

AFFECTED ENVIRONMENT

Historical Setting

Pre-impoundment conditions (before 1851)

Before construction of the Indianford dam Lake Koshkonong was a deepwater marsh with abundant and diverse emergent vegetation. There are observations such as recorded by Fifield (Fifield 1904) who reported that in 1837 his boat drifted across the river near Fort Atkinson and got caught in the wild rice beds. At that time the early pioneers referred to Koshkonong and Horicon as similar lakes.

The early ecology and natural history of Lake Koshkonong is well described; as this area was settled by Thure Kumlien, a well-educated Swedish, Koshkonong naturalist and writer. Thure, an eminent naturalist kept meticulous notes, letters, and journals. Thure's granddaughter, Angie Kumlien Main has captured much of his writing in *The Wisconsin Magazine of History* and the *Wisconsin Academy of Sciences, Arts, and Letters* (Main 1943a, Main 43b, Main 1944, Main 1945). Thure's interests in ornithology drew him to Lake Koshkonong (he settled near present-day Busseyville), as he reasoned it to be centrally situated between the Mississippi River and Lake Michigan. Main (1945) recounts,

“It is now a wilderness of white and black ash, willows, and soft maples. Along the edges of the tree the red osier and panicle dogwood, the button bush, the six-foot rushes and then the lower patches of blue flag and the big glossy arrow-shaped leaves of the arrow-head crowd the shore to the very water's edge, making the place a veritable jungle”.

Lake Koshkonong is a widening of the Rock River and is fed by numerous springs. In the territorial and early days of this state, the lake as a whole was not as deep as it is now. Wild rice and wild celery grew abundantly in the bays and shallow parts of the lake (Main 1945). When Dr. Increase A. Lapham visited Lake Koshkonong in 1850, he wrote (*Wisconsin Antiquities*, p. 35), “The water is 4-12 feet deep. At the time of our visit in July, wild rice was growing abundantly over almost its entire surface, giving it more the appearance of a meadow than a lake”.

The deepwater marsh of Lake Koshkonong at that time supported a rich diversity of flora and fauna. Thure Kumlien himself wrote of Lake Koshkonong (Kumlien 1877);

“The land surrounding the lake consists to a great extent of low and very extensive marshes, on which thousand of tons of hay are annually cut; but limestone bluffs exist in many places all around the lake.... The lake with its, in many places, marshy shores and hundreds of acres of wild rice, and the grass-like plant known to botanists as *Vallisneria spiralis* (wild celery, *Vallisneria americana*), growing in it in the greatest abundance used to a great favorite place for duck, and especially the famed Canvasback (*Aythya vallisneria*), which with the Redhead, is particularly fond of the *Vallisneria spiralis*. Geese cormorants, and white pelican were also very numerous, and fifty to one hundred of those latter birds could be seen at one time in the latter part of April or first of May. In the marshes and on the shores were a greater variety of waders... Of the snipe family, twenty species, beside curlews, and godwits. Three species rails, and gallinules and coots (coots) very plenty”.

Era of Early Dam Construction (1851-1900)

In April of 1843 the Wisconsin Territorial Legislature authorized Clouden and Luke Stoughton to dam the Rock River on their land in Section 21, T4N, R12E, the Indianford site (page 34, laws of 1843). The authorization included the right to use the water to propel machinery and to sell or lease such rights. The height of the dam was limited to not more than 4 feet above the normal river level. The Stoughtons were directed to construct a lock for barge passage and a slide or chute for the passage of rafts and to serve as a fishway. These aids to navigation were to be in readiness upon completion of the dam and were to be operated by the Stoughtons without charge. The authorization further specified that construction was to commence within one year and to be completed within three

years. Provisions for flowing of lands were described and the right to repeal the authorization was reserved by the Territorial Legislature.

Apparently the dam was not constructed until after March of 1851. The Wisconsin State Legislature (Chapter 339, Laws of 1851) again authorized the Stoughtons to construct a dam but modified the 1843 authority. The maximum height of the dam above normal river level was raised to 6 feet and the necessity of a lock to permit navigation was reaffirmed. The Act clearly stated that the flowage of private lands without the consent of the owner was not authorized and water levels could not be raised to the extent that they damaged existing mills or potential mill sites.

The dam was constructed some time after 1851. The original structure consisted of rock filled wooden cribs and earthen dikes along with some masonry, stone work and a gristmill. There are reports in the record (state vs. Norcross, 132 Wis. 534) that until March, 1898 there were eight 5'x5' gates in the dam which were operated to regulate the height of the water and that sometime after that date (about 1900) those gates and their openings were permanently closed. Abutments were added to the dam which narrowed the channel of the river. Litigation had been commenced in Rock County Circuit Court by property owners who alleged that Pliny Norcross had exceeded the authorized 6 foot dam height and as a result and because the gate openings had been closed, 5,000-6,000 acres of private lands had been flooded (as well as cellars in Fort Atkinson) and roads were made impassable. Further, the locks and chutes required by both the 1843 and 1851 authorization had never been constructed and accordingly navigation had been limited and the movement of fish impeded. In 1907, this litigation found its way to the Wisconsin Supreme Court where judicial notice of navigability became the major issue. The matter was remanded to circuit court for further proceeding.

In the late 1800's and early 1900's Lake Koshkonong was the most important staging habitat for canvasbacks in the Midwest (Sinclair 1924, Frautchi 1945). Many of the local Lake Koshkonong landmarks we recognize today were derived from the early settlers and waterfowl hunting. The first white person located at what is now Beloit, was one **THIEBAULT** (sometimes spelled **THIEBEAU**, and pronounced Tebo). This French-Canadian trader, moved away from Beloit, having been employed by the Government as interpreter among the tribes in the northern part of the Territory. He finally settled on Lake Koshkonong, at a place called **Thiebault's Point**, where he was, it is believed, murdered in the winter of 1837-38, by his son and one of his wives. Whatever the motive, Thiebault was probably murdered, and his body disposed of by cutting a hole in the ice and throwing it into the lake (American Local History Network; <http://www.usgenet.org/usa/wi/county/rock/City/Blt002.html>).

Historic **Bingham's Point** was named for Ira Bingham, a local market hunter who designed a modified double-bowed flatboat, which was intended for rowing and nicknamed "the Monitor" after the Civil War warship. The nickname was due to the long narrow double-bowed boat which rode low on the water and had canvas extensions that could be raised to protect the hunter in rough weather. Once positioned, the decoys and the lapping water concealed the hunter completely. It is no wonder that old club records recount staggering bags of game, especially canvasbacks. The Carcajou Club was incorporated in 1896 by a group of Janesville men including H.L. Skavlem, C.L. Valentine and Alex McNaughton. As early as 1870, sportsmen organized into prestigious shooting clubs with names like **Blackhawk Club** and **Carcajou Club** that were frequented by such notables as General Phil Sherman, former US Vice President Tom Marshall and Wisconsinites like August Pabst, Governor George Peck, Charles Pfister and the Baraboo Ringlings brothers. The area's reputation for excellent shooting even drew members from New York and California. More than one group of wealthy Chicago sportsmen formed their own clubs here (Donna Tonelli; website; <http://edecoy.org/Homme.html>).

By the late 1800's Thure Kumlien (Kumlien 1877) concluded changes to the landscape, local fauna, and the lake were already evident. Thure writes,

"As for the fish in the lake, the time is past when twenty-eight to thirty-five pound pickerels can be found, or twenty-five pound catfish. Bullheads, perch, sunfish, garpikes, and dogfish are common yet; but the pike, pickerel, bass, redhorse, sucker, and catfish are not near as plentiful as formerly. Perhaps the dams across the Rock River, below the lake are too powerful hindrances for the fish of the Mississippi River to up to our water to spawn; if so, were effectually, prevented from ever having shad successfully planted in this part of Rock River".

Thure, (Kumlien 1887) also commented on the Indianford dam,

“In 1844, there was a steamboat going through the lake, said to have come up from St. Louis. The new settlers hailed this occurrence with great pleasure and hopes...The idea never occurred to them that this big Rock River, on which with their own eyes they had seen a steamboat from St. Louis, ever could be, by any authority, pronounced an un-navigable stream, and dams allowed to be built across it”.

Era of Dam Reconstruction and Dam Heightening for Power Production (≈1900-1939)

Anecdotal reports indicate the deep water marsh habitat of Lake Koshkonong remained healthy through 1910. Threinen wrote, “Mr. Cole from Fort Atkinson stated that in 1907 looking out over the lake it looked like a vast meadow so thick was the vegetation. A Mr. Knoepfel said that in 1910 the east shore of the lake was a vast bed of wild rice. A Mr. Boese said that Blackhawk Island extended into the lake a great distance and was covered with wild rice”.

A March, 1915 field report by C. Gross of the Wisconsin Railroad Commission illustrated the construction at that time. In an August 1916 memo to the Commission, C.A. Halbert states that the Indianford Dam owned by the Janesville Electric Company is under reconstruction, involving some 275 feet of wood crib spillway being replaced with concrete. At this time the eastern hundred feet of the main spillway was being constructed. The elevation of this section evidently varied from 10.11 feet to 11.18 feet, Railroad Commission datum (W.R.C.). The elevation of the reconstructed concrete spillway is given as 11.54 feet and it is noted that the spillway is provided with bolts intended to secure flashboards. The easternmost 40 feet of the dam had previously been reconstructed with concrete with an average spillway elevation of 12.11 feet (W.R.C.). This section replaced, what were the eight slide gates from the original dam. This is the section that was to be rebuilt and fitted with lift gates in 1917. Halbert established the datum base still in use (0.00 Commission datum = 763.54 mean sea level (msl)).

John W. Robbins, et. Al., vs. Janesville Electric Company before Wisconsin Railroad Commission – volume 19, page 608 (WP-60; 7/31/1917). Property owners upstream of the dam alleged that Janesville Electric Company had maintained water levels higher than had been authorized and that as a result there had been extensive flooding and damage and in addition that there were no gates at the dam sufficient to pass floods and that an adequate fishway had never been provided. The petitioners asked that the Railroad Commission establish minimum and maximum water levels and direct the owner of the dam to construct adequate floodgates and fishways. The Commission ordered that the owner of the dam remove any flashboards on top of the concrete spillway and directed that a floodgate section be constructed pursuant to plans approved by the Commission. The Commission committed itself to an investigation of the dam and an order regulating the operation of the new gates. The Commission further stated that a minimum level would be established if it were necessary to protect the public interest and emphasized that for the interim the concrete crest of the spillway would be the maximum height authorized for the dam.

In November, 1917, W.G. Hoyt of the Wisconsin Railroad Commission investigated the relationship between the water levels at Lake Koshkonong and Indianford to enable the Commission to issue an order regulating operation of the newly installed floodgates. Hoyt’s investigations and conclusions are particularly valuable:

1. He concluded that the difference between the water surface at the lake and dam may vary from 0.30 feet during normal flows to in excess of 3 feet during the highest flow.
2. He stated that the backwater effect of the railroad bridge upstream from the Indianford Dam (C.M.&St.P.) was probably minimal below a flow of 2,000 feet per second or at a dam stage of 13.1 feet (W.R.C.) with the gates closed or 12.5 feet with the gates open.
3. The consensus of the investigating engineers was that the normal elevation of Lake Koshkonong was between 12.1 (775.64 feet msl) and 12.6 feet (776.14 feet msl) (W.R.C.) and that the gates should be opened when the stage at the dam was between 11.7 and 12.1 feet (W.R.C.). Having surveyed the damage around the lake, the engineers recommended opening the gates at the lower point.

4. The investigators emphasized that although the six gates would discharge a maximum of 1500 feet per second at an elevation of 14.0 feet (W.R.C.), that this discharge capacity would not entirely alleviate high water conditions on the lake.

W.G. Hoyt's investigations of 1917 correspond well with summer pool elevations reported at the Fort Atkinson Water Plant during the early 1930's (Hoyt normal pool=775.64 msl and WDNR analysis in Attachment 5 = 775.52 msl).

John W. Robbins et al vs Janesville Electric Company before Wisconsin Railroad Commission – volume 20, page 397 (February 1918). The floodgate section at the east end of the dam had been completed. The construction included six wooden lift gates averaging 6 feet in width. The nature of the lifting gear is not apparent, but probably consisted of a cog and wheel apparatus. The sill elevation at the gate section was



approximately 7.6 feet (W.R.C.) and the elevation of the main spillway crest was described as **11.44 feet** (W.R.C.), 0.18 feet higher than the old spillway which it had replaced. Because the new floodgate section gave the dam a discharge capacity much in excess of the old dam, Janesville Electric Company was not directed to restore the spillway elevation to 11.26 feet (W.R.C.) by flashboards or other means. In addition, the electric company was directed to remove an old coffer dam obstructing the floodgates by dredging a channel 45 feet wide at the bottom (with bottom elevation not higher than 8.0 feet W.R.C.), leading from the main channel of the river to the floodgate section. The Commission directed that at least two gates be fully open when the water elevation at the dam exceeded 12.1 feet and that all six gates be fully open when the water elevation exceeded 12.6 feet (W.R.C.). The gates were to be closed when the water elevation dropped below the crest of the spillway unless special authority had been received from the Commission.

J.P. Robbins et al vs. Janesville Electric Company before the Wisconsin Railroad Commission – volume 23, page 146; 6/21/1919. Petitioners alleged that the old coffer dam partially obstructing access to the floodgate section had not been removed pursuant to the 1918 Commission order and argued further that delaying the opening of all six gates until water levels had exceeded elevation 12.6 feet (W.R.C.) did not provide sufficient relief from flooding. Property owners described damage that had occurred during high water in the spring of 1919 and related that while waters at the lake rose to levels causing damage, the water level elevation at the dam was too low to require that all floodgates be opened. The Commission recognized that opening gates sooner would detract from the efficiency of power generation, but decided that greater relief from flood damage was due upstream property owners. The Commission modified the 1918 order and directed that all six gates be fully opened and remain open whenever the water elevation at the dam exceeded 12.1 feet (W.R.C.). Further, Janesville Electric was given the option of removing the remnants of the coffer dam above the gates in accordance with the previous order or opening all six gates fully from February 15 to June 15 yearly when the water level elevation at the dam exceeded 12.0 feet (W.R.C.).

The Commission's direction that all gates were to be closed when the water level receded below the crest of the spillway remained in effect. However, no absolute minimum water level was established and the entire stream flow

could be diverted through the powerhouse during periods of low flow as long as it was economical for power generation.

Carp were first introduced into Wisconsin in 1881, but records indicate little mention of carp population problems in Lake Koshkonong until about 1912. By 1923 Lake Koshkonong's vegetation had largely disappeared and fishing and hunting dropped off drastically. This dramatic shift in the ecosystem prompted Sinclair's national sporting magazine article about Lake Koshkonong's woes (Sinclair 1924). Sinclair was convinced that the carp and high water were at fault for the disappearance of the vegetation. The loss of vegetation was so bad that a biologist from the Federal Biological Survey was called in (Hylan 1923). He reported no vegetation and blamed it on the carp and water levels.

In 1952 a report by C.W. Threinen (WDNR 1952), *History, Harvest and Management of the Lake Koshkonong Fishery*, came to the following conclusion:

“Looking back over the history of the vegetation in Lake Koshkonong and adding to it our most recent information, it is apparent that the greatest single event in the epochs in lake ecology was the extra two feet added to the dam at Indian Ford in about 1917. This changed the lake from a marsh to an unstable lake.”

Main (1945) reports, “When this dam was changed from a height of four feet to six or seven feet, the depth of the lake was greater. This killed the wild rice, except that which grew in the shallow bays”.

Threinen came to the following conclusion in 1952,

“It appears that most of the erosion takes place at high water when unstable peat or alluvial soils are exposed to wave action. To prevent shoreline erosion water levels must be watched closely and the dam operated with precision to prevent damaging high waters.”

“Before creation of the large expanse of open water by an increase in the dam in 1917 when the lake was a “sea of green” largemouth bass, perch, bluegills and probably northern pike were important fishes. This condition could be produced again by aggressive and continued control of carp and by lowering the water level somewhat.”

A June 4, 1929 Railroad Commission memo submitted by George P. Steinmetz noted that the water level elevation of the dam was 12.38 feet (W.R.C.) and that all floodgates were opened and water was passing through them with no obstruction. Steinmetz stated that new wheels and generators were being installed in the power plant by the Wisconsin Power and Light Company, which had acquired the dam.

The main spillway was reconstructed in 1931 and Railroad Commission engineers confirmed construction of the spillway crest at an average elevation of 11.44 feet (W.R.C.). There was no modification of the floodgate section. However, the coffer dam upstream of this section had apparently been entirely removed by this time. In 1931, representatives of Wisconsin Power and Light Company and property owners on Lake



Koshkonong met before the Railroad Commission. An informal agreement resulted in which the company agreed not to reduce water levels more than 6 inches below the crest of the spillway.

A June 16, 1932 Commission memorandum by C.M. Dahlen generally describes the channel cross section at the C.M.St.P.&P. railroad bridge. The water level was 2 inches below the crest of the spillway at the Indianford Dam and three channels were very shallow (about 12 inches deep) while the fourth channel at the east end of the bridge had a three foot depth. It was noted that within the past two or three years the railroad company had repaired the bridge by replacing stone piers with concrete slabs. The demolished stone piers were evidently discarded in the river channel at the site thus prompting Dahlen's investigation of this alleged obstruction of navigation.

Another Commission memorandum submitted by W.A. Muegge on December 1, 1933, relates an investigation and response to complaints of high water above the dam on Lake Koshkonong. Muegge confirmed the original elevation of the sills of the floodgates and the main spillway. He took soundings of the channel upstream from the floodgate section which demonstrated that the old coffer dam had in fact been removed.

Before the Public Service Commission of Wisconsin – A petition was presented by property owners in the vicinity of Lake Koshkonong to raise the level of the Rock River at Indianford Dam six inches above the exiting normal level. (2-WP-461, volume 21, page 705; 11/28/1939). Owners of low lying lands and farmers appeared at a hearing on this question and objected to any increase in water levels at the Indianford Dam citing concerns about flood damage and poor drainage of agricultural lands. The Commission relied upon investigation by its staff, the United States Geological Survey and the United States Army Corps of Engineers in reaching the following conclusions:

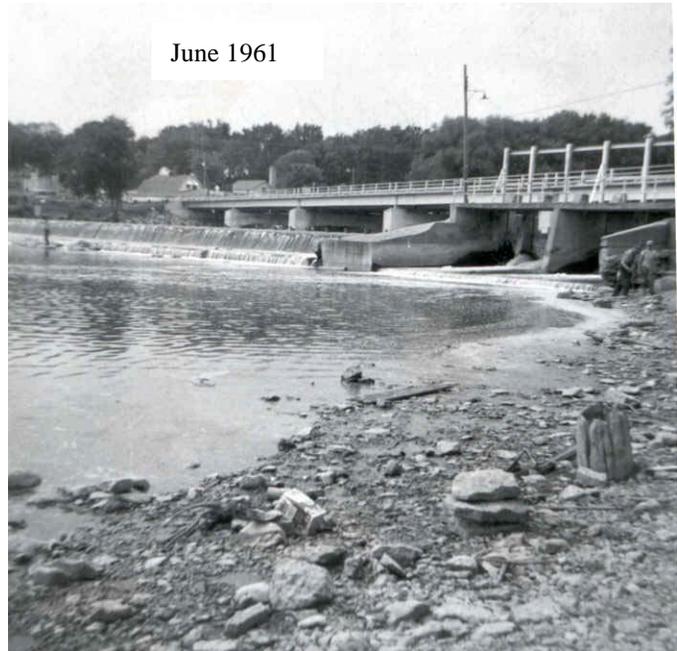
1. *During periods of low flow, the Indianford Dam controlled water levels as far upstream as Fort Atkinson. The installation of flashboards during such low water periods would be generally unobjectionable provided they did not cause increased water levels during spring floods or summer storms.*
2. *During major flood events, the railroad bridge upstream from the dam was a control section determining the elevation of Lake Koshkonong.*
3. *Floodwater storage made available by adding 6-inch flashboards to the dam was not significant amounting to 4715-acre feet or 0.03 inches of runoff from the drainage area.*
4. *The Commission concluded that the reduction in discharge capacity of the dam caused by the placement of 6-inch flashboards was not acceptable.*
5. *The Commission further stated that the owner of the dam and its predecessors had maintained the spillway at the elevation of 11.44 feet (W.R.C.) and had operated the floodgates as required for more than 20 years and thus had acquired prescriptive flowage rights to maintain the dam at that height and operate the gates in the manner authorized by the Railroad Commission in 1919 (WP-60).*
6. *The Commission stated that the prescriptive rights described did not extend to the flowage of lands by placement of flashboards during the periods of low stream flow. The Commission further stated that the Wisconsin Power and Light Company could apply for authority to place flashboards on the dam if the appropriate flowage easements were first obtained.*

The Commission dismissed the order generally citing its lack of authority to require that the owner of the dam usurp private property rights by flowing lands which at least periodically had not been flowed before. (note: ck applicability of WP/414 obstruction)

12/27/1965 Transfer of the dam from Wisconsin Power and Light Company to Rock County (2-WP-2251). This docket described how power generation by Wisconsin Power and Light had ceased in 1962 due to a net operating loss on the facility. An inspection of the dam by the Public Service Commission pursuant to Section 31.184(4), Wisconsin Statutes, and Wisconsin Power and Light engineering staff itemized a list of necessary repairs to the concrete structure and its gear. The maintenance was performed at the expense of Wisconsin Power and Light and generally consisted of repair of cracked and spalled concrete resetting the floodgate frames, installing new metal gates,

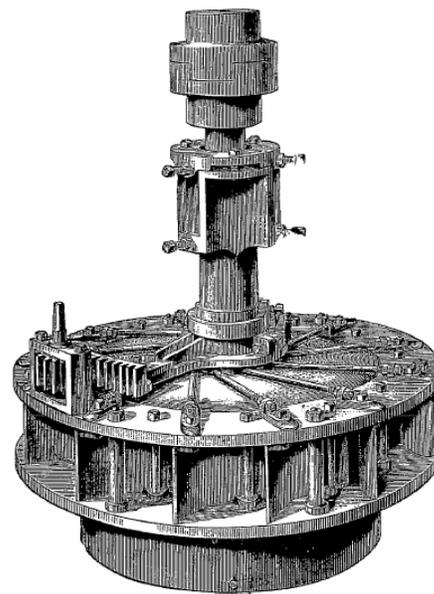
manual lifting gear and reconstruction of the east downstream wing wall, and the dike on the east bank.

In testimony a Public Service Commission staff engineer stated that the Commission did not generally consider the discharge capacity of a powerhouse to evaluate the effect of a dam on flood flows (pages 28 and 29). The engineer stated that the Public Service Commissions did not generally object to removal of wicket gates (see figure 1) from the powerhouse and that Rock County could apply to the Commission for authority to fill the headrace at some future date. A contract between Wisconsin Power and Light Company and Rock County granting the dam, powerhouse and real estate along with certain unspecified flowage rights for the sum of \$1 was presented to the Commission as an exhibit.



The Commission found that the county met the requirements of Section 31.14(2) Wis., Stats. and was financially capable of maintaining the dam for a period of ten years and no objection being heard conditioned the transfer on the performance of the repairs itemized by Wisconsin Power and Light and upon the acceptance of the transfer by Rock County. Public Service Commission staff recommended the continuation of the operating orders designated in WP-60 (Railroad Commission Orders of 1917 and 1918).

Figure 1. Generalized schematic of a wicket gate. Wicket gates are a series of vanes arranged radially around a opening that open and close to allow variable amounts of flow to drive the turbine.



1956-1981

In the late 1960's wicket gates in the powerhouse became rusted shut making that discharge capacity unavailable. Manipulating the manually operated floodgates was a very time consuming proposition and the operating orders for the lift gates were not rigidly adhered to. This period is marked by extreme vacillation in water levels, accelerated erosion and loss of peripheral wetlands on Lake Koshkonong. These conclusions are documented in Department of Natural Resources memoranda and in correspondence from the general public.

Wisconsin Electric Power Company in a December 20, 1974 report investigated the restoration of the powerhouse at Indianford as a means of stabilizing water levels on Lake Koshkonong. The report was authorized by the Rock County Planning Commission and the Wisconsin Department of Natural Resources. The report describes three metal head gates in place upstream of the wicket gate in flume no. 1. This wicket gate had frozen in the 7/10 open position and the wicket gates in unit no. 2 were frozen completely shut. The report detailed two alternatives:

1. The wicket gates could be rejuvenated and used to regulate flow through the powerhouse.
2. The head gates in unit 1 could be rejuvenated and new gates installed in unit 2. Both sets of gates would have to be fitted with a lifting mechanism. The wicket gates would then have to be jacked fully open or removed.

Either alternative was judged to be equally feasible with the second alternative being more economical by virtue of lower long-term maintenance costs. A 1974 investigation by the Department of Natural Resources (3-WR-1835) relating to the hydraulic capacity of the dam resulted in a suggestion that Rock County consider the installation of two 20-foot wide taintor gates at the dam. The matter was closed when it became evident that the discharge capacity of the powerhouse was to be restored by leasing the power rights.

10/28/1976 Rock County entered into a lease agreement with Peter Burno. Mr. Burno agreed to act as an agent for the county in operating the dam in exchange for the right to restore the generating capacity of the powerhouse and enjoy the profits of that power production.

During 1978 at least one of the wicket gates was made operative and during the major flood in spring of 1979 both flumes of the powerhouse were open. During the past two years, one wicket gate has generally been left open to provide for increased discharge capacity at the dam.

4/25/91 The Department reestablished water levels for Lake Koshkonong in 3-SD-82-809. This order moved control elevation from the Indianford Dam to Lake Koshkonong, established minimum gate operations, established a winter draw down and required dam operations based upon current hydrologic conditions. The order was challenged and affirmed by a Jefferson County Circuit Court. The order to affirm was challenged to the Court of Appeals where it was remanded back to the Department for hearing. Order # 3-SD-82-809 was changed and was a result of a compromise between all parties to the appeal.

