

**2001 SUMMARY REPORT
of
POND-A-RUDY**

Lake County, Illinois

Prepared by the

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LAKE IDENTIFICATION AND LOCATION

Lake Name: Pond-A-Rudy

State: IL

County: Lake

Nearest Municipality: Mundelein

Township/Range: T43N, R10E, Section 3

Basin Name: Des Plaines River

Subbasin Name: Indian Creek

Major Tributaries: None

Receiving Water Bodies: Bresen Lake

Surface Area: 13.9 acres

Shoreline Length: 0.7 miles

Maximum Depth: 2.0 feet

Mean Depth: 1.0 feet

Storage Capacity: 13.9 acre-feet

Lake Type: Dammed slough - 1946

Watershed Area: 61 acres (Approx.)

BRIEF HISTORY OF POND-A-RUDY

In 2000, the Lake County Health Department - Lakes Management Unit (LMU) conducted a full limnological analysis of Bresen Lake, which receives water from Pond-A-Rudy. The LMU had very little information regarding Pond-A-Rudy and were uncertain of its quality and how this was effecting waters down stream. As a result, it was decided that Pond-A-Rudy would be included in the LMU's 2001-baseline study of the County lakes. The only historical information that the LMU had on PAR was from an Illinois Department of Conservation (now the Department of Natural Resources) report from 1972. In this Lake County surface water inventory, Pond-A-Rudy is described as a slough that was dammed in 1946 flooding the surrounding area and created a lake. The report states that it had a maximum depth of 9.5 feet with an average depth of 2.5 feet. In 1963 it experienced a severe winter fish kill due to low dissolved oxygen concentrations and its shallow nature. The lake was restocked in 1965 with bluegill, crappie, and northern pike. However at that time, the population was already dominated by species that are tolerant of low dissolved oxygen conditions, such as carp and green sunfish. In 2001, this description did not quite fit what LMU staff found. Currently, Pond-A-Rudy has a maximum depth of 2.0 feet (compared to 9.5 feet in the 1972 report). One explanation of this significant difference in depth could be the dam. In 2001, LMU staff found no intact dam (the remains of the dam were found). The removal of this dam would have significantly changed the depth and surface area of the lake. The 1972 report states that the surface area of Pond-A-Rudy is 21.2 acres. Using ArcView geographical information system (GIS) and digital aerial photography we found that the current surface area of Pond-A-Rudy is 13.9 acres. The removal of the dam may not account for all of the depth change. Sedimentation may also account for some of the depth loss. LMU staff reported very thick aquatic and wetland plant growth, which can significantly contribute to the sedimentation of a lake. It is highly likely that after the dam was removed, Pond-A-Rudy became shallow, filled in with vegetation, and then reverted to its original state.

LIMNOLOGICAL DATA – WATER QUALITY

In shallow bodies of water, such as Pond-A-Rudy, two surface samples are usually collected, one at the inlet and one at the outlet. Since Pond-A-Rudy has no distinguishable inlet (just a small creek that enters a wetland areas on the southwest side) only one surface sample was collected from a central location in the lake (Figure 1). However, due to extreme water fluctuations these samples were collected approximately 40 –50 feet from shore during July, August, and September. Water levels in May and June remained stable. From June to July, water level dropped approximately 20 inches. As a result, Pond-A-Rudy was unnavigable by canoe and samples were taken by wading into the water during the rest of the study (July, August, and September). LMU staff returned to Pond-A-Rudy in October and found that Pond-A-Rudy returned to spring levels due to fall rains. LMU staff found that the main input into the lake is from a stormwater pipe that collects runoff from an adjacent business complex and that Pond-A-

Rudy's immediate watershed is small (Figure 2). This, combined with the fact that Pond-A-Rudy is at the top of its drainage basin explains why Pond-A-Rudy almost went dry during the summer months. Overall, Pond-A-Rudy has *poor* water quality. Due to its extremely shallow nature this is not surprising. Often, wetlands improve water quality. While this is true in some cases it does not apply to all wetlands, including Pond-A-Rudy. However, just because Pond-A-Rudy has poor water quality, it still has great value as a wildlife area. Below is a discussion of highlights from the complete data set for Pond-A-Rudy (*Table 1, Appendix A*).

Average dissolved oxygen (D.O.) concentrations during the 2001 study was 9.74 mg/L, which is above the concentration needed to support aquatic life is ≥ 5.0 mg/L. However, D.O. concentrations were not homogenous throughout the study. D.O. was as high as 14.81 mg/L in June and as low as 4.31 mg/L in July. These fluctuations can be attributed to variations in aquatic plant growth. During May and June, Pond-A-Rudy had thick aquatic plant growth, which produces oxygen as a byproduct of biological processes (photosynthesis). By July, Pond-A-Rudy had become dominated by *Euglenoid* algae growth, which can form thick surface scums that can block light from reaching submersed vegetation. Without light this vegetation can not live and starts to decompose. This is an oxygen consuming process, thus D.O. concentrations drop. Furthermore, D.O. concentrations fluctuate on a daily basis, with concentrations highest during the day because of photosynthesis (an oxygen producing process) and lowest at night/early morning due to respiration (an oxygen consuming process). In a shallow, highly vegetated system such as Pond-A-Rudy, these differences between day and night D.O. concentrations can be extreme. By August the algae scum had subsided and aquatic plant growth resumed and as a result the D.O concentration rebounded. Normally, monthly and daily fluctuations are a concern for fishery health. However, since Pond-A-Rudy has been experiencing D.O. problems for decades, even when it was much deeper, there is not much of a fishery to be concerned about. Past IDOC records note the dominance of fish species that are tolerant of low D.O. conditions, such as carp and green sunfish. Since Pond-A-Rudy is so shallow it probably freezes through during the winter, which would kill most fish that could not find refuge in the adjoining creek and nearby Bresen Lake.

The shallow depth of Pond-A-Rudy brought about many other water quality problems. Since Pond-A-Rudy is so shallow, wind action as well as wildlife activities can easily disturb the bottom sediment. As the summer progressed and Pond-A-Rudy became shallower, the concentrations of different types of solids substantially increased starting in July (*Table 1, Appendix A*). In 2001, average total suspended solids (TSS), which is a measurement of suspended organic and inorganic particles, was 26 mg/L. This is substantially higher than the Lake County median of 5.7 mg/L. TSS increased by a factor of 50 from June to July (1.1 mg/L to 50.2 mg/L, respectively). The extreme increase in TSS is not completely due to the resuspension of bottom sediment. Starting in July, Pond-A-Rudy began experiencing nuisance algae blooms. Since TSS measures both inorganic and organic particles (algae), the increase in these blooms would explain the increase from June to July. Furthermore, total volatile solids (TVS), which is a measurement of suspended organic matter such as algae; also substantially increased from June to July further reinforcing the impact of the algae blooms.

Algae need light and nutrients, most importantly carbon, nitrogen (N) and phosphorus (P), to grow. Light and carbon are not normally in short supply (limiting). This means that nutrients (N&P) are usually the limiting factors in algal growth. Pond-A-Rudy's average phosphorus concentration in 2001 was 0.151 mg/L, which is four times higher than the Lake County median value of 0.04 mg/L. As with TSS and TVS, the phosphorus concentration in July (0.222 mg/L) was five times higher than June (0.038 mg/L), and remained elevated the remainder of the 2001 study. Ammonia nitrogen (NH₃-N) and nitrate nitrogen (NO₃-N) were nondetectable the entire study. This was due to uptake by algae. Total Kjeldahl Nitrogen (TKN) was present throughout the study, with concentrations significantly increasing in July. Since TKN is a measurement of organic forms of nitrogen, an increase in algae growth, which is an organic source, causes an increase in TKN.

To compare the availability of these nutrients, a ratio of total nitrogen to total phosphorus is used (TN: TP). Ratios <10:1 indicate nitrogen is limiting. Ratios of >15:1 indicate phosphorus is limiting. Ratios >10:1, <15:1 indicate that there is enough of both nutrients for excessive algal growth. Most lakes in Lake County are phosphorus limited. Pond-A-Rudy had an average TN:TP ratio of 11:1. However, as with many other water quality parameters, the N:P ratio varied from month to month with a sharp change starting in July. During May and June, Pond-A-Rudy was phosphorus limited with high plant densities and low nutrient concentrations preventing algal blooms. In July Pond-A-Rudy become nitrogen limited (10:1). This was due to an increase in phosphorus concentrations and low nitrogen concentrations. In August, Pond-A-Rudy returned to a moderate ratio of 13:1 but by September Pond-A-Rudy had again become a nitrogen-limited system (7:1).

Another way to look at nutrient concentrations and how they affect productivity of a lake is the use of a Trophic State Index (TSI) based on the average phosphorus concentration. TSI can be based on phosphorus, chlorophyll *a*, and Secchi disk depth to classify and compare lake productivity levels (trophic state). The phosphorus TSI is setup so the higher the phosphorus concentration the greater amount of algal biomass and as a result, a higher trophic state. Based on a TSI phosphorus value of 76.6, Pond-A-Rudy is classified as hypereutrophic (≥ 70 TSI). This means that Pond-A-Rudy is a highly productive system that has excessive nutrient levels and high algal biomass (growth). Field observations reinforce that Pond-A-Rudy is *hypereutrophic*. For comparison, most lakes in the County are *eutrophic* (TSI values $\geq 50 < 70$). Out of all the lakes in Lake County studied by the LMU since 1988, Pond-A-Rudy ranks 94 out of 102 lakes based on average phosphorus TSI (*Table 2, Appendix A*).

TSI values along with other water quality parameters can be used to make other analyses of Pond-A-Rudy based on water quality standards and use impairment indexes established by the Illinois Environmental Protection Agency (IEPA). Using 2001 LMU water quality data, Pond-A-Rudy is listed as having several water quality standard violations. These include violations based on high phosphorus concentrations, high pH, low D.O., high concentrations of suspended solids, and noxious growth of aquatic plants. Based on the IEPA Swimming Use Impairment index, Pond-A-Rudy is categorized as

providing *Nonsupport*. Under the recreational use impairment index, Pond-A-Rudy was also categorized as providing *Nonsupport*. This is due to a high TSI value and high levels of suspended sediment, both of which result in poor visibility and contribute to an overall reduction in use of the lake. However, considering Pond-A-Rudy's shallow, wetland nature these nonsupport rankings are not major concerns. In the case of Aquatic Life Use Impairment index, Pond-A-Rudy was categorized as providing *Partial* support. This partial ranking is due to excessive aquatic plant growth and high concentrations of suspended sediment. Based on the above use impairment indexes, Overall Use Impairment index for Pond-A-Rudy is listed as *Nonsupport*.

LIMNOLOGICAL DATA - AQUATIC PLANT ASSESSMENT

A healthy aquatic plant population is critical to good lake health. Aquatic plants provided many water quality benefits such as sediment stabilization. Additionally, aquatic vegetation provides important wildlife habitat and food sources. Based on a floristic quality index (FQI) Pond-A-Rudy has slightly below average aquatic plant diversity. FQI is a rapid assessment metric designed to evaluate the closeness that the flora of an area is to that of undisturbed conditions. It can be used to: 1) identify natural areas, 2) compare the quality of different sites or different locations within a single site, 3) monitor long-term floristic trends, and 4) monitor habitat restoration efforts (Nichols, 1999). Each submersed and floating aquatic plant species (emergent shoreline species were not counted) in the lake is assigned a number between 1 and 10 (10 indicating the plant species most sensitive to disturbance). Nonnative species were also utilized in the FQI calculations for Lake County lakes. These numbers were then averaged and multiplied by the square root of the number of species present to calculate an FQI. A high FQI number indicates that there are a large number of sensitive, high quality plant species present in the lake. During the 2001 study, Pond-A-Rudy had an FQI of 12.1. The Lake County average FQI for 2000-2001 was 14.0.

Due to extremely low water levels, surveys of Pond-A-Rudy were only conducted in May and June (Table 3). Additionally, shoreline plants of interest were also observed (Table 3). However, no surveys were made of these shoreline species and all data is purely observational. In May, there were only three species found and these three covered 100% of the surface area of Pond-A-Rudy. In June, seven species (including the macroalga *Chara*) were found and they too covered 100% of the surface area. It is unknown if the number of species increased in future months. However, visual observations confirm surface coverage remained at 100% throughout the study. Starting in July, Pond-A-Rudy experienced nuisance *Euglenoid* algae blooms. This genus of alga thrive in waters containing high organic matter, such as Pond-A-Rudy, and may form red scums when the blooms are intense enough. In both July and August, these blooms were severe enough to cause red scums. As stated previously, these dense blooms negatively impacted the submersed vegetation, which caused a drastic increase in TP, TVS, and TSS and an overall decrease in Pond-A-Rudy's water quality.

Table 3. Aquatic and shoreline plants on Pond-A-Rudy, May-June 2001.

Aquatic Plants

Chara (macroalga)

Coontail

Common Duckweed

Elodea

Curlyleaf Pondweed

Leafy Pondweed

Sago Pondweed

Chara sp.

Ceratophyllum demersum

Lemna minor

Elodea canadensis

Potamogeton crispus

Potamogeton foliosus

Stuckenia pectinatus

Shoreline Plants

Silver Maple

Reed Canary Grass

Water Smartweed

Cottonwood

Common Buckthorn

Common Arrowhead

Weeping willow

Common Bur-Reed

River Bulrush

Softstem Bulrush

Common Cattail

Acer saccharinum

Phalaris arundinacea

Polygonum coccineum

Populus deltoides

Rhamnus cathartica

Sagittaria latifolia

Salix babylonica

Sparganium eurycarpum

Scirpus fluviatilis

Scirpus validus

Typha latifolia

LIMNOLOGICAL DATA – SHORELINE ASSESSMENT

A shoreline assessment was conducted on October 18, 2001 after Pond-A-Rudy had returned to navigable levels. Shorelines were assessed for a variety of criteria (*Appendix B* for methodology). Based on this assessment, several important generalizations can be made. A large majority of Pond-A-Rudy's shoreline is undeveloped (95%). This undeveloped shoreline is made up of woodlands (72%) and cattail wetland (28%). There is only one house on Pond-A-Rudy and its adjacent shoreline was left undisturbed and now serves as a well established buffer strip approximately 184 feet long and 10-15 feet wide (Figure 3).

The assessment also noted the presence of shoreline erosion. In 2001, 95% of Pond-A-Rudy's shoreline was assessed as having no form of erosion. This is due to Pond-A-Rudy's undeveloped nature and the presence of quality shoreline types such as wetlands and woodlands, which help to deter erosion. In many areas, several higher quality plant species were noted, such as common arrowhead, river bulrush, and common bur-reed. There was *slight* erosion on only 5% of Pond-A-Rudy's shoreline, which interestingly was the developed portion of the shoreline. However, the slight erosion on this parcel was intermittent and could easily be rectified by the landowner by planting native, deep-rooted emergent vegetation within the buffer and removing nuisance species such as buckthorn.

LIMNOLOGICAL DATA – WILDLIFE ASSESSMENT

Wildlife observations were made on a monthly basis during water quality and plant sampling activities. Wildlife habitat is by far Pond-A-Rudy's best attribute. As stated previously in this report, 95% of Pond-A-Rudy's shoreline is undeveloped. There are healthy populations of mature trees that provide good habitat for a variety of bird species. There are also a few large stands of dead trees and deadfall that provide excellent habitat. Additionally, there are expansive woodland areas that provide habitat for smaller bird and mammal species. Several types of waterfowl were observed during the course of the study including the black-crowned night heron, which is a State of Illinois endangered species (Table 4). One reptile species was also noted, a snapping turtle that measured 16.5 inches across.

Although no surveys were done of the fishery, it can be assumed that it is almost nonexistent. Past surveys done by the Department of Natural Resources found the fishery to be in poor condition even when Pond-A-Rudy was much deeper. These reports state that Pond-A-Rudy was susceptible to winter fish kills due to low D.O. concentrations and freeze through. This would be especially true now since Pond-A-Rudy is only 2.0 feet deep. Some smaller fish may be able to find winter refuge in the adjoining creek leading to Bresen and return to Pond-A-Rudy during spring/summer months. However, the possibility of finding any high quality species is minimal.

**Table 4. Observed wildlife species on Pond-A-Rudy,
May – September 2001.**

<u>Birds</u>	
Canada Goose	<i>Branta canadensis</i>
Mallard	<i>Anas platyrhynchos</i>
Ring-billed Gull	<i>Larus delawarensis</i>
Great Egret	<i>Casmerodius albus</i>
Great Blue Heron	<i>Ardea herodias</i>
Green Heron	<i>Butorides striatus</i>
Blackcrown Night Heron	<i>Nycticorax nycticorax</i>
American Kestrel	<i>Falco sparverius</i>
Barn Swallow	<i>Hirundo rustica</i>
Cedar Waxwing	<i>Bombycilla cedrorum</i>
American Crow	<i>Corvus brachyrhynchos</i>
Marsh Wren	<i>Cistothorus palustris</i>
Red Wing Black Bird	<i>Agelaius phoeniceus</i>
<u>Mammals</u>	
Raccoon	<i>Procyon lotor</i>
Muskrat	<i>Ondatra zibethicus</i>
<u>Amphibians</u>	
Snapping Turtle	<i>Chelydra serpentina</i>

There are two invasive plant species (reed canary grass and buckthorn) found along Pond-A-Rudy's shoreline that can have negative impacts on the habitat and should be controlled/eliminated (if possible). These two species were found along all of Pond-A-Rudy's shoreline. These plants are seldom used by wildlife for food or shelter. Unfortunately, much of the woodland shoreline is already dominated by buckthorn and the reed canary grass is already well established in the wetland on the southwestern end of Pond-A-Rudy. On a more encouraging note, LMU staff found no purple loosestrife, which is a highly noxious wetland invasive plant, at Pond-A-Rudy in 2001.

EXISTING LAKE QUALITY PROBLEMS

Pond-A-Rudy is a quality wetland and is best used as a wildlife area and is not well suited for anything else. Pond-A-Rudy should be left alone and little could be done from a management standpoint to improve upon current conditions except for the elimination of invasive species. The best management strategy for this type of system is to maintain current quality and limit the impacts from external sources. This task is made easier by the fact that Pond-A-Rudy has a small watershed and most of the land around Pond-A-Rudy is not suited for development. However, Pond-A-Rudy should be monitored in the future to ensure that this valuable quality habitat is not lost. Listed below are the main problems on Pond-A-Rudy.

- *Low Dissolved Oxygen*

Due to the shallow morphometry and massive biological and chemical oxygen demand during summer months, Pond-A-Rudy experiences low dissolved oxygen levels. These low D.O. concentrations are cyclic, with lowest D.O. occurring at night/early morning. However, July D.O. concentrations were low during the day. This means that D.O. concentrations at night during this period may have been extremely low. Low D.O. levels can cause fish stress and if continual, stress can eventually lead to fish mortality. Historically, Pond-A-Rudy Lake has experienced fish kills due to low D.O.. If Pond-A-Rudy still contained any fish, it would still be experiencing fish kills. If some fish do survive then there is a high risk of mortality due to winter freeze through. Low D.O. concentrations and freeze through has led to a nonexistent/very poor quality fishery. However, this is not a major concern considering Pond-A-Rudy's undeveloped wetland nature where sport fishing is not and should not be a consideration.

- *Excessive Aquatic Vegetation*

From a plant/algae management standpoint it is advisable that Pond-A-Rudy be left alone. This is largely due to the usage of the site versus the cost of management. Pond-A-Rudy is a shallow wetland and consequently has several problems, in particular excessive plant/algae growth. More than likely these problems have plagued Pond-A-Rudy for decades. Furthermore, without very intensive management, these problems will continue. Even with intensive management it is possible that the reduction of the plant problem could bring about a more severe algae problem (and visa-versa). However, this well-established plant community provides excellent habitat and is also a valuable food source for wildlife such as waterfowl.

- *Invasive Species*

Two exotic invasive species that are found along Pond-A-Rudy's shoreline that are of concern are buckthorn and reed canary grass. Both of these species provide minimal food or habitat benefit to wildlife. Furthermore, both species are extremely aggressive and have displaced desirable, native vegetation. If ignored, further loss of quality food and habitat will occur. A control program would be a major undertaking considering the extent of the infestation. However, this problem is only going to get worse. Another possible area of concern is the cattails and possibility of further encroachment and displacement of desirable species such as arrowhead.