No Wake" boating ordinance for area of lake North East of Turtle Island

- Actions Item: Town of Wyocena – Develop a "no wake" ordinance in the area of Park Lake north east of Turtle Island and recognize the "no wake" ordinances on Park Lake within the Village of Pardeeville.
  Village of Pardeeville - Continues to maintain current "No Wake" boating ordinances.

- Actions Item: Village of Pardeeville – Recognize the "no wake" ordinances on Park Lake within the Town of Wyocena.
  Village of Pardeeville - Continues to maintain current "No Wake" boating ordinances and formally recognizes the "no wake" areas on the lake but with in the Town of Wyocena.

- Actions Item: Columbia County – PLMD submits a formal Waterway Marker Application and Permit form 8700-058 to the Columbia County Board of Supervisors.
  PLMD – Submits Form 8700-058 Waterway Marker Application and Permit

  Estimated Cost: Four "No Wake" 9" diameter regulatory navigation buoys and mooring systems $600.00

Sport Fish Regulations

Fishing regulations consistent with the fishery management activities and goals will need to be established. In order to maintain an abundance of predator fish great enough to exert predation pressure on the fish community size limits of predator fish will be increased and daily bag limits will be reduced.

Goal - Protect restored fishery by maintaining high predator fish biomass.

Objectives – Abundance and size structure objectives are presented in the Fishery section.

- Actions Item: WDNR will submit rule change proposal to change fishing regulations.
  - Increase minimum size limits and reduce bag limits on predator fish species
    - Northern pike 32 inch minimum with one fish daily bag
    - Largemouth bass 18 inch minimum with one fish daily bag
    - Walleye 18 inch minimum with three fish daily bag.

Water Quality and Watershed

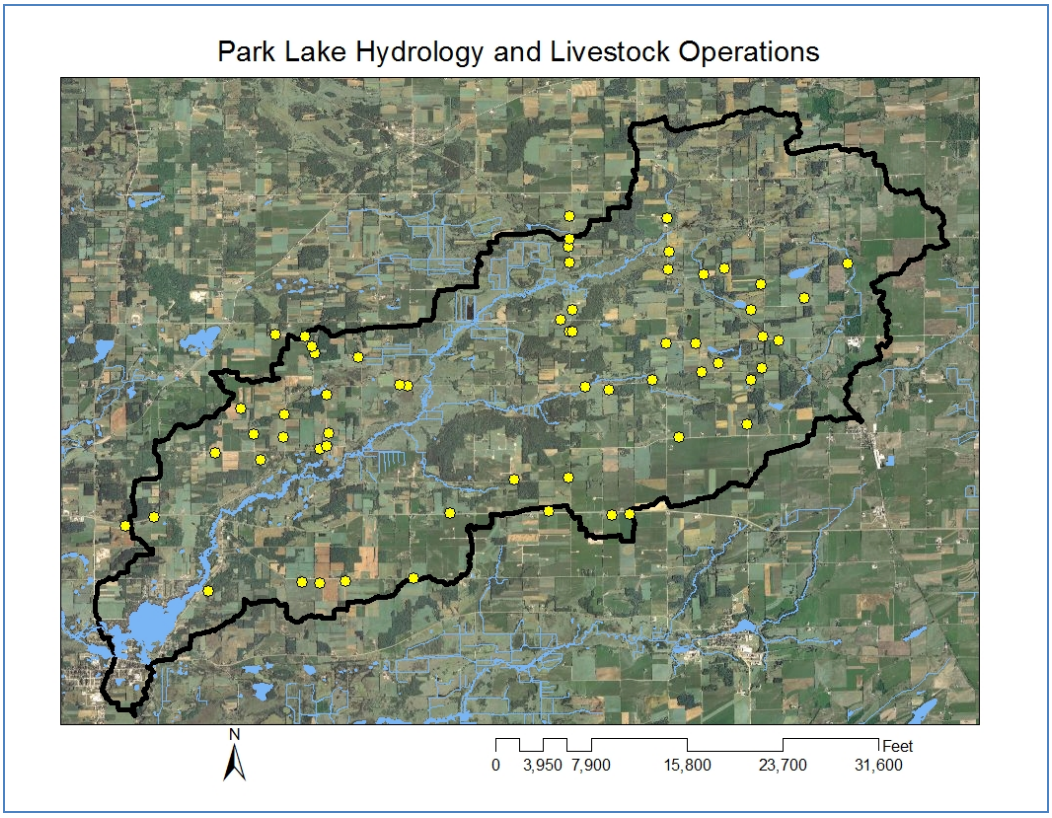
Watershed Management Plan

The Columbia County Land and Water Conservation Department (CCLWCD) has begun implementation of a Watershed Management Plan for the Park Lake Watershed using the data from an NR 151 Watershed Livestock Inventory and watershed based water chemistry data to prioritize operations, Best

Management Practices (BMP's) and geographical micro watersheds. Once operations are prioritized and necessary BMP's are determined, the 70% funding can be secured as stated in the statutory requirements listed in Wisconsin Department of Natural Resources Administrative Rule, Chapter NR 151, Runoff Management, to move forward implementing projects with landowners.

The approach toward Watershed Management in Park Lake first began in 2006 when the Columbia County Land and Water Conservation Department applied for a Wisconsin Department of Natural Resources Lake Planning Grant for the Park Lake Watershed to conduct a NR 151 Livestock Inventory. Livestock operations were inventoried based on a multitude of parameters as stated in NR 151, thus defining the best management practices needed to remedy the sites.

Ice out of 2007 marked the beginning of the water chemistry work in the Park Lake Watershed, continuing in scope and approach through 2008. As intended in 2009, the water chemistry study grew into a Total Maximum Daily Load Study and Soil and Water Assessment Tool (SWAT) modeling study looking at the impact of watershed runoff on lake quality. Tributaries and segments of the Fox River have been studied to identify the upland contributors.



Upon completion, the water chemistry data analyses will be used in conjunction with the livestock inventory and upland data to indentify the micro watersheds providing the nutrient and sediment loading needing sufficient reductions. The agricultural inputs will have BMP's installed to reduce the direct runoff and sedimentation issues that exist.

To date 5 different awards in excess of $500,000 of Targeted Management Runoff Grants (TRM), Land and Water Resource Management (LWRM) funds and Environmental Quality Incentives Program (EQIP) funds have been successfully secured by the CCLWCD for work on 9 sites. In 2012 a large scale TRM grant is being applied for to address the best management needs of another 19 operations and watershed based nutrient management and gully erosion in the Park Lake Watershed.

Upon the completion of implementing substantial agricultural non point phosphorus reduction BMP's, the impact on water quality will be assessed to reprioritize the watershed management approach in the Park Lake Watershed, managing field level phosphorus. Although labor intensive and time consuming this type of watershed management addresses the phosphorus loads in the soil column that move to surface water based on differences in concentration gradient. In order to implement this, field scale nutrient management plans producing the Phosphorus Index must be written, implemented and monitored.

Water Quality

Park Lake is on the 303D Impaired Waters list for exceeding the state standards for phosphorus and sediment because current water quality does not meet numeric criteria in a water quality standard and designated uses such as fishing and swimming are not being met(Wisconsin Administrative Code NR 102) . Since 2007 the Park Lake Watershed has undergone water quality monitoring to start quantify loading within the watershed. In 2009, Columbia County and the University of Wisconsin-Stevens Point began a two year study to understand where the sediment and phosphorus was highest in the watershed. Sampling sites were established in four locations above Park Lake and one downstream. The study revealed high levels of phosphorus routinely moved through the streams. All but one stream site showed median concentrations well above Wisconsin's phosphorus criteria for streams (75 parts per billion).

Water quality standards will be established for Park Lake to identify criteria for the community to observe and recognize if the lake is deteriorating as it did in the late 1990's. Although yet to be finalized, the criteria to be used for Park Lake will be: In lake Total Phosphorus (TP), Chlorophyll a, and an average Secchi Disc reading over the growing season.

Post Restoration Water Quality Monitoring

Upon completion of the restoration Park Lake and watershed will need to be monitored to assess water quality. The timeframe for monitoring in the lake protection grant will be two years, following the same monitoring time frames established for plants.

The approach will consist of in lake and watershed monitoring every other week, from ice out to ice up. The "deep hole" will be monitored taking Chlorophyll A and Total Phosphorus samples. Depth profiles will also be taken for ph, dissolved oxygen, specific conductivity, and temperature. In the watershed one location at Highway 44 will be monitored every other week, from ice out to ice up. The water will be tested for No2+N03, Ammonium (N), Total Kjeldahl Nitrogen, Total Phosphorus, Reactive Phosphorus, and Chloride, as well as, monitored for Specific Conductivity, Dissolved Oxygen, Temperature, and ph.

Pre Restoration						
In lake	**Test**	**Quantity**	**Cost**			**Total**
	Depth Profile	6				
	Chl A	6	28			$168
	TP	6	22			$132
Personal	**People**	**Hours**	**Combined/Trip**	**Trips**	**Hourly**	
	2	3.5	7	6	35	$1470
Total						***$1770***

Post Restoration						
In Lake	**Test**	**Quantity**			**Cost**	**Total**
	Depth Profile	6				
	Chl A	18			28	$504
	TP	18			22	$396
						0
Watershed						0
	River Package	**Quantity**			**Cost**	
Location	44	18			85	$1530
Personal	**People**	**Hours**	**Combined/Trip**	**Trips**	**Hourly**	
	2	4.5	9	18	35	$5670
Total						***$8100***

****The post restoration monitoring as discussed is for the purposes of the Lake protection grant. Future monitoring In lake and/or watershed may or may not be necessary in the future.****

Other Considerations

1. Village of Pardeeville Infrastructure Project

During the drawdown the village of Pardeeville will be replacing the water and sewer lines currently on or under the lake bed between Chandler Park and Breezy Point Drive. It should be stated this will not be a component of the Lake Protection Grant or drawdown cost estimates but is a component of the comprehensive project as such the cost are included below.

	Item	No. of Units	Units	Unit Cost	Total Amount
1.	Bonds, Insurance, Mobilization	1	LS	$ 7,500.00	$ 7,500
2.	Removals	1	LS	$ 5,000.00	$ 5,000
3.	Coffer Dam Base Flow or Pass Through Base Flow	1	LS	$ 35,000.00	$ 35,000
4.	12" HDPE DIPS DR11 Labor and Materials	980	LF	$ 50.00	$ 49,000
5.	6" HDPE DIPS DR11 Labor and Materials	980	LF	$ 30.00	$ 29,400
6.	12" RW Valves and Appurtenances with Labor	2	EACH	$ 2,750.00	$ 5,500
7.	Hydrant and Appurtenances with Labor	1	EACH	$ 3,500.00	$ 3,500
8.	Manholes and Castings with Labor	1	LS	$ 15,000.00	$ 15,000
9.	Restoration on Each Side	2	EACH	$ 7,500.00	$ 15,000
	Subtotal				$164,900
	Contingencies (15%)				$24,700
	Engineering (15%)				$24,700
	Grant(s) Administration (5%)				$8,200
	Estimated Total				**$222,500**

2. Electrical Generation Loses

During the time of the drawdown loses from electrical generation will be endured by the Village of Pardeeville and surrounding community. The estimated cost of this lose is $25,000 +-, as tentatively provided by Dave Tracey, Village Manager for the Village of Pardeeville.

The costs will not be paid for in the WDNR Lake Protection Grant but can be used as local match. The PLMD can reach a deal with the Village of Pardeeville to offset the costs associated with this revenue loss.

Total Project Cost

The available grant funding requires a 25% local match made by the involved community collective. For this project the loss of local utility electrical production is a cost element that will be considered by the grant authority for local match purposes.

Practice	Costs	Required Local Match	Available Local Match Credit
Fish Inventory and Flow Test	**$3148**		
Rotenone	**$50,320**		
Fish Restocking	**$11,500**		
Fish Habitat	**$7,500**		
Water Quality Monitoring	**$9,870**		
Aquatic Plant Inventories	**$2,000**		
Navigation Buoys	**$600**		
Loss of Power	**$25,000**		**$25,000**
Total	**$109,938**	**(25%)$27438.50**	
Other Local Match Activities			**To be determined**
Total Cash Needed for Local Match	**$2,484.50**		

Future aquatic plant management activities are not included in the above cost structures.

Timeline for Park Lake Restoration: Begins July 2012 continues through May 2014