LOCH LOMOND

LONG TERM LAKE AND WATERSHED MANAGEMENT PLAN

FOR THE

LOCH LOMOND PROPERTY OWNERS ASSOCIATION

PREPARED BY

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PROJECT PURPOSE

The *2015 Loch Lomond Water Quality Report Summary*, prepared by the Lake County Health Department, identified the need to prepare a long-term (10 year) management plan for Loch Lomond, which this document addresses. This long-term management plan not only focuses on the lake itself, but also highlights the fundamental influence of the contributing watershed, located primarily in the Village of Mundelein, Lake County, Illinois. The plan has been developed to align with the goals of the *Bull Creek - Bull's Brook Watershed - Based Plan*, dated December 17, 2008, listed below, as they relate to Loch Lomond and its watershed.

- Protect and restore the natural resource components of the watershed's natural drainage system
- Improve the overall water quality in the lakes, ponds, streams, and wetlands of the watershed
- Reduce flood damage in the Bull Creek/Brook Watershed and prevent flooding from worsening in the watershed and along the Des Plaines River downstream
- Protect, restore, and enhance stream health and channel function and conveyance
- Guide new development and redevelopment to benefit rather than impair watershed goals to reduce flood damage, improve water quality and protect natural resources
- Implement a "Green Infrastructure" plan to guide preservation, restoration, and management activities in the watershed
- Provide watershed stakeholders with the knowledge, skills, and motivation needed to take action on implementing the watershed plan
- Identify, develop and capitalize on potential funding sources for implementing watershed projects and programs recommended in the action plan
- Improve coordination between municipalities, townships, special districts (i.e. parks, schools, forest preserves, etc.), county agencies and other local government units, federal, state, regional agencies, and private business, non-profits, citizen stakeholders, and the general public in watershed plan implementation, monitoring, enhancement, and protection

The primary purpose of this plan is to identify watershed goals and action items that can address point and nonpoint source pollution affecting Loch Lomond. This plan provides principles and guidelines for addressing current and future watershed and water quality issues. The following items were identified as priorities for long-term management of the lake.

- Improve water quality
- Improve water clarity
- Manage excessive aquatic plants
- Prevent algal blooms (floating and planktonic)
- Combat invasive aquatic plants
- Prevent erosion and sedimentation
- Improve habitat and sustain the fishery
- Maintain recreational uses
- Sustain property values

This plan has been prepared by Hey and Associates, Inc. for the Loch Lomond Property Owners Association (LLPOA). However, additional stakeholders and resources include, but are not limited to, the Loch Lomond Lake Management Committee (LLLMC), the Lake County Health Department (LCHD), the Lake County Stormwater Management Commission (LCSMC), the Bull Creek/Bull Brook Watershed Council, the Village of Mundelein, and the Mundelein Park and Recreation District (MPRD). The following sections describe the overall approach that was used to identify issues and opportunities throughout the Loch Lomond watershed and provide guidance for more detailed project planning moving forward.

PROJECT OVERVIEW

Loch Lomond is situated in the Des Plaines River Watershed (Hydrologic Unit Code (HUC) 07120004). This watershed extends from southern Racine County, Wisconsin, to the mouth of the Des Plaines River at its confluence with the Illinois River. The Lake County, Illinois portion of the Des Plaines River Watershed is shown on Exhibit 1. The Bull Creek Watershed (HUC 071200040302) is a management unit and subwatershed of the Des Plaines River and is shown on Exhibit 2. The Bull Creek Watershed encompasses the headwaters of Loch Lomond to near Independence Grove Forest Preserve, where Bull Creek flows into the Des Plaines River.

The Loch Lomond Watershed is a further subset of the Bull Creek watershed. For this plan, the Loch Lomond watershed has been updated using the current, highest resolution topographic data. The watershed is approximately 1,262 acres and encompasses Loch Lomond and the surrounding land. Loch Lomond is a 74.85-acre impoundment lake with 2.18 miles of shoreline. The directly adjacent land use is predominantly single-family residential. Exhibit 3 shows the current watershed land use, as defined by the LCHD. Bull Creek was dammed in 1955, just west of its intersection with US Highway 45, creating the unique lacustrine ecosystem present today.

The Loch Lomond watershed extends from just west of IL Route 83 to the dam adjacent to US Highway 45. The headwaters are comprised of predominantly agricultural land and wetlands, including the large wetland complex just east of IL Route 83 and south of Winchester Road and the smaller series of wetland complexes from Kasting Lane to Midlothian Road and IL Route 176. The northern wetland drains via a channel that flows through residential areas and MPRD lands, prior to draining into the northern portion of the lake (inlet 3, see Exhibit 7). The southern series of smaller wetlands primarily drains through residential properties, and into the southwestern inlet (Inlet 2, see Exhibit 7) of the lake. Inlets 2 and 4 receive smaller portions of watershed runoff, almost completely comprised of residential property.

PROJECT APPROACH

The approach to this initial planning effort of the project was to gather and assess available data, identify potential opportunities for improvements, and develop a long-term management strategy. Many entities were queried for the purposes of data gathering for the comprehensive data review; listed below are key sources:

- Lake County Health Department (LCHD)
  - Water quality monitoring data
  - July 2015 aquatic plant sampling data
  - *2015 Loch Lomond Summary Report*, dated 2015
  - 2015 existing land use GIS information
- Lake County Stormwater Management Commission (SMC)
  - Stream Inventory GIS data
  - Detention Basin Inventory GIS data
  - *Bull Creek - Bull's Brook Watershed - Based Plan*, dated December 17, 2008
  - *Des Plaines River Watershed Planning Year 1 Progress Report*, dated March 2017
  - Des Plaines River Watershed Planning Meetings

  - *Des Plaines River Watershed-Based Plan*, dated June 2018
- McCloud Aquatics
  - Water quality data
  - Historic aquatic plant management treatments
- Northwater Consulting
  - *Des Plaines River Watershed Spatial Watershed Assessment and Management Model*, Northwater Consulting, dated February 2018
- Illinois Environmental Protection Agency (IEPA)
  - Volunteer Lake Monitoring Program (VLMP) water quality monitoring data
  - *Illinois Integrated Water Quality Report and Section 303(d) List – 2016*, dated July 2016
- Illinois Department of Natural Resources (IDNR)
  - Fisheries status summary, dated December 20, 2016
  - Historic aerial photography
- Midwest Biodiversity Institute
  - *Biological and Water Quality Assessment of the Upper Des Plaines River and Tributaries*, dated December 31, 2017

Following review of available data to begin to assess stream and watershed characteristics, a reconnaissance of the upstream waterway network was performed in the Summer of 2017 to determine existing conditions and identify issues. The reconnaissance included a visit to the upper watershed after significant rainfall to observe how water traveled through the watershed. As part of the LCSMC, a similar assessment was performed in 2015. During the 2017 reconnaissance, the 2015 stream inventory was used as a baseline for comparison. Representative photos of findings are included in Exhibit 8.

Survey was preformed to measure both the soft sediment and hard bottom contours at Inlet 1, North Beach, and South Beach. Soft sediment contours, hard sediment contours, survey elevations, and estimates of soft sediment volume are included in Exhibits 4 and 5. Hey has concluded that there is no current need for dredging at any of these sites. Current sediment depths do not appear to be at levels that would warrant removal and are likely not a large contribution to nutrient loading.

A shoreline erosion assessment was also performed by Hey in 2017 to document current shoreline conditions on Loch Lomond. The majority of the shoreline is relatively stable; most lots have engineered stabilization practices. Stable shoreline characterization includes sheet pile, riprap, and concrete structures, while lesser stable shorelines are comprised of sparse riprap and yards mowed down to the water line. The results of this erosion assessment are included as Exhibit 6.

Additional field observations were documented following upper watershed reconnaissance. Notable findings are included below:

- Significant debris are present at the outlet of the large northern wetland area.
- Very little vegetative buffer exists between the northern agricultural field and the northern wetland area.
- Major channel erosion was documented on residential property
- Portions of the flowpaths are routed through residential properties, including through maintained turf grass and bare channels.

- Some portions of the flowpaths have been stabilized, primarily around the flowpaths to Outlets 2 and 3.
- Storage volume is present in the wetland areas and designated detention basins.
- Residential practices that may be contributing to the inflow of nutrients include excessive leaf debris, significant mulch displacement, and non-bmp landscaping practices.
- Agricultural runoff and residual phosphorus in the wetlands and ponds is likely a large source of phosphorus into Inlet 3.

Concurrent with the data gathering and assessment portion of the project, overall project goals and opportunities were assessed based upon field observation and detailed review of the available data. Project goals listed in the project purpose section were considered, along with a variety of factors including economic feasibility, consistency with previous planning efforts, short and long-term benefit to the community, and overall watershed benefit. A detailed discussion of opportunities identified is included in the following sections of this report.

FINDINGS AND RECOMMENDATIONS

OVERALL OPPORTUNITY DISCUSSION

The primary goal of this project is to identify potential opportunities for improvements for Loch Lomond and within the surrounding watershed. These opportunities are focused on a variety of goals, described above. The primary goal is to enhance the lake and create a valuable asset for the community. This section describes opportunities identified based upon the project effort described in this report. In addition to the review of available data, and field reconnaissance, Hey attended multiple Loch Lomond POA meetings to gather input from involved parties to collect anecdotal data and ensure a comprehensive, watershed based understanding of goals and constraints. The following list of priorities was compiled to encompass stakeholder concerns in the watershed

- Improve water quality
- Improve water clarity
- Manage excessive aquatic plants
- Prevent algal blooms (floating and planktonic, health risks)
- Combat invasive aquatic plants
- Prevent erosion and sedimentation
- Improve habitat and sustain the fishery
- Maintain recreational uses (birding, swimming beaches, small watercraft, etc.)
- Sustain property values (both shoreland property and community value)

Impoundment lakes are especially vulnerable to impacts from nutrients and other pollutants. Due to external loading of nutrients, particularly phosphorus, and relatively shallow waters, runoff events directly affect Loch Lomond.

Sampling results show some of the priority constituents in this watershed include Phosphorus (TP), Total Suspended Solids (TSS), Nitrogen (Total and nitrate), and Chloride (Cl).

Table 1. Historic Water Chemistry Data					
Date	Site (If Noted)	Source	P (mg/l)	TSS (mg/l)	Cl (mg/l)
1988 Average	N/A	LCHD	0.091	N/A	N/A
1991 Average	N/A	VLMP	0.147	N/A	N/A
1999 Average	N/A	LCHD	0.235	N/A	N/A
2004 Average	Epilimnion	LCHD	0.245	13.2	N/A
2005 Average	Epilimnion	LCHD	0.361	13.1	287
2015 Average	Epilimnion	LCHD	0.196	11.0	134
2015 Average	Inlet	LCHD	0.103	10.14	94.25
11/14/2016	Inlet 4	LCHD	0.078	17.2	434
11/14/2016	Inlet 3	LCHD	0.216	54.7	90.6
11/14/2016	Pond Outlet 3A	LCHD	0.107	23.4	96.9
11/14/2016	Inlet 2	LCHD	0.019	2.3	76.1

Hey recommended additional sampling sites and the LCHD completed sampling at the locations included in Exhibit 7 from May to September 2017. A table and figures of the results are included below. Figure 1 illustrates the influence of major runoff events on Inlet 3 phosphorus loadings, as shown by the sample results following the July 12017 storm event.

Table 2. 2017 LCHD Sampling Results								
Date	Site	P (mg/l)	TSS (mg/l)	Cl (mg/l)	Cond (mS/cm)	pH	Temp (C°)	DO (mg/l)
11/14/2016	Inlet 2	0.019	2.3	76.1	N/A	N/A	N/A	N/A
11/14/2016	Inlet 3	0.216	54.7	90.6	N/A	N/A	N/A	N/A
11/14/2016	Inlet 3A	0.107	23.4	96.9	N/A	N/A	N/A	N/A
11/14/2016	Inlet 4	0.078	17.2	434.0	N/A	N/A	N/A	N/A
5/17/2017	Inlet 1	0.029	2.0	306.0	1.413	8.10	19.13	8.76
5/17/2017	Inlet 1A	0.073	45.3	109.0	0.809	8.26	20.80	9.95
5/17/2017	Inlet 1B	0.039	<1.30	197.0	1.287	8.06	15.29	9.31
5/17/2017	Inlet 2	0.016	4.0	71.0	0.647	8.23	21.14	8.39
5/17/2017	Inlet 3	0.071	10.1	74.0	0.617	8.04	20.53	7.49
5/17/2017	Inlet 3A	0.069	15.6	80.0	0.617	8.09	22.54	7.03
5/17/2017	Inlet 4	0.047	2.5	379.0	1.802	7.67	16.00	10.39
6/20/2017	Inlet 1	0.048	2.2	98.0	0.564	8.14	18.72	10.66
6/20/2017	Inlet 1A	0.037	3.4	50.2	0.429	8.01	20.13	10.25
6/20/2017	Inlet 1B	0.060	1.5	NA	0.540	7.95	18.24	9.94
6/20/2017	Inlet 2	0.027	3.3	74.3	0.531	8.19	21.31	9.42
6/20/2017	Inlet 3	0.189	19.0	93.5	0.643	7.99	20.83	10.28
6/20/2017	Inlet 3A	0.135	18.0	92.9	0.512	8.28	21.81	9.76
6/20/2017	Inlet 3B	0.167	21.2	35.2	0.552	7.87	17.70	8.87
6/20/2017	Inlet 4	0.046	2.6	297.0	0.732	7.44	18.16	10.53

Table 2 Continued. 2017 LCHD Sampling Results								
Date	**Site**	**P (mg/l)**	**TSS (mg/l)**	**Cl (mg/l)**	**Cond (mS/cm)**	**pH**	**Temp (C°)**	**DO (mg/l)**
7/19/2017	Inlet 1	0.062	3.3	350.0	1.620	8.05	21.28	10.38
7/19/2017	Inlet 1A	0.031	<1.30	61.7	0.716	7.82	22.01	9.92
7/19/2017	Inlet 2	0.034	<1.30	46.5	0.491	7.40	22.25	8.97
7/19/2017	Inlet 3	0.242	5.0	27.4	0.341	7.73	22.98	9.64
7/19/2017	Inlet 3A	0.338	5.1	27.5	0.332	7.59	24.26	7.78
7/19/2017	Inlet 3B	0.312	9.4	23.6	0.325	7.24	24.16	7.56
7/19/2017	Inlet 4	0.074	12.0	237.0	1.447	6.99	19.19	9.97
8/22/2017	Inlet 1A	0.033	<1.30	73.5	0.763	7.97	22.33	9.88
8/22/2017	Inlet 2	0.022	2.3	114.0	0.534	8.25	21.72	8.20
8/22/2017	Inlet 3	0.176	5.2	53.9	0.486	7.90	22.97	6.64
8/22/2017	Inlet 3A	0.166	5.2	59.0	0.511	7.82	23.84	6.03
8/22/2017	Inlet 3B	0.185	4.0	38.7	0.469	7.37	22.59	2.48
8/22/2017	Inlet 4	0.049	4.8	343.0	1.618	7.83	19.44	8.38
9/11/2017	Inlet 2	0.010	1.9	96.7	0.678	8.47	16.72	11.07
9/11/2017	Inlet 3	0.095	12.0	116.0	0.839	8.42	16.96	9.60
9/11/2017	Inlet 3A	0.093	21.8	116.0	0.806	8.61	20.61	12.03
9/11/2017	Inlet 3B	0.174	32.6	60.3	0.680	7.78	16.07	8.16
9/11/2017	Inlet 4	0.040	3.8	428.0	2.271	8.06	17.93	10.89
10/10/2017	Inlet 1	N/A	N/A	N/A	0.315	8.11	15.05	10.79
10/10/2017	Inlet 1A	N/A	N/A	N/A	0.293	8.20	15.10	10.75
10/10/2017	Inlet 1B	N/A	N/A	N/A	0.367	8.40	15.94	10.28
10/10/2017	Inlet 2	N/A	N/A	N/A	0.566	7.98	16.00	10.84
10/10/2017	Inlet 3	N/A	N/A	N/A	0.601	7.83	16.23	9.99
10/10/2017	Inlet 3A	N/A	N/A	N/A	0.607	8.01	16.35	8.83
10/10/2017	Inlet 3B	N/A	N/A	N/A	0.596	7.98	15.11	8.49
10/10/2017	Inlet 4	N/A	N/A	N/A	0.575	7.82	15.87	9.96

Figure 1. Lake County Health Department 2017 Phosphorus Sampling Results. Note: US EPA Phosphorus goal is 0.05 mg/L.

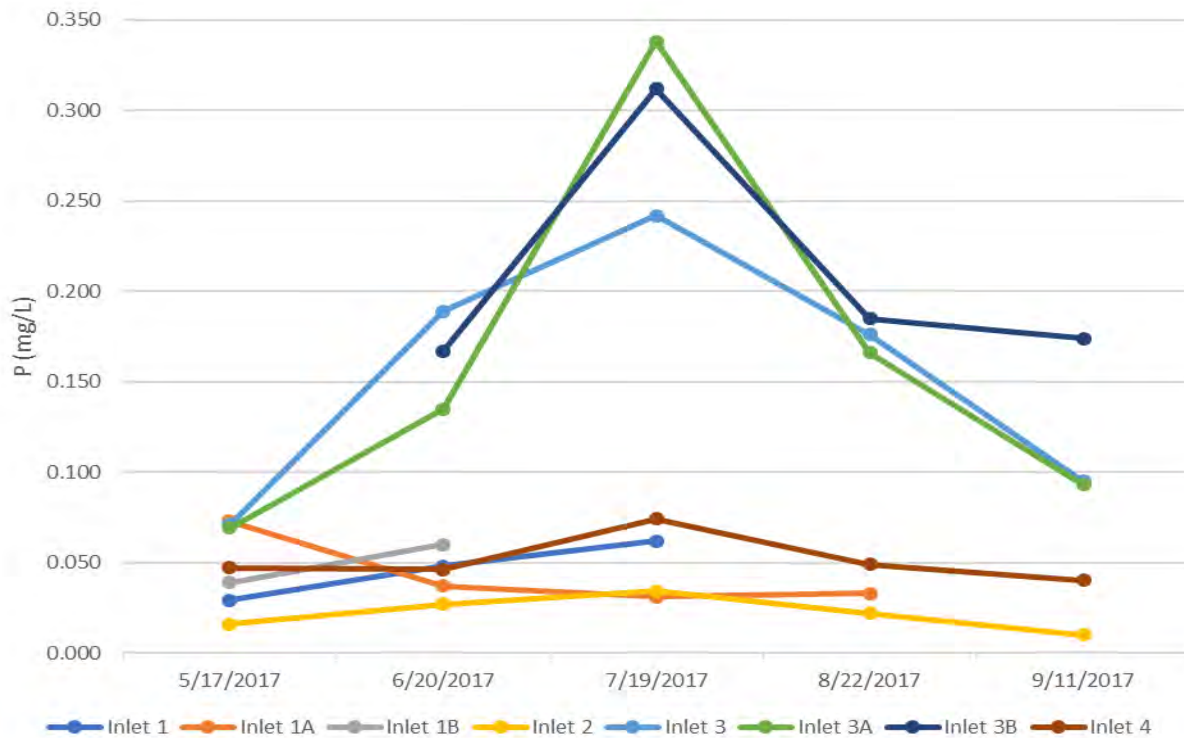


Figure 2. Lake County Health Department 2017 Total Suspended Solids Sampling Results.

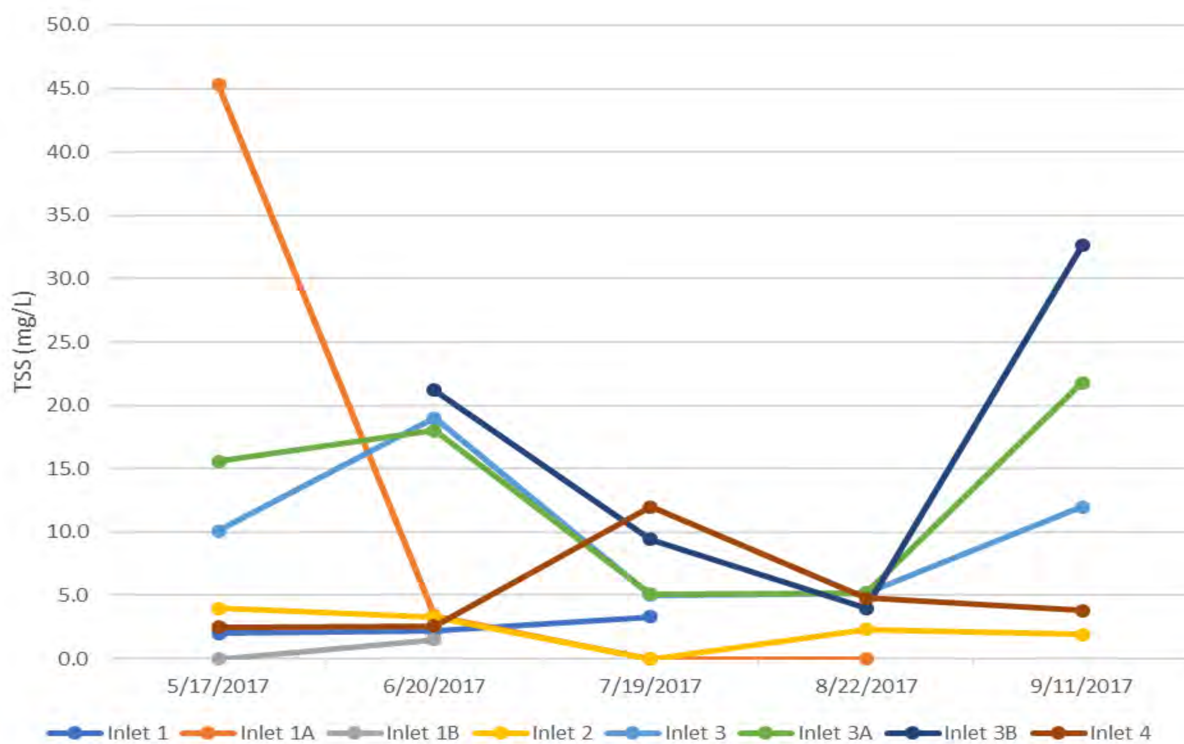
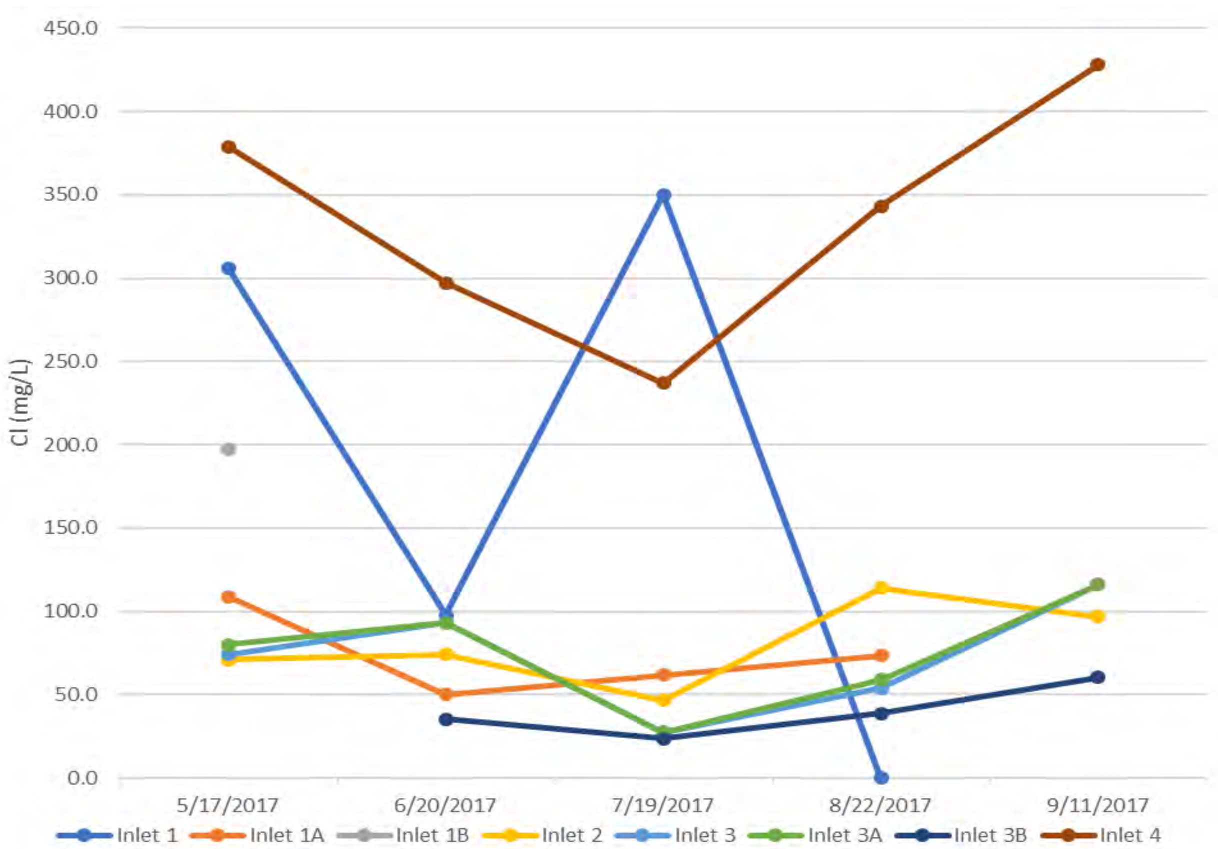


Figure 3. Lake County Health Department 2017 Chloride (Road Salt) Sampling Results.



POTENTIAL PROJECTS AND PRIORITIES

Following field reconnaissance and examination of available data, 12 potential projects for the Loch Lomond watershed have been identified. The primary goal of these proposed projects is to combat transport of excess sediment and nutrients by targeting watershed runoff and erosion prior to discharge into the lake. Repairing existing channels and exploring Best Management Practices (BMPs) in key locations could help stabilize conditions and improve long-term water quality on both Loch Lomond and water bodies downstream. The following is a list of potential projects intended to improve water quality of Loch Lomond. Note that some of these identified projects overlap in spatial extent, so not all projects listed below can be implemented independently. Multiple options for the same site have been intentionally included to compare potential loading reductions and provide some flexibility in planning. Additionally, multiple projects for the large farmland site were included to provide options for further discussion and consideration with the landowner. Exhibit 8 shows the location and site photos of each of these project areas. Landowner cooperation will be key to the implementation of any of these identified practices, especially the ones located on the large agricultural fields.

The projects were also submitted to the Lake County Stormwater Management Commission (LCSMC) as part of their 2018 Des Plaines River Watershed-Based Plan. LCSMC has prepared a report and Action Plan Web Application, in which they have included additional details about each project. The plan and web application can be found here:

https://www.lakecountyil.gov/2387/Des-Plaines-River-Watershed-Plan

Project 1: Stabilize bank erosion on residential property.

This location, on parcel number 10-24-106-008, was noted both during the Hey field reconnaissance and the LCSMC stream inventory as having severe erosion. A photo is included on Exhibit 8. This channel side slope is characterized by steep banks and thick canopy cover. Proposed improvements include grading banks to a more natural slope, installing stone toe protection, installing erosion control blanket, and planting native vegetation to stabilize banks. Surrounding trees would be selectively thinned to promote success of ground vegetation. The model suggests that implementation of this project could potentially remove 3.2 pounds of phosphorus per year; reducing the loading by 0.7%.

Project 2: Enhance farmland adjacent to the large upstream wetland by planting a 50-foot buffer.

A 50-foot wide (NRCS recommended width) vegetated buffer strip is shown on Exhibit 8. This riparian buffer is designed to span the length of the wetlands complex, as it is adjacent to the upstream agricultural field located to the north and east. The agricultural land south of Winchester Road and east of Route 83 is approximately 121 acres. The parcel numbers associated with the field are 10-14-200-001, 10-14-400-002, 10-14-200-008, 10-14-200-002, 10-14-200-005, and a road right-of-way. This buffer is calculated to be approximately 7 acres in size and would capture sediment and nutrients from field runoff prior to them entering the wetland. Other options for improvements for these 121 acres of farmland are included as Projects 3-6. The model suggests that implementation of this project could potentially remove 15.3 pounds of phosphorus per year; reducing the loading by 3.3%.

Project 3: Enhance farmland adjacent to the large upstream wetland by planting a 100-foot buffer.

Much like Project 2, a 100-foot wide vegetated buffer strip could be created to span the perimeter of the wetlands complex, as it is adjacent to the upstream agricultural field. The agricultural land south of Winchester Road and east of Route 83 is approximately 121 acres. The parcel numbers associated with the field are 10-14-200-001, 10-14-400-002, 10-14-200-008, 10-14-200-002, 10-14-200-005, and a road right-of-way. This buffer is calculated to be approximately 14 acres in size and would capture sediment and nutrients from field runoff prior to them entering the wetland. The model suggests that implementation of this project could potentially remove 20.4 pounds of phosphorus per year; reducing the loading by 4.4%.

Project 4: Convert agricultural land to hay/perennial crop.

The 121-acre agricultural field identified in Project 2 could be converted from row crop to hay or perennial crop. Row crops generally facilitate conditions that contribute to sedimentation and nutrient transport. The model suggests that implementation of this project could potentially remove 15.3 pounds of phosphorus per year; reducing the loading by 3.3%.

Project 5: Convert agricultural land to prairie.

The 121-acre agricultural field identified in Project 2 could be converted from row crop to prairie. This practice would significantly reduce seasonal runoff of nutrients and eliminate new inputs. The model suggests that this conversion from active farmland to prairie implementation of this project could potentially reduce 40.8 pounds of phosphorus entering the lake per year; reducing the loading by 8.8%. Additionally, the model suggests that implementation of this project could potentially remove 1,099.0 pounds of nitrogen per year; reducing the loading by 10.2%.

Project 6: Create and adopt a Nutrient Management Plan (NMP) and implement no-till practices.

Nutrient Management Plans are conservation plans that document strategies and best management practices (BMPs) focused on reducing nutrient-laden runoff from fields. NMPs target specific practices, ranging from site-specific fertilizer application regimes, to emergency response plans, to planting perennial vegetative cover. Each NMP is site-specific and designed to be practical and feasible to implement for the landowner.

The purpose of no-till practices are to limit soil disturbance. Soil disturbance increases the erosion potential because soil particles become loose and more susceptible for transport. Reductions in costs of field maintenance, improved soil structure, and reductions in soil compaction are some secondary advantages of no-till practices. The model suggests that implementation of this project could potentially remove 35.7 pounds of phosphorus per year; reducing the loading by 7.7%.

Project 7: Modify the detention basin on the MPRD property at 1401 N Midlothian Road, Mundelein IL.

An outline of the current 1-acre dry detention basin with a 25-foot buffer (where possible, as to not relocate the road) is shown on the exhibit, located on parcel number 10-13-300-046. Potential improvements include transitioning to a wetland bottom basin and planting a native prairie buffer around the basin. These basin enhancements would help to treat park runoff prior to it entering the creek. At the time of this report, MPRD was designing park improvements adjacent to this pond which may hamper the ability to modify the pond. The model suggests that implementation of this project could potentially remove 1.48 pounds of phosphorus per year; reducing the loading by 0.3%.

Project 8: Channel stabilization downstream from the pond on the MPRD property at 1401 N Midlothian Road, Mundelein IL.

As shown on Exhibit 8, the banks directly downstream from the Keith Mione Community Park Pond, located on parcel number 10-13-300-046, are bare and vertical. This section of channel was flagged for recommended maintenance by LCSMC. Sediment from the banks can be eroded and easily transported downstream, directly into Loch Lomond. Bank stabilization maintenance, including stone toe protection, bank regrading, and native plantings, in this location could minimize future erosion and decrease sediment entering the lake. The model suggests that implementation of this project could potentially prevent 0.002 pounds of sediment per year from entering the lake.

Project 9: Stabilize shoreline erosion on residential property.

During the shoreline erosion field reconnaissance, it was noted that there was active erosion on residential parcel number 10-24-107-011. Adjacent properties to the north, extending to the inlet to the north, were also noted as potential shoreline erosion sites. Rip-rap shoreline stabilization and native plantings offer a natural approach to decrease erosion potential. It appears that the landowners of the parcel noted above may be using the shoreline as a launch ramp. If this is the desired use for the space, proper infrastructure should be constructed to limit erosion on the site. Lake shoreline stabilization treatments include rock rip-rap, sheet piling, concrete structures, and native plantings. Site-specific treatments should be selected to provide for the desired shoreline use. Typically, native shoreline buffer plantings provide erosion protection, water quality treatment, and wildlife, invertebrate, and fisheries habitat. The model suggests that implementation of this project could potentially prevent 0.026 pounds of sediment per year from entering the lake.

Project 10: Stone armor channel portion flowing on residential property.

Smaller headwater channels meander through residential properties in this area. This location is on parcel number 10-24-104-028. Using stone and small boulders, these channel sections could be armored to slow water movement, encourage infiltration along the flow path, limit erosion, and limit downstream sedimentation. A photo is included on Exhibit 8. The model suggests that implementation of this project could potentially prevent 0.459 pounds of sediment per year from entering the lake.

Project 11: Stone armor channel portion flowing on residential property.

Much like the stone armor project listed as Project 10, this is another location where headwater channels flow through residential properties. This location is on parcel 10-24-108-013. Some portions of this channel remain bare and could be contributing sediment and nutrients to the lake. Stone armoring would provide stabilization for these portions of the channel. The model suggests that implementation of this project could potentially prevent 0.005 pounds of sediment per year from entering the lake.

Project 12: Treat the pond on the MPRD property at 1401 N Midlothian Road, Mundelein IL with alum or Phoslock®.

The goal of these suggested pond treatments is to sequester phosphorus upstream of the lake at Keith Mione Community Park, located on parcel number 10-13-300-046. Phoslock®, or similar alum treatments, bind to free reactive phosphorus in the water column and permanently deactivates it. Further information can be found here: http://www.sepro.com/phoslock/. Alum, short for aluminum sulfate, is used to control the internal recycling of phosphorus in a waterbody. Either option will lock and hold phosphorus out of production and limit quantities entering the lake from upstream, however application preferences vary. The underlying concept here is predicated on the assumption that this pond is a likely large contributor of seasonal phosphorus loadings. This conclusion is justified in part due to the results of the water quality sampling, which indicate the highest phosphorus levels of any subwatersheds to Loch Lomond and the frequent algae blooms that are observed on the pond. By largely eliminating the extant loading currently in the pond, overall loadings to the lake would decrease. The phosphorus removal rate has not been estimated at this time. However, the results of the treatment would be instantaneous and measurable.

Model Results

Modeling of the Des Plaines River Watershed, as part of Lake County Stormwater Management Commission's Des Plaines River Watershed Planning effort, has been completed by Northwater Consulting to assess pollutant contributions and reductions in the watershed.

The pollutant loading model created for the watershed is a SWAMM (Spatial Watershed Assessment and Management Model), meaning distinct management units were created throughout the watershed based on spatial characteristics including land use, soils, and parcels. Runoff, soil erosion, and pollutant delivery were modeled for each spatial unit using the Universal Soil Loss Equation (USLE) and Event Mean Concentrations (EMC), ultimately estimating non-point pollutant loading. These two components, USLE and EMC, consider soil characteristics, pollutants present, distance to waterbody, and runoff as a property of precipitation for each spatial unit.

The model was calibrated using USGS gauge data, Des Plaines River Watershed Workgroup (DRWW) monitoring results, and 1980-2016 rainfall data to ensure parameters and process produced regionally average actual data. Pollutant loading results were calculated for Total Nitrogen, Total Phosphorus, TSS, Chloride, and Fecal Coliform Bacteria.

This model does not include point source pollutant loading, internal loading, nor does it strive to quantify extensively complex pollutant interactions in the watershed. This model has been designed and calibrated for this scale of watershed modeling; actual site-specific values will vary from the calculated results.

This model has been used to quantify reduction potential of the proposed improvements projects, listed in detail above. Channel and bank stabilization reductions were interpreted by Hey using the Northwater Consulting model, while all other projects were calculated by Northwater Consulting. Table 3 shows the preliminary modeling results, while Table 4 shows the calculated reductions compared to the total loading to the lake.

TABLE 3. DPRW Pollutant Model Reduction Results						
Hey Proposed Project	Project Description	Nitrogen Reduction (lbs/yr)	Phosphorus Reduction (lbs/yr)	Sediment Reduction (lbs/yr)	Chloride Reduction (lbs/yr)	Bacteria Reduction (lbs/yr)
1	Channel stabilization	6.305	3.152	3.152	*N/A	*N/A
2	50-ft buffer strip	244.22	15.30	35.95	61.93	27.62
3	100-ft buffer strip	366.33	20.40	47.93	123.85	49.71
4	Agricultural lands to hay/perennial crop	366.33	15.30	35.95	30.96	38.67
5	Agricultural lands to prairie	1,098.99	40.80	71.89	278.67	66.28
6	NMP and no-till practices	183.16	35.70	0.00	0.00	0.00
7	Dry to wet basin with 25-ft buffer	29.28	1.48	0.38	697.76	4.82
8	Bank stabilization	0.003	0.002	0.002	*N/A	*N/A
9	Shoreline stabilization	0.052	0.026	0.026	*N/A	*N/A
10	Channel armoring	0.918	0.459	0.459	*N/A	*N/A
11	Channel armoring	0.010	0.005	0.005	*N/A	*N/A
12	Alum or Phoslock® treatment	**N/A	**N/A	**N/A	**N/A	**N/A
Total Reduction Potential***		219.73-1135.56	20.42-45.92	4.02-75.91	697.76-976.43	4.82-71.10

* No reduction is calculated because the problem addressed was not contributing this pollutant to the overall load.

**No reduction is calculated because the model is not designed to calculate internal pollutant loading.

***Since projects 2-6 are different options on the same parcel, the minimum end of the range was calculated by totaling projects 1 and 7-12, and the lowest reduction value for projects 2-6, while the maximum end of the range was calculated by totaling projects 1 and 7-12, and the highest reduction value for projects 2-6.

TABLE 4. DPRW Pollutant Model Percent Reduction Results						
HEY PROPOSED PROJECT	PROJECT DESCRIPTION	NITROGEN REDUCTION (%)	PHOSPHORUS REDUCTION (%)	SEDIMENT REDUCTION (%)	CHLORIDE REDUCTION (%)	BACTERIA REDUCTION (%)
1	Channel stabilization	0.06	0.68	0.00	*N/A	*N/A
2	50-ft buffer strip	2.26	3.30	0.01	0.01	0.84
3	100-ft buffer strip	3.39	4.40	0.01	0.02	1.51
4	Agricultural lands to hay/perennial crop	3.39	3.30	0.01	0.01	1.18
5	Agricultural lands to prairie	10.16	8.79	0.01	0.06	2.01
6	NMP and no-till practices	1.69	7.70	0.00	0.00	0.00
7	Dry to wet basin with 25-ft buffer	0.27	0.32	0.00	0.14	0.15
8	Bank stabilization	0.00	0.00	0.00	*N/A	*N/A
9	Shoreline stabilization	0.00	0.01	0.00	*N/A	*N/A
10	Channel armoring	0.01	0.10	0.00	*N/A	*N/A
11	Channel armoring	0.00	0.00	0.00	*N/A	*N/A
12	Alum or Phoslock® treatment	**N/A	**N/A	**N/A	**N/A	**N/A
Total Loading Reduction Percentage***		2.03-10.50	4.41-9.90	0-0.01	0.14-0.2	0.15-2.16

* No reduction is calculated because the problem addressed was not contributing this pollutant to the overall load.

**No reduction is calculated because the model is not designed to calculate internal pollutant loading.

***Since projects 2-6 are different options on the same parcel, the minimum end of the range was calculated by totaling projects 1 and 7-12, and the lowest reduction value for projects 2-6, while the maximum end of the range was calculated by totaling projects 1 and 7-12, and the highest reduction value for projects 2-6.

Priorities

A phosphorus containing lawn fertilizer ban is already in place for the watershed and many of the surrounding municipalities, but loading levels still seem to be an issue in the watershed. Chloride, a pollutant linked to seasonal road salt application, can be combated by updating municipal winter maintenance plans to reduce salt application. As more research is done into the impact of chlorides on water quality, it is becoming an emerging source of concern in protecting waterways. The Village of Buffalo Grove has recently updated their winter maintenance plan, and have had success reducing costs, reducing road salt application quantities, and improving road conditions. Coordination with municipalities could also be explored to reduce chloride loadings in the watershed. These projects, included in the section above, have been selected and designed to decrease phosphorus inputs to the watershed and to the lake itself.

Priority has been placed on future projects associated with the agricultural field south of Winchester Road and east of Route 83. This field has been identified by the preliminary modeling completed by LCSMC as being a large contributing source to nutrient pollution in the watershed. Further discussion with the landowner to explore "Edge of field" BMPs, like prairie buffers, NMPs, transitioning to perennial crops, like alfalfa, and no-till farming techniques.

Feasibility of these improvements and identification of practical BMPs will require engagement of the property owners. The LLPOA and surrounding residents should continue to closely monitor lake conditions as improvement projects are implemented.

Managing water quality for Loch Lomond will be a balancing act of "better water clarity" rather than "good water clarity." In multiple conversations with lake residents and users, there was a clear indication that the users had little tolerance for large stands of aquatic macrophytes.

Loch Lomond has a maximum depth of approximately 7 feet, but much of the lake is only 4-5 feet deep. The VLMP dataset shows secchi depths average 34 inches (less than 3 feet) for Loch Lomond during the summer months. The 2018 VLMP data indicates that the current lake surface that is occupied by aquatic vegetation is less than 5 percent. If an aggressive phosphorus loading minimization or sequestration program was implemented, and was successful at appreciably lowering phosphorus concentration reaching the lake, water clarity would likely increase. When sunlight can penetrate deeper into a lake, more of the lake bottom is exposed to sunlight, and can subsequently host more aquatic plant species. Increasing secchi depths slightly (about one foot) would allow much more of the lake bottom to be exposed to sunlight and populations of submerged aquatic vegetation would likely greatly increase - to quantities much greater than the current 5 percent. If more aquatic vegetation was present on the lake, management protocols would need to shift from the standard algicide treatments that are currently in use to aquatic herbicides.

There lies the management paradox of implementing best practices to decrease phosphorus concentrations getting to the lake and essentially causing the "weed beds" to expand. As the LLPOA moves forward with implementation of some of the projects outlined in this document, it may be worthwhile to work in a stepwise and cautious fashion to closely watch the response of the lake to the practices. Given the nature of the watershed, phosphorus delivery mechanisms are relatively consistent and predictable. Other than the agricultural fields, the land use is relatively developed and will remain the same for the foreseeable future. Practically, there is little to no chance that phosphorus reaching the lake could be entirely eliminated, but even modest reductions could have demonstrable effects on the lake ecology.

An unpredictable factor for lake quality impacts for Loch Lomond are the changing nature of precipitation patterns in northern Illinois. Recent trends indicate that large rainfall events are becoming more common throughout the region and can provide a large "slug" of nutrients in the resulting runoff. Loch Lomond is particularly vulnerable to these kinds of rainfall events given that the lake is nearly all surface water driven. These events can help to fuel the increasingly common "toxic algae blooms" that have been occurring in other areas lakes and can pose health risks to lake users and pets.

The lake users are encouraged to engage the services of a qualified lake ecology and management consultant to closely monitor lake conditions to identify the lake responses to the watershed changes and develop appropriate management protocols. The protocols must balance human uses with lake ecology to manage tolerable algae levels, populations of submerged aquatics, habitat, and recreational use.

In order to continue planning and executing these projects, it is recommended that the LLPOA foster a partnership with McHenry-Lake County Soil & Water Conservation District (SWCD) and the local Natural Resource Conservation Service (NRCS). To address projects associated within the agricultural field, NRCS partnerships may be critical. More information on these organizations can be found at: http://mchenryswcd.org/ (McHenry-Lake County SWCD) and https://www.nrcs.usda.gov/wps/portal/nrcs/il/contact/local/area+1+nrcs+service+centers/#Lake (NRCS).

Aquatic Plant Management

The goals of the Loch Lomond aquatic plant management should be to target the reduction of non-native and other invasive vegetation and to promote native plant diversity. Residents and users of the lake should be educated as to the potential harm invasive plants can bring to the lake. Much like fishing information, aquatic plant educational material should be posted at access points and included in the distributed newsletter. Preventing new non-native plants from entering new waterbodies is one of the most effective method of invasive control. Once introduced to a lake, invasives generally establish quickly and are difficult to eradicate. Upstream wetland and detention ponds may also be a source of new plant materials leading to new populations of desirable or undesirable species.

As of LCHD's July 2015 sampling, chara *(Chara vulgaris)*, duckweed *(Lemna minor)*, and white water lily (*Nymphaea tuberosa*) were found to be present in the lake. Per anecdotal information from McCloud Aquatics regarding the 2016 growing season, curly-leaf pondweed *(Potamogeton crispus)*, sago pondweed *(Stuckenia pectinata)*, horned pondweed *(Zannichellia palustris)*, and coontail *(Ceratophyllum demersum)*, were also present in the lake in small numbers. Below is both a list of plants recommended for control and a list of plants recommended for planting.

Table 5. Priority non-native or invasive aquatic plants targeted for control

Common Name	Scientific Name	Considerations
Eurasian water milfoil	*Myriophyllum spicatum*	Non-native and invasive
Curly-leaf pondweed	*Potomogeton crispus*	Non-native and invasive
Coontail	*Ceratophyllym demersum*	Native but can grow at high densities

Table 6. Native aquatic plants targeted for planting		
Common Name	**Scientific Name**	**Considerations**
Native Pondweeds	*Potamegeton spp.*	Submergent and floating leaved
White water lily	*Nymphaea tuberosa*	Floating leaved
Spatterdock	*Nuphar advena*	Floating leaved
Pickeral weed	*Pontedaria cordata*	Emergent; purple flowers
Hardstem bulrush	*Schoenoplectus acutus*	Robust emergent
Chairmaker's rush	*Schoenoplectus pungens*	Robust emergent
Blueflag iris	*Iris virginica shrevei*	Emergent; classic blue flowers
Sweetflag	*Acorus calamus*	Emergent; herbivore resistant

McCloud Aquatics also noticed *Microcystis* in the lake during the 2016 growing season. Monitoring and testing for this cyanobacterium was planned for 2017 and should be continued well into the future. *Microcystis* can potentially produce neurotoxins and hepatotoxins; health concerns include nerve and liver damage and failure. As desired uses for Loch Lomond include swimming and other activities that put residents in direct contact with the water, these health hazards should be closely monitored.

As stated in the Priorities section, most residents and users of Loch Lomond have expressed little tolerance for large stands of aquatic macrophytes. The 2018 VLMP data indicates that the current lake surface that is occupied by aquatic vegetation is less than 5 percent. IDNR recommends aquatic plant coverage of 20-40% of the lake bottom to maintain a healthy fishery. As stated by the LLPOA, a goal of 30% shoreline coverage of submerged and surface plants has been set as a target for lake vegetative cover. It may be challenging for the LLPOA to balance the desire for better water quality and concern over large stands of submerged aquatic plants in the lake. It is recommended that the LLOPA pursue water quality improvement projects and subsequently treat and reduce excessive aquatic plant population to a tolerable level on an annual basis.

Aquatic plants can be treated in a variety of different ways, including mechanical harvest, manual harvest, herbicide, liners, and, a drastic alternative, dredging. Mechanical and physical harvest may be the least invasive and least costly options for the lake. To remove patchy stands of aquatic plants in undesirable locations, McCloud Aquatics recommends that riparian property owners rake or hand pull around their shorelines. This technique proves to be fairly effective, especially for small populations of species such as curly-leaf pondweed.

To reach LLPOA's goal of 30% shoreline coverage of submerged and emergent plants, it is recommended that cooperative lakeshore owners and public lake be targeted for shoreline planting initiatives. Planting plans can be designed to avoid existing locations designated for other uses, such as ramps, beaches, and watercraft docking areas. It is suggested that planting plans also be developed for any channel inlet areas or locations of known discharge to the lake. Areas near the dam, old northern beach area, and other areas of shallow water (1-4 feet) could be used as spots to establish new stands of desirable species. Target species to be included in shoreline plantings are included in Table 6. Discrete stands of native submergent and floating leaved aquatic plans could be easily managed at tolerable levels and would not compete with other lake uses. Any lake management contractor should be given maps of any installed plantings to avoid any collateral damage during treatments for invasive species.

Maintaining a Healthy Fishery

In 2016, IDNR completed a fishery survey (Exhibit 9). They classified the Loch Lomond fishery as "balanced" due to mature fish abundance, capable of maintaining the fishery though natural reproduction. However, IDNR also noted a possible "stockpiling" of fish at about 13-14", due to a cycle of size range abundance, scarcity of size range specific food, and slow growth rates. Other causes of the findings may be overharvesting of fish sizes 13-14". Monitoring fish size, and a possible harvest, if stockpiling is confirmed, is recommended.

Loch Lomond is periodically stocked with fish, generally predators, to help balance out panfish species and is coordinated by the LLPOA Lake Committee. Intermittent stocking of small quantities of fish do not develop a fishery. It's crucial to both alternate the species stocked and remain consistent in introducing fish (biennially is recommended by IDNR). Stocking impacts on the fishery are challenging to monitor and quantify due to varying success (0-100%, IDNR estimates approximately 50%) and varying lake conditions.

Fishing rules and regulations are posted at access points and should continue to be distributed via newsletter. Reasonable length and harvest limits should be adjusted as needed in response to improving lake conditions to maintain a sustainable, resilient, diverse, and balanced fishery for years to come.

Carp management should comprise of periodic harvesting, as it has been historically practiced. The presence of carp generally leads to turbidity and subsequent low water clarity, impairing aquatic plants from becoming established. Reducing carp numbers would further goals of better water quality and more shoreland aquatic plant growth. Piscicides are not recommended for carp control, as they may cause mortality of native and desired species. Proper maintenance (stocking and harvesting regulations) of native predator species, such as bass, channel catfish, and northern pike, some of which are already found in the lake, will also aid in controlling carp populations.

In the December 2016 Lake Status Summary, regarding reducing carp populations, IDNR stated "The drawback to light penetration is that, plants grow. Over treating vegetation causes a similar problem to no vegetation; soft sediments become re-suspended, algae blooms occur and the water turbid. The cycle can be vicious when searching for clear water."

Recent studies indicate that the Loch Lomond fishery is fairly healthy and stable. It is recommended that these periodic fish surveys, conducted by the IDNR, be continued. Since the LLPOA is working towards better water quality and more native vegetation, habitat conditions and fish populations dynamics will be impacted. Plants provide structural habitat, influence growth patterns, impact spawning, and interact closely with water quality. IDNR recommends aquatic plant coverage of 20-40% of the lake bottom to maintain a healthy fishery. This is consistent with the LLPOA's stated goal of 30% desirable vegetation coverage. Less maintenance of the fishery, in terms of stocking and carp removal may be needed if LLPOA has success with increasing aquatic and wetland plant coverage. As conditions change in response to water quality and aquatic plant management implementation, monitoring species diversity and distribution will allow for proper adjustments in stocking, harvesting, and habitat management.

NEXT STEPS

It is recommended that the LLPOA begin planning and implementing the water quality improvements projects detailed in this report by building partnerships and reaching out to property owners. The projects are numbered (1-12) in order from high/greatest priority to low/lesser priority. Response of aquatic plants and fisheries should be closely monitored as water quality conditions in the lake improve, as discussed above. Adjustments to regular plant and fishery maintenance should be made as the lake adjusts over time to lower pollutant loadings, and theoretically, better water clarity. Annual assessments, especially of the aquatic macrophyte plant coverage, will be necessary to prescribe appropriate treatment protocols. The LLPOA should continue to work towards it's 30% shoreline coverage of submerged and emergent plants by educating residents and determining locations where native aquatic plantings may be tolerable. The native aquatic species list included in this report can stand as a guide for planting plans.

FUNDING

Project funding will be a primary driver of the ability to accomplish these improvements. While the POA collects fees that provide a steady and predictable funding mechanism for management and improvements, it is likely additional outside funding will be needed to accomplish some of the proposed work. A number of grant opportunities exist for certain types of projects identified in this document. Partnering with local businesses, municipalities, and planning groups may also prove to be a successful pathway for coordination, management, and funding.

The Lake County Stormwater Management Commission Watershed Management Assistance Grant program helps fund the planning, design, and implementation of stormwater management projects. Applications for this grant are accepted on an annual basis, the POA was awarded this grant in 2017. More information can be found online at:

https://www.lakecountyil.gov/3635/Watershed-Management-Board-WMB

The Illinois EPA Section 319 Grant Program funds projects that address water quality issues relating directly to nonpoint source pollution. Grant funds can be used for the implementation of Illinois EPA-approved watershed-based plans, including the development of information/education programs and the implementation of BMPs. Applications for Section 319(h) grant funds are accepted on an annual basis. More information can be found online at:

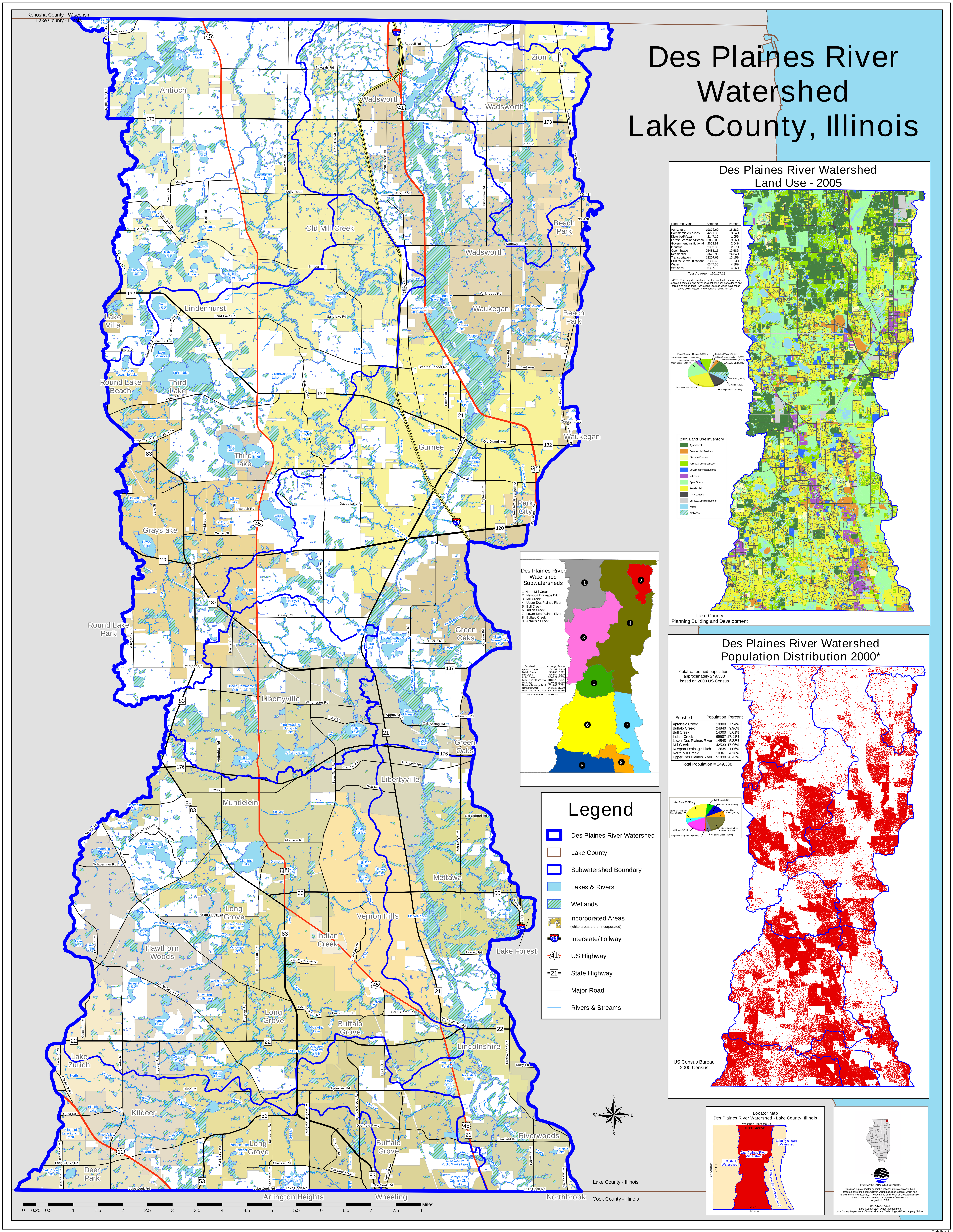
http://www.epa.illinois.gov/topics/water-quality/watershed-management/nonpointsources/faqs/index

The NRCS Conservation Reserve Program (CRP) provides funding to farmers to comply with environmental laws, enhance the environment, and resolving soil, water and natural resource concerns. Farmers under contract receive annual payment or cost sharing can be arranged. More information can be found online at:

https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/?cid=stelprdb1041269

Exhibit 1

Des Plaines River Watershed



Land Use Class	Acreage	Percent
Agricultural	19876.60	15.28%
Commercial/Services	4221.33	3.24%
Disturbed/Vacant	2147.19	1.65%
Forest/Grassland/Beach	12833.00	9.86%
Government/Institutional	2653.91	2.04%
Industrial	2953.05	2.27%
Open Space	25481.15	19.58%
Residential	31672.98	24.34%
Transportation	13207.69	10.15%
Utilities/Communications	2385.60	1.83%
Water	6347.56	4.88%
Wetlands	6327.12	4.86%

Total Acreage = 130,107.18

Subshed	Acreage	Percent
Aptakisic Creek	4041.52	3.11%
Buffalo Creek	8799.09	6.76%
Bull Creek	7152.64	5.50%
Indian Creek	24503.52	18.83%
Lower Des Plaines River	11636.78	8.94%
Mill Creek	20107.36	15.45%
Newport Drainage Ditch	5018.07	3.86%
North Mill Creek	14432.23	11.09%
Upper Des Plaines River	34415.97	26.45%

Total Acreage = 130107.18

Subshed	Population	Percent
Aptakisic Creek	19800	7.94%
Buffalo Creek	24840	9.96%
Bull Creek	14000	5.61%
Indian Creek	69587	27.91%
Lower Des Plaines River	14548	5.83%
Mill Creek	42533	17.06%
Newport Drainage Ditch	2639	1.06%
North Mill Creek	10361	4.16%
Upper Des Plaines River	51030	20.47%

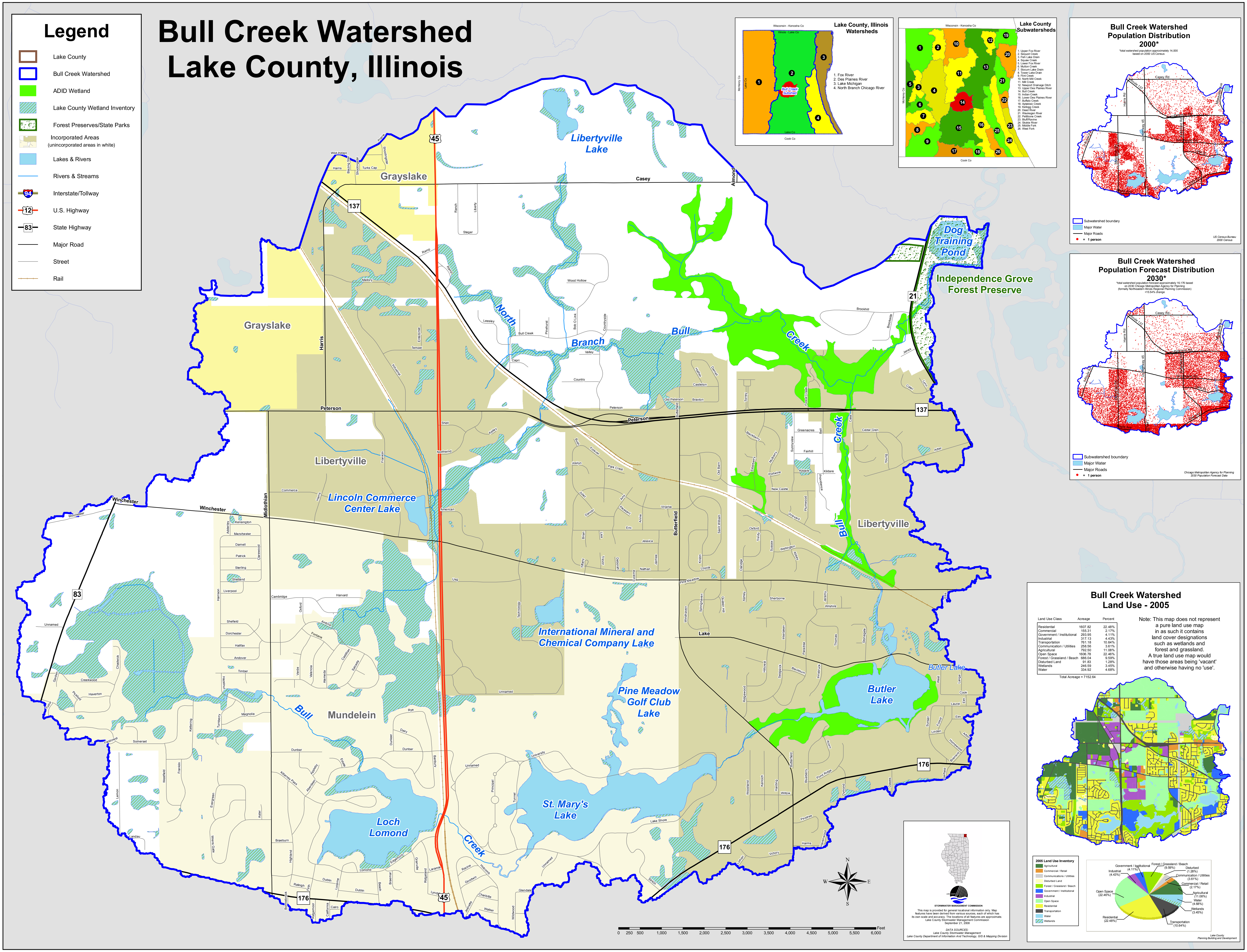
Total Population = 249,338

Exhibit 1

Exhibit 2

Bull Creek Watershed

Bull Creek Watershed
Lake County, Illinois



Bull Creek Watershed Land Use - 2005

Land Use Class	Acreage	Percent
Residential	1607.82	22.48%
Commercial	155.31	2.17%
Government / Institutional	293.95	4.11%
Industrial	317.13	4.43%
Transportation	761.18	10.64%
Communication / Utilities	258.56	3.61%
Agricultural	792.50	11.08%
Open Space	1606.78	22.46%
Forest / Grassland / Beach	686.04	9.59%
Disturbed Land	91.83	1.28%
Wetlands	246.59	3.45%
Water	334.92	4.68%

Total Acreage = 7152.64

Note: This map does not represent a pure land use map in as such it contains land cover designations such as wetlands and forest and grassland. A true land use map would have those areas being 'vacant' and otherwise having no 'use'.

Exhibit 2

Exhibit 3

Lake County Health Department Land Use

Prepared by:

Hey and Associates, Inc.

Engineering, Ecology and Landscape Architecture

Scale:

0 600 1,200 Feet

Project Number: 17-0032

Orientation:

Date: 5/16/2018

Legend:

- Watershed (provided by Lake County)
- Flowlines (clipped from the National Hydrography Dataset, refined by Hey using aerial imagery and Lake Co Inlet Map)

Land Use (provided by Lake County):

- Agricultural
- Forest and Grassland
- Government and Institutional
- Industrial
- Multi Family
- Public and Private Open Space
- Retail/Commercial
- Single Family
- Transportation
- Water
- Wetlands

Project Name:

Loch Lomond Management Plan

Prepared For:

Loch Lomond Property Owners Association

Information about exhibit:

Lake Co provided Watershed and Land Use

Exhibit Title:

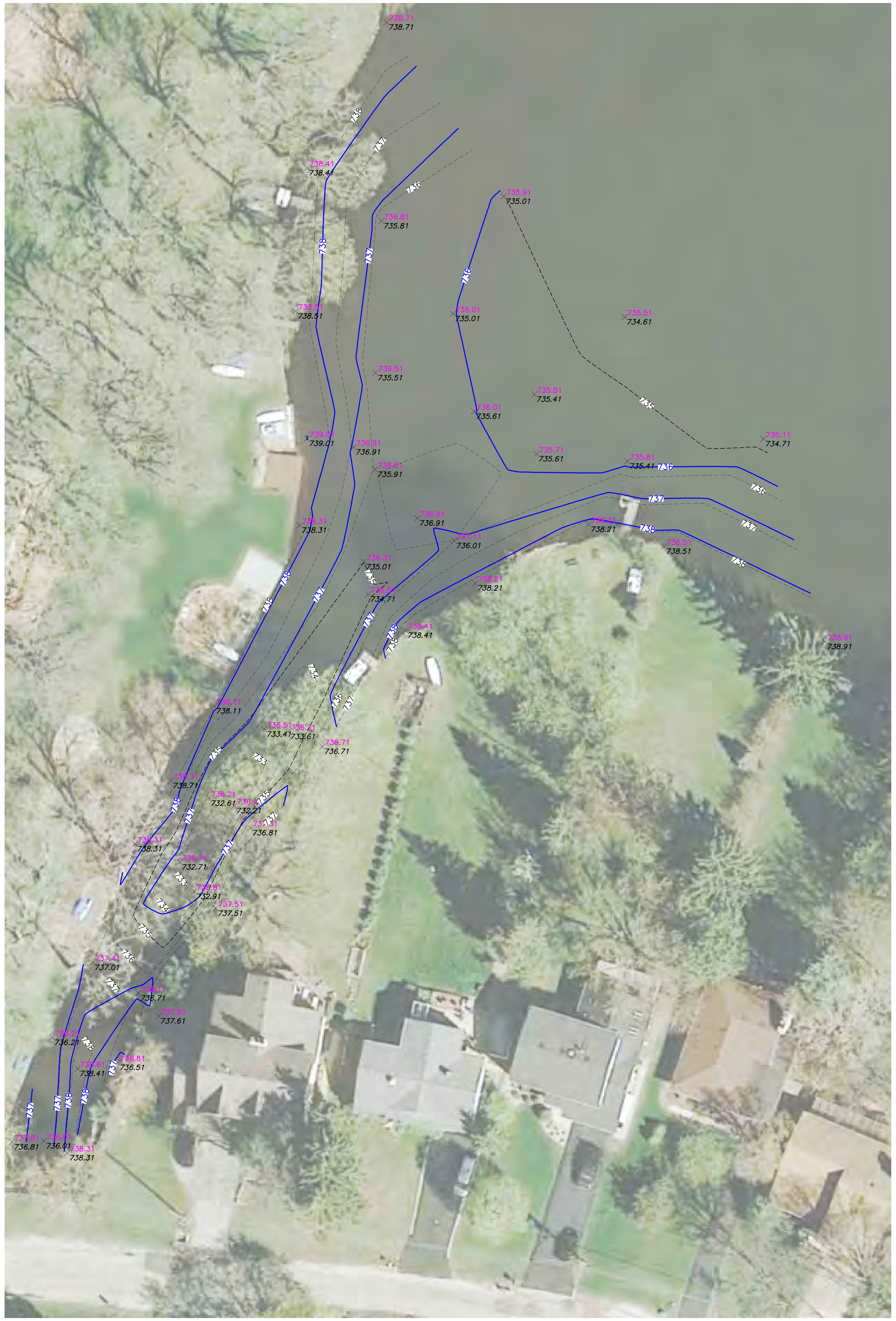
Loch Lomond Watershed Land Use (2015)

Exhibit:

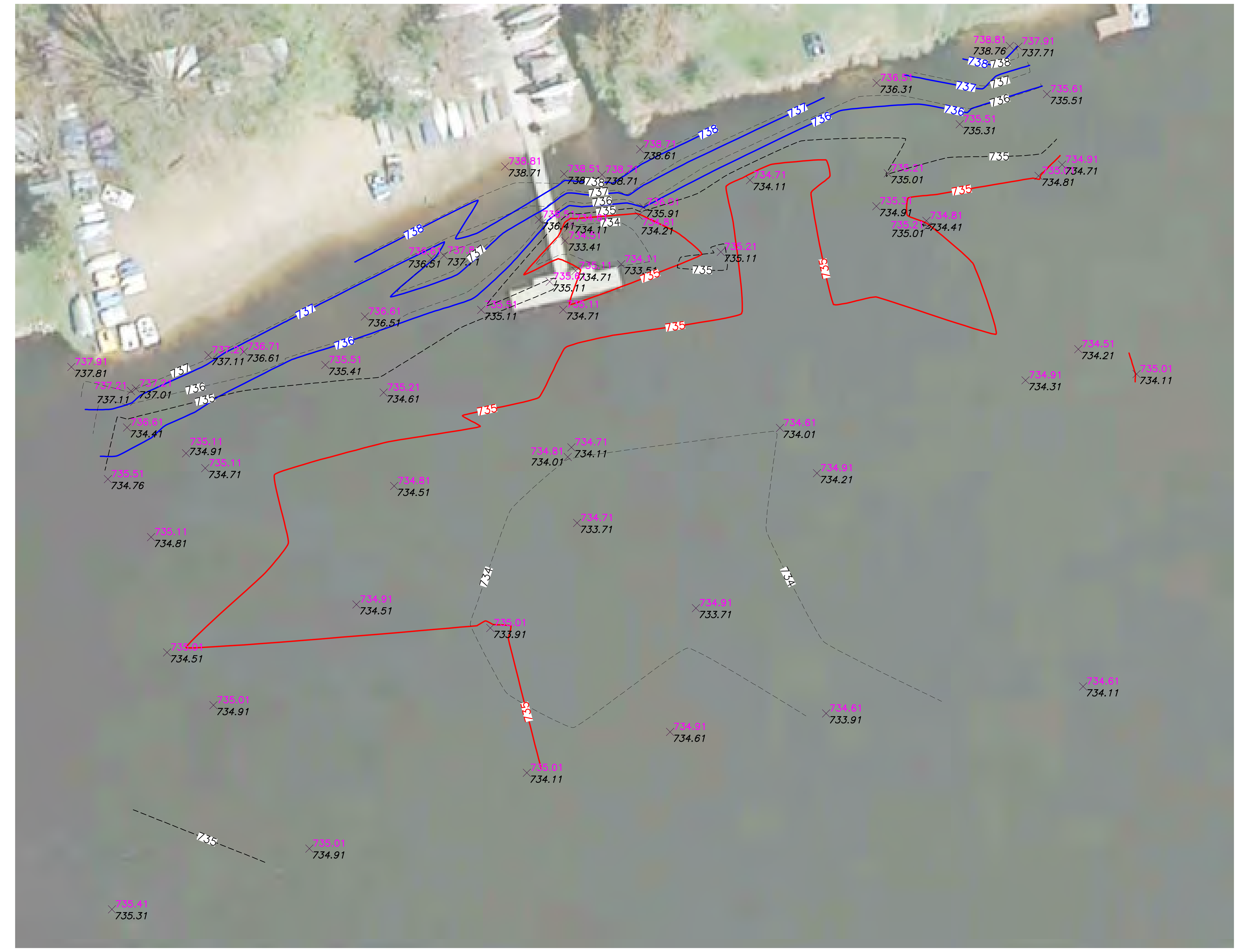
3

Exhibit 4

Bathymetry 1



1 Inlet 1



2 North Beach

0 30 60
Scale in Feet

N

LEGEND

Soft Sediment Contours

Hard Bottom Contours

771.37 Soft Sediment Spot Elevation
770.77 Hard Bottom Spot Elevation

Inlet 1
Soft Sediment Total Volume = 1,234.55 CY

North Beach
Soft Sediment Total Volume = 1,199.43 CY

No.	Revision/Issue	Date

Hey and Associates, Inc.
Engineering, Ecology and Landscape Architecture
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Volo, Illinois 60073
Office (847) 740-0888
Fax (847) 740-2888
Volo@Heyassoc.com

Professional Design Firm
License No. 184.002429

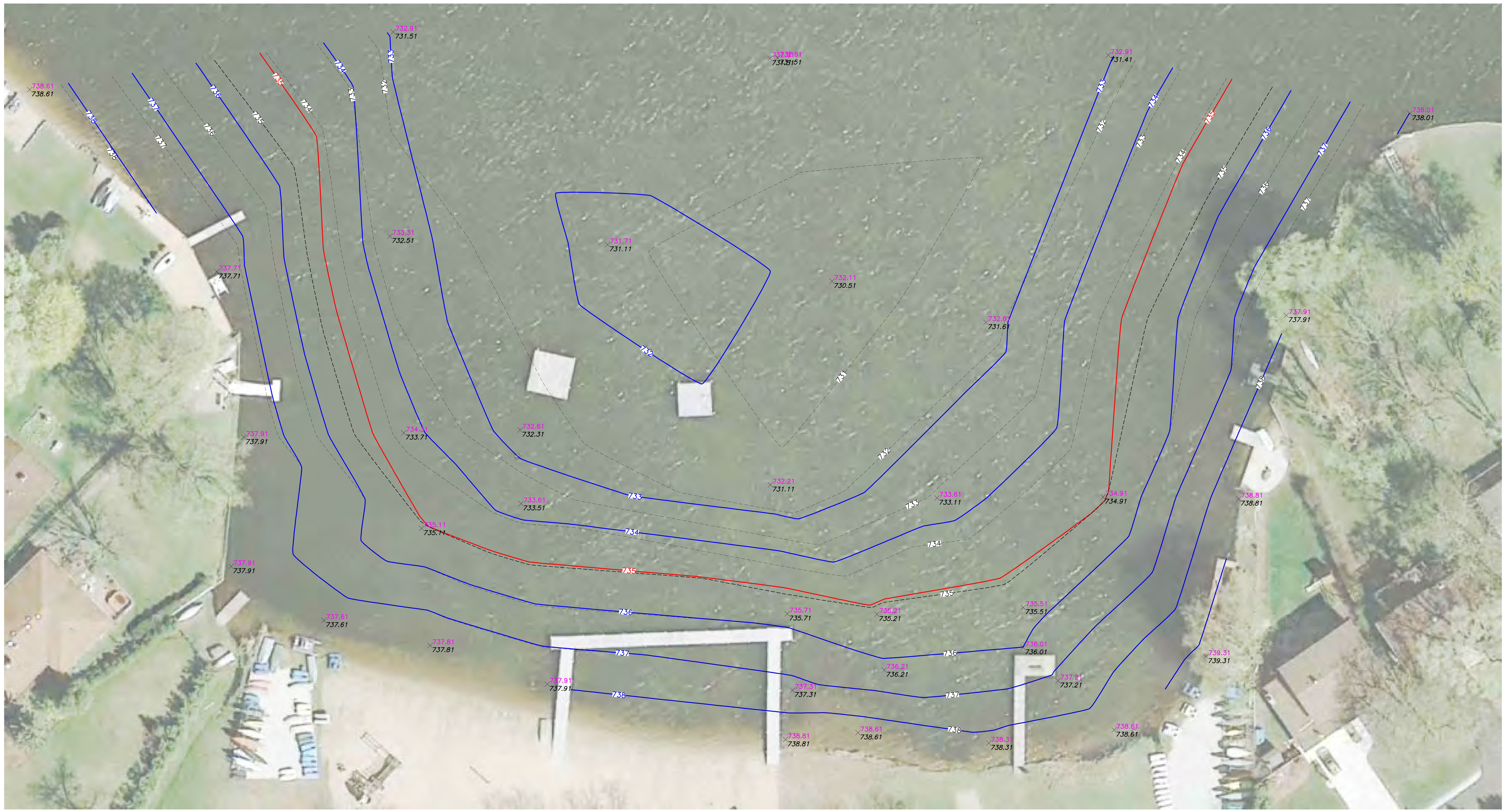
Loch Lomond
Mundelein, Illinois

Bathymetric Survey
Inlet 1 and North Beach

PROJECT NO:	17-0032	DRAWING NO:
DESIGNED BY	JJH	4
DRAWN BY	CFR	
CHECKED BY	VJM	
APPROVED BY		SHEET NO:
ISSUE DATE	11/07/2017	1 OF 2

Exhibit 5

Bathymetry 2



① South Beach

0 30 60

Scale in Feet

N

LEGEND

Soft Sediment Contours

Hard Bottom Contours

771.37 Soft Sediment Spot Elevation
770.77 Hard Bottom Spot Elevation

South Beach
Soft Sediment Total Volume = 3,632.08 CY

No.	Revision/Issue	Date

Hey and Associates, Inc.
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Professional Design Firm
License No. 184.002429

Loch Lomond
Mundelein, Illinois

Bathymetric Survey
South Beach

PROJECT NO:	17-0032	DRAWING NO:	5
DESIGNED BY	JJH		
DRAWN BY	CFR		
CHECKED BY	VJM		
APPROVED BY		SHEET NO:	
ISSUE DATE	11/07/2017	2 OF 2	

Exhibit 6

Shoreline Erosion

Prepared by:

Hey and Associates, Inc.

Engineering, Ecology and Landscape Architecture

Scale:

0 300 Feet

Project Number: 17-0032

Orientation:

Date: 5/16/2018

Legend:

- None - Minimal Erosion
- Minor - Intermediate Erosion
- Major Erosion

Project Name:

Loch Lomond

Prepared For:

Loch Lomond Property Owners Association

Aerial Date:

2015

Exhibit Title:

Shoreline Erosion

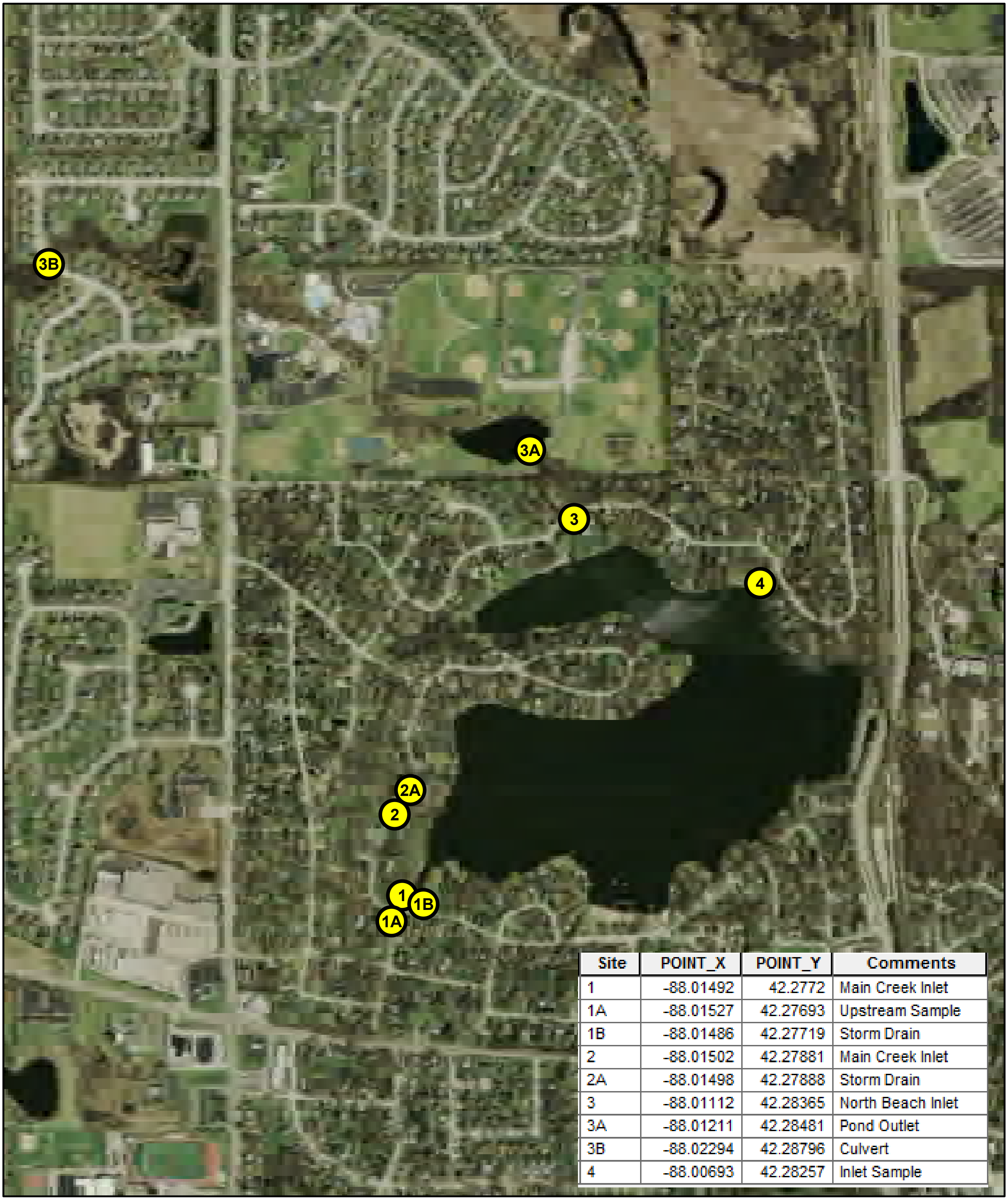
Exhibit:

6

Exhibit 7

Sampling Locations

Loch Lomond Sampling Sites 2016-2017



Site	POINT_X	POINT_Y	Comments
1	-88.01492	42.2772	Main Creek Inlet
1A	-88.01527	42.27693	Upstream Sample
1B	-88.01486	42.27719	Storm Drain
2	-88.01502	42.27881	Main Creek Inlet
2A	-88.01498	42.27888	Storm Drain
3	-88.01112	42.28365	North Beach Inlet
3A	-88.01211	42.28481	Pond Outlet
3B	-88.02294	42.28796	Culvert
4	-88.00693	42.28257	Inlet Sample

N
W E
S

0 350 700 1,050 1,400
Feet

Ecological Services
Product Number LLM17
Revised 05/2017

Exhibit 7

Exhibit 8

Potential Improvements

Prepared by:

Hey and Associates, Inc.

Engineering, Ecology and Landscape Architecture

Scale:

0 600 1,200 Feet

Project Number: 17-0032

Orientation:

Date: 5/16/2018

Legend:

Potential Improvement

Project Locations

Updated Loch Lomond Watershed 2017

Project Name:

Loch Lomond Management Plan

Prepared For:

Loch Lomond Property Owners Association

Information about exhibit:

Updated Watershed derived from 2017 Des Plaines River Watershed Study

Exhibit Title:

Potential Improvements Projects

Exhibit:

8

Exhibit 9

IDNR Fisheries Survey

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Illinois Department of
Natural Resources

One Natural Resources Way Springfield, Illinois 62702-1271
www.dnr.illinois.gov

Bruce Rauner, Governor
Wayne A. Rosenthal, Acting Director

December 20, 2016

Dear Mr. Chesek,

Please feel free to pass this information around and bring it to the Lake Committee for their information. Enclosed is a brief summary of the work we did on Loch Lomond this year. The report is organized in a more condensed, fishermen friendly format compared to past reports and is the method the IDNR is using to pass along survey information. If you have specific questions, please feel free to contact me.

These data are snapshots of the fishery on the day we were there. Variation exists relative to the sampling season, fish sizes, their habits as well as the gear type and some water quality parameters. Keep in mind these are not the only fish that inhabit your lake, just the ones we happened to come across and collect when we were there. We tend to collect the most common sizes of the most common species. We collect all predator fish we can and try to collect representative size groups of bluegills (we're most interested in their maximum size) so trends can be seen in this predator/prey relationship.

In Loch Lomond, we saw a pretty large drop off in the abundance of larger size fish (those between 13" and 14", see the bass abundance graph). Our catch rate was high at 172 fish per hour, reproduction was good (83 of the 172 bass were < 8" long) and survival beyond their first year was good (89 fish were > 8"). Over all, the fishery would be considered "balanced" because there are plenty of mature fish (those > 12") capable of maintaining the fishery with natural reproduction but it appears fish are either being harvested between 13" and 14" long or growth rates are slowing near that size range and they're beginning to stockpile. When fish stockpile, the abundance of a certain size group of fish creates a scarcity of food for that group and the two combine to slow growth rates. Stunting usually occurs near the size fish first become sexually mature, in largemouth bass that's around 12" long. If you notice stockpiling slip toward the 12" mark from where it is today (between 13" and 14") then stunting will be confirmed and some harvest will need to take place so a natural die off does not occur. Some fish always survive natural die offs but abundance drops pretty precipitously and the lack of predation opens up a chance for less desirable fishes to flourish.

We collect as many size groups of bluegill as we can (not necessarily every bluegill) so we can detect their maximum size. Bluegill almost never have a problem with natural reproduction because they can spawn 2 to 3 times per summer, while most other fish spawn only once per year. A balanced bass fishery (good size diversity) has the ability to contain bluegill reproduction so they don't stunt (first maturity around 6" long) and there is enough food for fish to grow quickly and reach the 8" length most fishermen like to catch. We did collect 8" bluegill which usually suggests enough predation but the number of bluegills 8" long was a little low relative to our expectations so looking at the whole picture, more size diversity in the bass fishery would likely help "grow" more large bluegills by reducing the number of small bluegill in the lake. A lot of bass and good size diversity in the bass population is key. Changes are relatively slow; 3 to 4 years once an action is taken to manipulate a population so don't expect immediate results. Fish take time to grow! The other side of the coin is that we have seen situations where, in the fall, large bluegill were caught by fishermen once water temperatures dropped a little but were missed by our electrofishing gear because they were still living offshore and away from where we were sampling: An obvious case of sampling error! If your fishermen report good numbers of larger size bluegill in their creel, then the above may have been the case.

We've removed about 3662 pounds of carp biomass from Loch Lomond over the past couple of visits. Most of the carp are large to very large (up to 28 lbs.) so although the numbers of carp removed hasn't been large (n = 230 fish) the fish were. Carp root around in the bottom's soft sediments searching for invertebrates and re-suspend small clay/mud particles which reduces light penetration and impacts the ability of plants to grow. Our goal in reducing carp abundance is to reduce sediment re-suspension and increase light penetration so plants can grow. The drawback to light penetration is that, plants grow. Over treating vegetation causes a similar problem to no vegetation; soft sediments become re-suspended, algae blooms occur and the water turbid. The cycle can be vicious when searching for clear water. Please consult the Lake County Health Department – Lakes Management Unit for ways to find a balance.

If you have questions, need interpretation, or would like to discuss any part of the report please feel free to call.

Sincerely,

Frank Jakubicek – IDNR
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