LAKE LEVEL MANAGEMENT PLANS
WATER YEAR 2019

Kansas Water Office
September 2018

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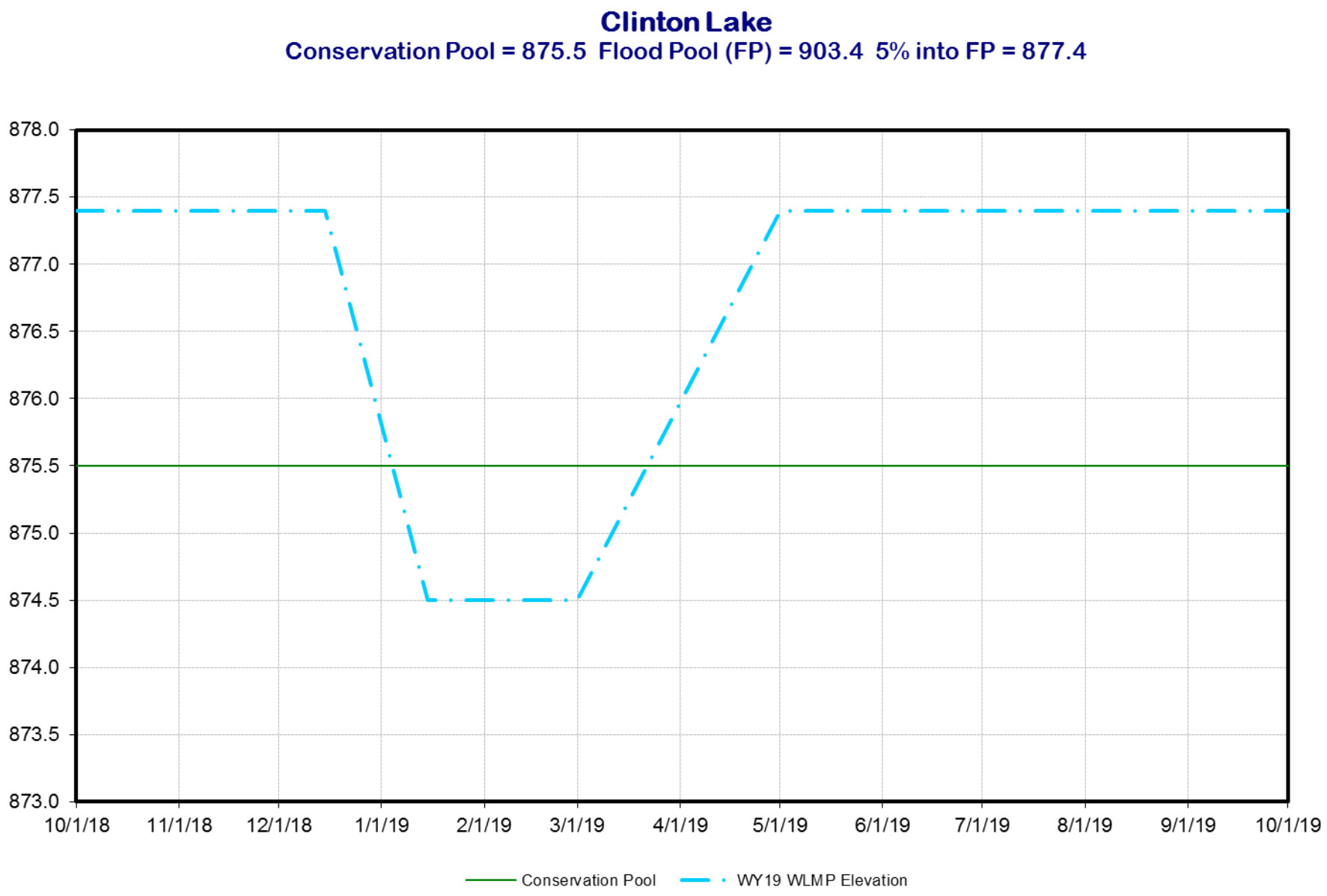
U.S. Army Corps of Engineers (USACE), Kansas City District

Water level management plans may be implemented in whole or in part depending on the needs of other project purposes based on the hydrologic conditions that exist at the time. This may be critical if either drought or severely wet basin conditions occur. If wet basin conditions prevail, the retention of even a modest amount of water in the flood pool during the primary flood runoff season will have to be adjusted lower or forgone. Periods of drought may preclude targeted drawdowns below the top of multipurpose pool. Inflow bypass may be necessary to satisfy downstream water right demand, as required by the Kansas Department of Agriculture, Division of Water Resources (KDA-DWR), which may prevent planned pool rises.


Clinton Lake
Conservation Pool = 875.5 Flood Pool (FP) = 903.4 5% into FP = 877.4
878.0
877.5
877.0
876.5
876.0
875.5
875.0
874.5
874.0
873.5
873.0
10/1/18
11/1/18
12/1/18
1/1/19
2/1/19
3/1/19
4/1/19
5/1/19
6/1/19
7/1/19
8/1/19
9/1/19
10/1/19
Conservation Pool
WY19 WLMP Elevation

CLINTON LAKE

Clinton Reservoir Water Level Management is based upon alternating year plans. One plan enhances conditions for migratory waterfowl (i.e. *Wildlife Plan*), the other plan enhances conditions for fisheries (i.e. *Fisheries Plan*). The following is the *Fisheries Plan*.

October 1 - December 15 (postpone until January 1 if water temperatures permit):

Maintain lake elevation at 877.4 NGVD to keep water into vegetation for migratory waterfowl.

December 15 (or begin January 1 depending on conditions) - January 15:

Evacuate water to 874.5 NGVD.

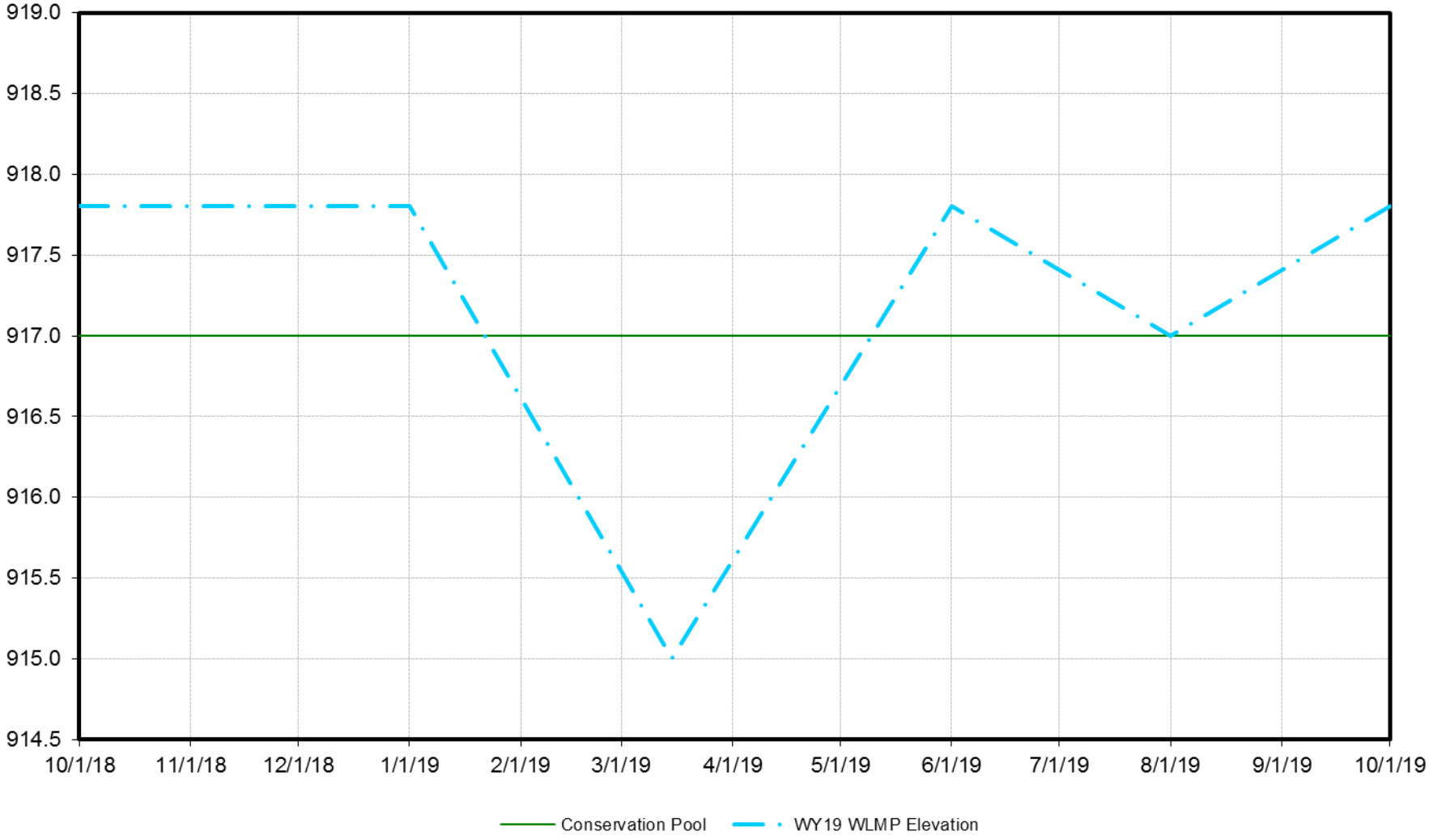
January 15 - March 1: Maintain level at 874.5 to reduce ice damage to facilities and preserve vegetation. Maintaining water level during winter months at this elevation will have negligible effects on winter fish survival and water quality throughout the year. There should also be no measurable affects to algae populations throughout the year from the planned change in water volume during winter months.

March 1 - May 1: Allow water level to raise 1.9 feet above CP to 877.4 NGVD. Note: CORPS will not allow higher water levels into flood pool. This rise will inundate rocky area free of algae, which will benefit the walleye spawn. Inundated vegetation will provide additional food and cover for littoral species. <u>March 1 to May 1st is the critical release period. To prevent excessive flushing of adult walleye and fry from the reservoir, releases should not exceed 500 cfs, if possible.</u>

May 1 – September 30: Maintain water level at 877.4 NGVD to create and maintain good spawning, nursery, and growth conditions for crappie bluegill and largemouth bass.

Hillsdale Lake

Conservation Pool = 917.0 Flood Pool (FP) = 931.0 5% into FP = 917.8



HILLSDALE LAKE

Corps of Engineer staff, Kansas Department of Wildlife, Parks and Tourism (KDWPT) personnel and Water supply interest designed the lake level management plan for Hillsdale Reservoir. This proposed plan is designed to benefit the natural resources and the recreational user. Lake level management will play a key role in the improvement of the current fishery. A major goal is to increase the duration of rising spring water levels to further benefit spawning sport fish populations, from the early spawning walleye through the later spawning largemouth bass and the number 1 sought after species, crappie. Habitat for spawning sport fishes and young of the year sport fish will be optimized with the rising water levels during this critical period. After May 1, the increase in water level above multipurpose pool from 917.0 to 917.8 NGVD will greatly benefit spawning fish populations and increase the quality of habitat available for young of the year. It will also allow for increased evaporation rates of summer and water supply usage. To accomplish these goals, release rates should be kept under 500 cfs when practicable.

Wildlife, specifically waterfowl needs benefit by holding water in the fall months. By holding the lake elevation at 917.80 or higher, migratory birds will benefit greatly by the shallow habitat created. Note: All participants at the coordination meeting were interested in holding the water level at the 10% of Flood pool level (918.8), during the September to January period.

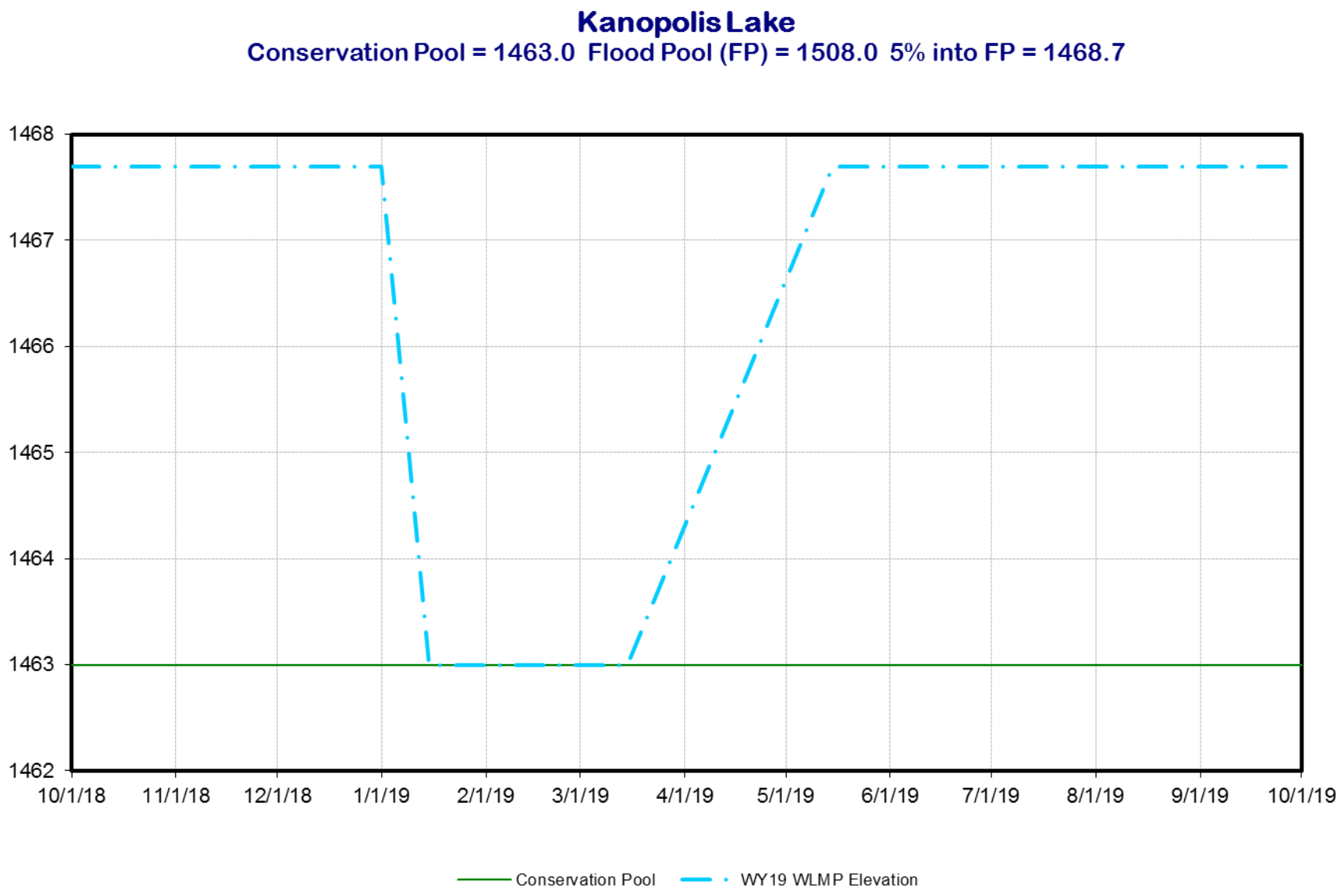
October 1 - January 1: Maintain lake elevation at 917.80 NGVD to keep water in the shoreline vegetation for migratory waterfowl.

January 1 - March 15: Gradually lower the lake elevation to 915.0 NGVD in order to increase water storage capacity to lessen the need to lower lake levels during fish spawning period. This level will allow for continued increases in water level and provide fishery benefits. <u>March 1 to May 1 is the critical release period. To prevent excessive flushing of adult walleye and fry from the reservoir, releases should not exceed 500 cfs.</u>

March 15 - June 1: Raise the lake elevation to 917.8 NGVD. The extra 0.8 feet multipurpose pool will allow for summer evaporation, water supply usage and enhance fishery-spawning habitat. <u>March 1 to May 1 is the critical release period. To prevent excessive flushing of adult walleye and fry from the reservoir, releases should not exceed 500 cfs when possible.</u>

June 1 – August 1: Allow the lake elevation to drop naturally with minimum monthly discharges to 917.0 NGVD. Evaporation and water supply usage will bring water levels back to multipurpose pool.

August 1 – October 1: Raise the lake elevation to 917.8 NGVD as inflows allow.


Kanopolis Lake
Conservation Pool = 1463.0 Flood Pool (FP) = 1508.0 5% into FP = 1468.7
1468
1467
1466
1465
1464
1463
1462
10/1/18
11/1/18
12/1/18
1/1/19
2/1/19
3/1/19
4/1/19
5/1/19
6/1/19
7/1/19
8/1/19
9/1/19
10/1/19
Conservation Pool
WY19 WLMP Elevation

KANOPOLIS LAKE

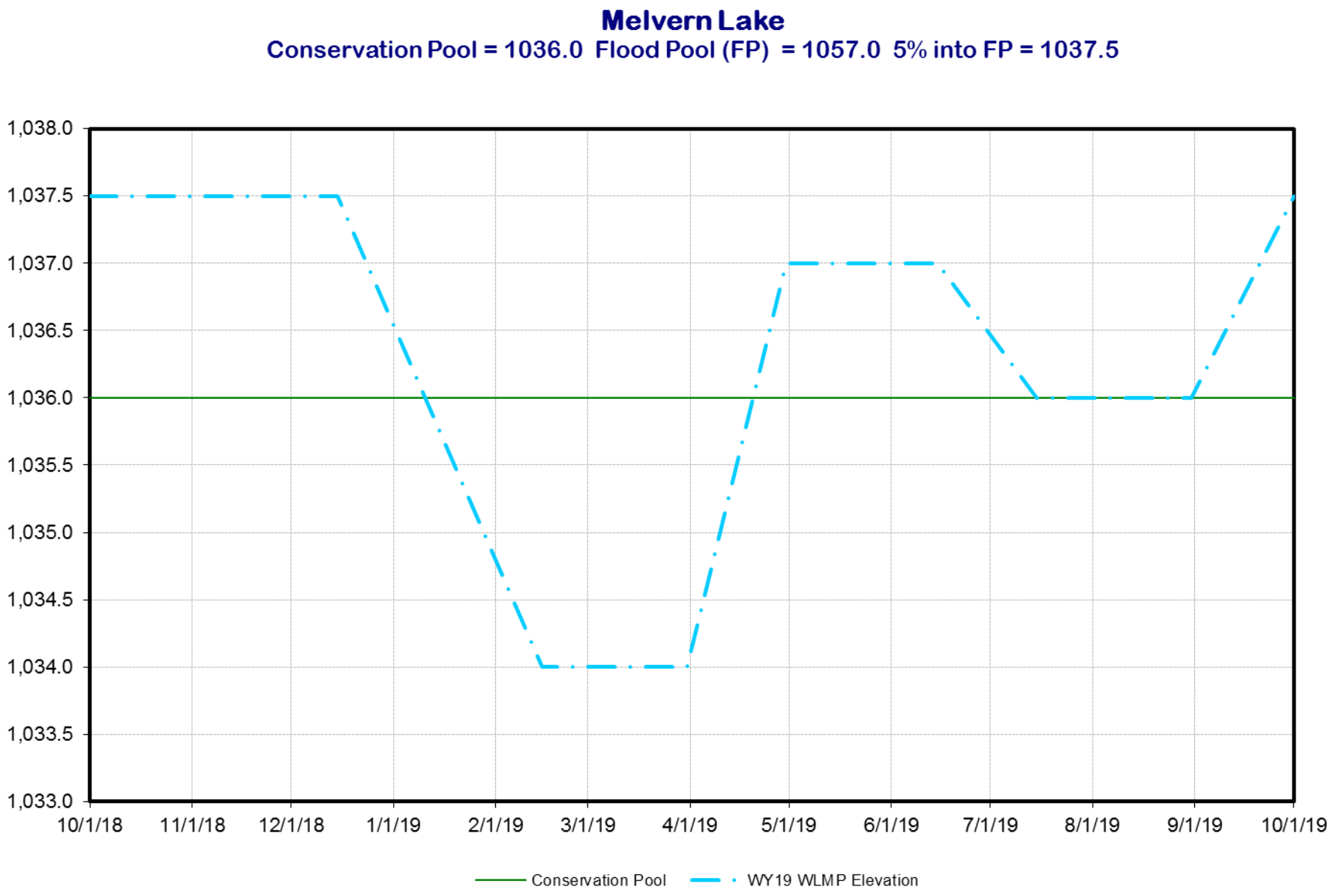
October 1 – January 1: Retain inflows in an attempt to increase the pool to 1467.7 NGVD.

January 1 – January 15: Draw down pool to 1463.0 NGVD to reduce the possibility of ice damage. This date will depend on whether or not ice forms. If ice forms earlier or later, pool will be lowered accordingly.

January 15 – March 15: Hold pool at 1463.0 NGVD.

March 15 – May 15: Allow pool to increase to 1467.7 NGVD and stabilize. Attempt to mediate inflows and outflows to preclude major elevation swings. Limit outflows to the uncontrolled port (if possible). Rapid drawdowns should be avoided during this time, if possible.

May 15 to September 30: Between elevations 1463.0 NGVD and 1467.7 NGVD, releases should be made through the uncontrolled port. History shows that the pool will naturally decrease during this period, but an attempt will be made to hold as much of this increased pool as possible to provide for maximum recreation benefits.


Melvern Lake
Conservation Pool = 1036.0 Flood Pool (FP) = 1057.0 5% into FP = 1037.5
1,038.0
1,037.5
1,037.0
1,036.5
1,036.0
1,035.5
1,035.0
1,034.5
1,034.0
1,033.5
1,033.0
10/1/18
11/1/18
12/1/18
1/1/19
2/1/19
3/1/19
4/1/19
5/1/19
6/1/19
7/1/19
8/1/19
9/1/19
10/1/19
Conservation Pool
WY19 WLMP Elevation

MELVERN LAKE

Melvern Lake is important to the eastern Kansas sport fishery and has often provided excellent waterfowl hunting opportunities. It is perhaps the clearest major impoundment in the eastern half of the state. All reasonable efforts should be made to capitalize on this situation. By continuing to allow for fall rises followed by carefully managed winter drawdowns and spring rises, then managing the lake level to encourage summer re-vegetation, we can positively enhance the benefits provided by Melvern Lake without negatively impacting its authorized project purposes.

October 1 - December 15: Maintain elevation 1037.5 NGVD. Maintaining a 1.5-foot rise will enhance waterfowl habitat throughout the season.

December 16 - February 15: Lower the water level to 1034 to crowd fish and allow for increasing pool levels in the spring to contain outflows while improving spawning conditions for walleye / sauger. Discretion may dictate the actual discharge period and volume. If weather conditions permit, a gradual drawdown is much preferred, however discharges may have to be increased and the period constricted to prevent marina damage before heavy icing occurs.

February 16 - March 31: Maintain water level at 1034 NGVD for reasons stated above.

April 1 - April 30: Increase water level to 1037 NGVD to enhance forage production and maintain nursery habitat.

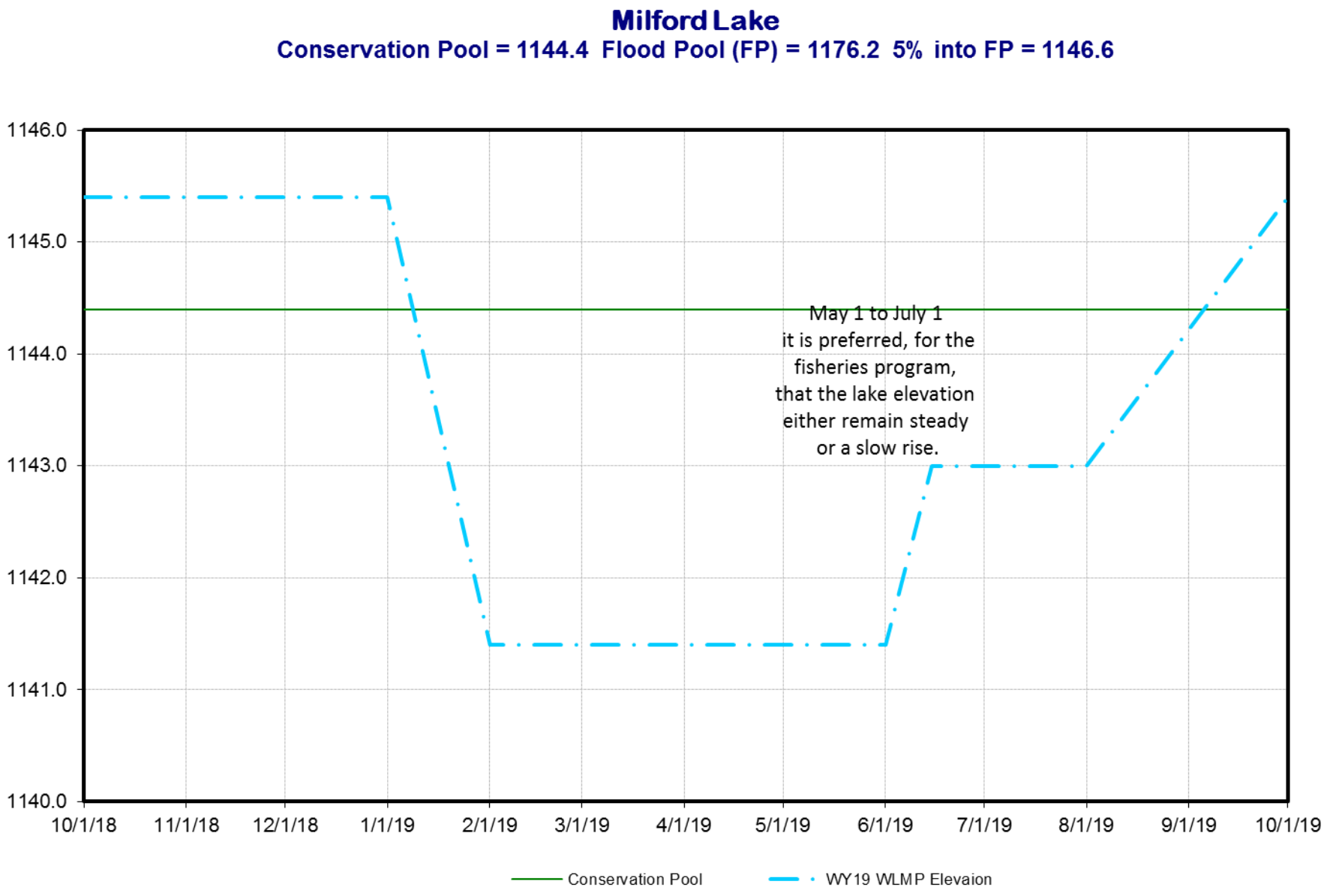
May 1 - June 15: Maintain water level at 1037 NGVD for fish and recreational benefits.

June 16 - July 15: Decrease water level to 1036 NGVD to initiate establishment of terrestrial vegetation.

July 16 - August 31: Maintain water level at 1036 NGVD to allow re-growth of vegetation.

September 1 - September 30: Allow rise to 1037.5 NGVD to improve waterfowl habitat.

Note: Discretion may dictate the actual dates and time/amount of discharge. The weather, lake, inflows, downstream conditions and invasive species all are considered when adjustments are made.


Milford Lake
Conservation Pool = 1144.4 Flood Pool (FP) = 1176.2 5% into FP = 1146.6
1146.0
1145.0
1144.0
1143.0
1142.0
1141.0
1140.0
10/1/18
11/1/18
12/1/18
1/1/19
2/1/19
3/1/19
4/1/19
5/1/19
6/1/19
7/1/19
8/1/19
9/1/19
10/1/19
May 1 to July 1
it is preferred, for the
fisheries program,
that the lake elevation
either remain steady
or a slow rise.
Conservation Pool
WY19 WLMP Elevaion

MILFORD LAKE

As in past years, this water level management plan for Milford Lake attempts to take into account the natural inflows of the lake to improve both fisheries and wildlife habitat. One of the fisheries functions of this plan is to control water releases in the early spring (April 1- June 15) during fish spawning. The winter drawdown will also help to provide a cushion against having to release high outflows (above 2000 cfs) when the walleye are concentrated along the face of the dam and susceptible to flushing from the lake. For wildlife purposes, maintaining the lake level 1.4' below conservation pool will provide tremendous habitat. With normal fall inflows the 1' rise provides tremendous benefits for wetlands, waterfowl, and hunting access.

October 1 to January 1: Maintain the lake elevation at least one foot over conservation pool. The goal of the fall & winter rise is to keep the lake elevation up as long as possible for waterfowl habitat but at the same time realizing that the lake elevation needs to be drawn down prior to the lake freeze up. This cold weather flexibility can be achieved through the local lake personnel that will monitor the lake conditions and make recommendations to adjust the drawdown date and/or discharge rate that will achieve the greatest benefit.

January 1 to February 1: Begin controlled drawdown of lake elevation as winter conditions allow with a maximum release of 2000 cfs to reach winter target elevation of 1141.4 NGVD.

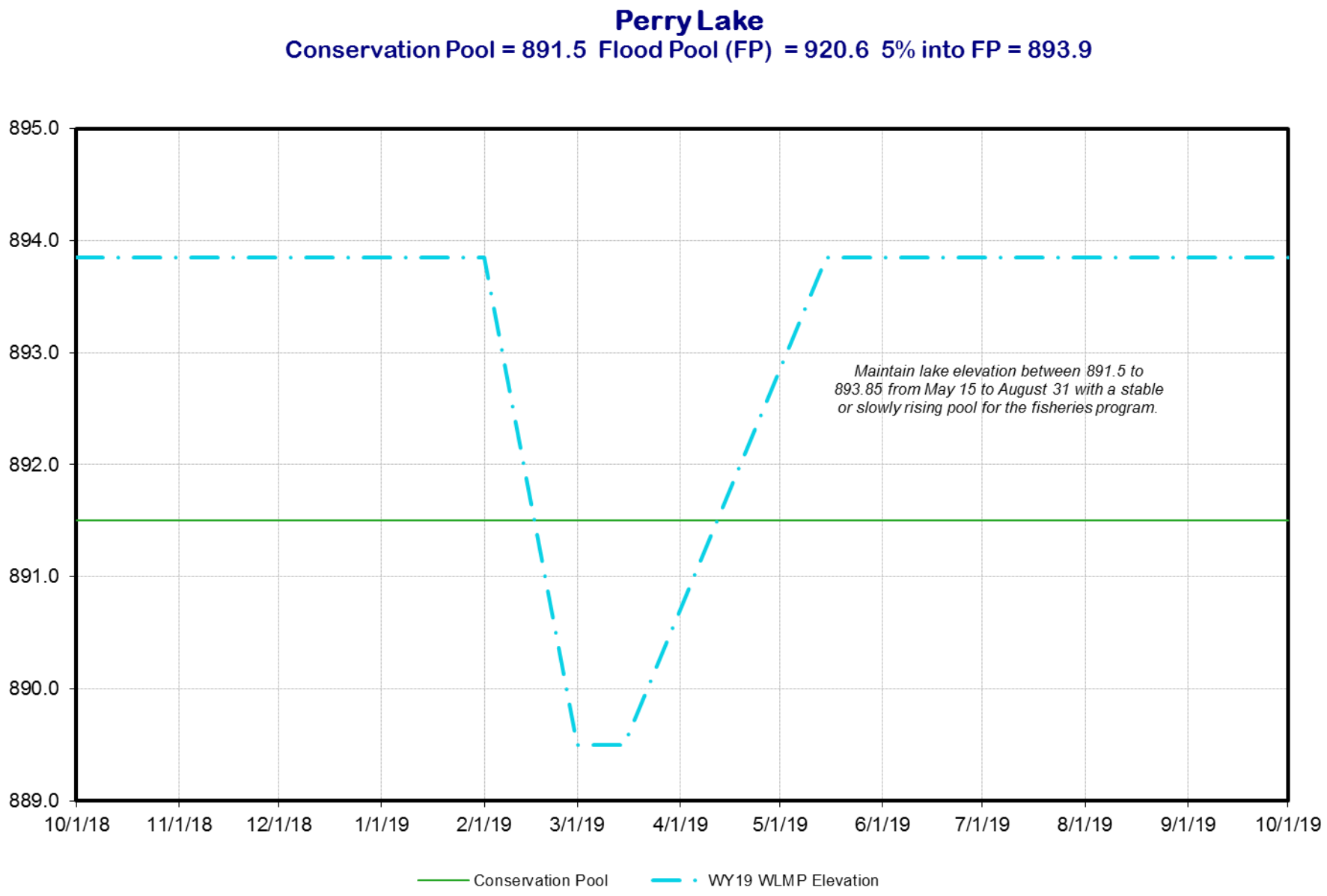
February 1 to March 15: Maintain the lake elevation at 1141.4 NGVD. This will eradicate exposed zebra mussels and provide clear spawning areas for walleye.

March 15 to May 1: Allow the lake elevation to gradually increase to 1143.0 NGVD. Maximum discharge should not exceed 2000 cfs.

May 1 to August 1: Maintain lake elevation at 1143.0. The fisheries program prefers that the lake elevation remains steady or a slow rise. Optimal maximum discharge should not exceed 2000 cfs. If there is a large inflow event and the pool rises above conservation pool, discharge should only bring the pool back down to 1144.4 NGVD. Re-vegetation and seeding of the shoreline will be accomplished while the lake is below 1144.4 NGVD.

August 1 to October 1: Hold discharge to minimum outflows and allow the lake elevation to increase and then be maintained at 1145.4 NGVD.

Note: Additional consideration that may affect outflows and lake elevations are the endangered species nesting on the Kansas River from May 15-August 15 and any construction projects that may be on-going. It is also realized that other Authorized Project Purposes may supersede this plan. Consideration may be given to forecasted navigation release demands prior to evacuating flood storage on or around July 1. This plan has been modified the last couple of years to help moderate some of the Harmful Algal Blooms (HABs), see Appendix A.


Perry Lake
Conservation Pool = 891.5 Flood Pool (FP) = 920.6 5% into FP = 893.9
895.0
894.0
893.0
892.0
891.0
890.0
889.0
10/1/18
11/1/18
12/1/18
1/1/19
2/1/19
3/1/19
4/1/19
5/1/19
6/1/19
7/1/19
8/1/19
9/1/19
10/1/19
Maintain lake elevation between 891.5 to 893.85 from May 15 to August 31 with a stable or slowly rising pool for the fisheries program.
Conservation Pool
WY19 WLMP Elevation

PERRY LAKE

As in past years, this water level management plan for Perry Lake attempts to take into account the natural inflows of the lake to improve both fisheries and wildlife habitat. One of the fisheries functions of this plan is to control water releases in the early spring (April 1- June 15) during fish spawning. For wildlife purposes, the scheduled autumn rise in water level will flood marshy areas, improving waterfowl habitat and hunter access to the upper cove areas of the lake. Although there is enough inflow to achieve the fall rise in only about half the years, when it occurs the two-foot rise provides tremendous benefits for wetlands, waterfowl, and hunting access.

October 1 to February 1: Hold discharge to minimum outflows and allow the lake elevation to increase, and then be maintained at 893.85 NGVD.

February 1 to March 15: Begin controlled drawdown of lake elevation as winter conditions allow with a maximum release of 2000 cfs to reach winter target elevation of 889.5 NGVD.

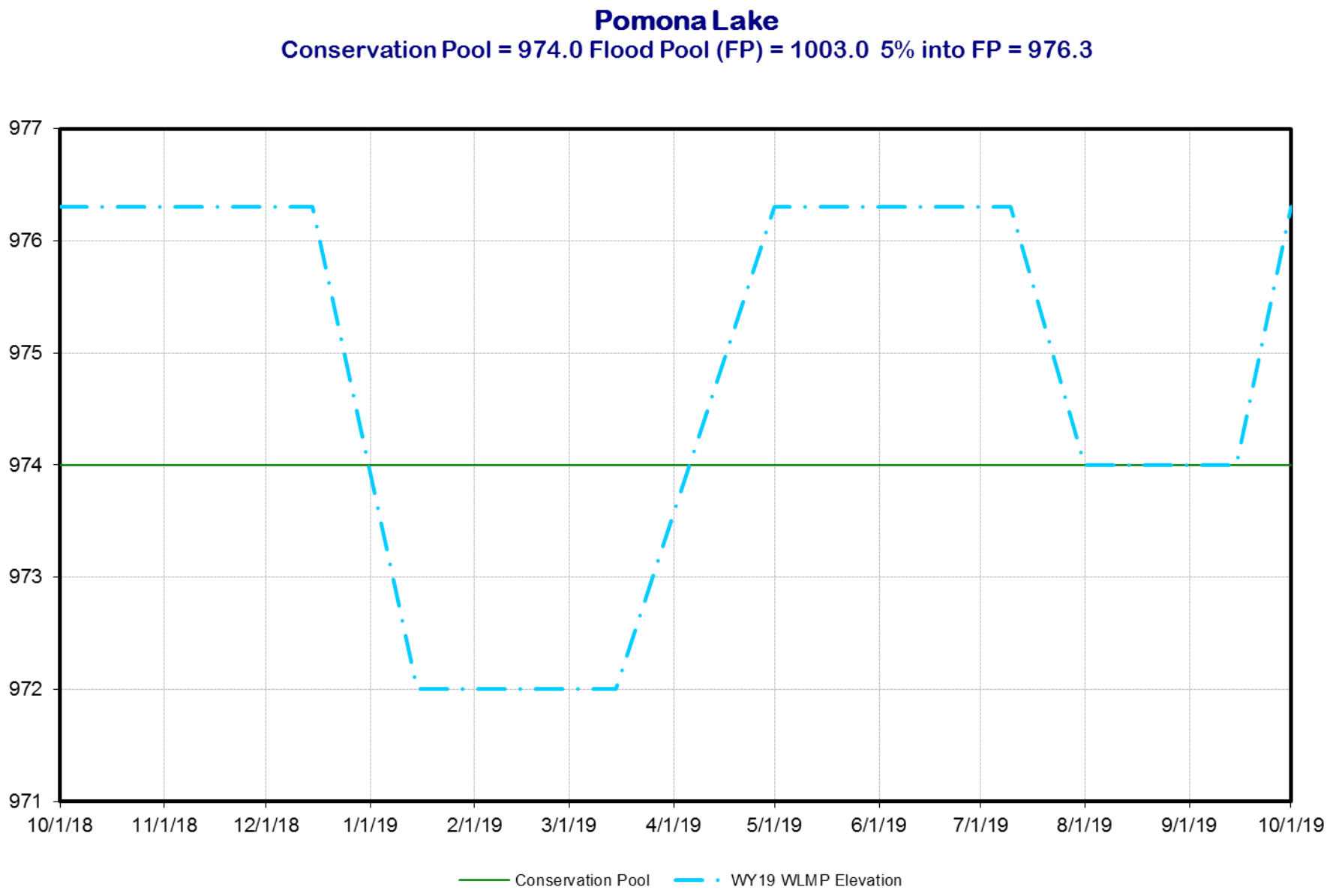
March 15 to May 15: Allow the lake elevation to gradually increase to 893.85 NGVD. This will inundate clear spawning habitat and will encourage future production of Bass, Crappie, and Sauger.

May 15 to August 31: Maintain lake elevation between 891.5 to 893.85 NGVD. From May 15 to August 31 it is preferred, for the fisheries program, that the lake elevation either remain steady or a slow rise. Optimal maximum discharge should not exceed 2000 cfs.

September 1 to Sept. 30: Increase water level to 893.85 NGVD to support waterfowl habitat and hunter access.

Note: The goal of the fall & winter rise is to keep the lake elevation up as long as possible for waterfowl habitat but at the same time realizing that the lake elevation needs to be drawn down prior to the lake freeze up. This cold weather flexibility can be achieved through the local lake personnel that will monitor the lake conditions and make recommendations to adjust the drawdown date and/or discharge rate that will achieve the greatest benefit.

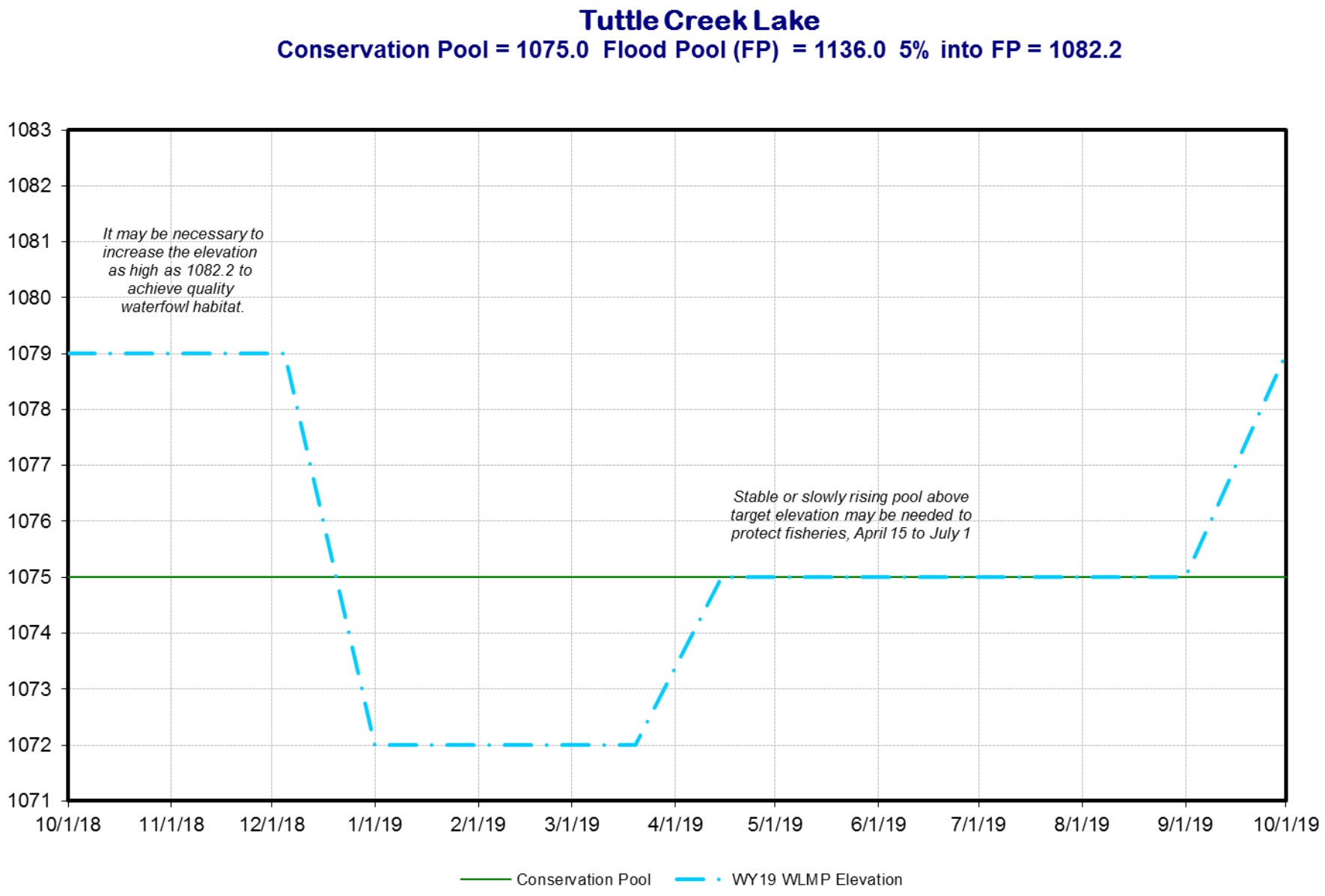
Additional consideration that may affect outflows and lake elevations are the endangered species nesting on the Kansas River from May 15-August 15 and any construction projects that may be on going. It is also realized that other Authorized Project Purposes may supersede this plan. Consideration may be given to forecasted navigation release demands prior to evacuating flood storage on or around July 1.


Pomona Lake
Conservation Pool = 974.0 Flood Pool (FP) = 1003.0 5% into FP = 976.3
977
976
975
974
973
972
971
10/1/18
11/1/18
12/1/18
1/1/19
2/1/19
3/1/19
4/1/19
5/1/19
6/1/19
7/1/19
8/1/19
9/1/19
10/1/19
Conservation Pool
WY19 WLMP Elevation

POMONA LAKE

October 1 to December 15:	Maintain elevation 976.3 NGVD. Maintaining a 2.3 foot rise will enhance waterfowl/shorebird migration and usage.
December 16 to January 15:	Lower the water level to 972.0 NGVD to crowd fish and allow for increasing pool levels in the spring to contain outflows while improving spawning conditions. In most years this drawdown has started later due to the extension of the waterfowl season, and extended later to allow a more gradual drawdown to reduce the effects of ice damage.
January 16 to March 15:	Maintain water level at 972.0 NGVD to improve predator fishing success and increase pool availability.
March 16 to April 30:	Increase water level to 976.3 NGVD to enhance forage production and maintain nursery habitat.
May 1 to July 10:	Maintain water level at 976.3 NGVD for fish and recreational benefits.
July 11 to July 31:	Decrease water level to 974.0 NGVD to establish terrestrial vegetation.
August 1 to September 15:	Maintain water level at 974.0 NGVD for vegetation re-growth.
September 16 to September 30:	Allow rise to 976.3 NGVD to improve waterfowl habitat.

Note: Discretion may dictate the actual dates and time/amount of discharge. The weather, lake inflows, and downstream conditions all are considered when adjustments are made.


Tuttle Creek Lake
Conservation Pool = 1075.0 Flood Pool (FP) = 1136.0 5% into FP = 1082.2
1083
1082
1081
1080
1079
1078
1077
1076
1075
1074
1073
1072
1071
It may be necessary to increase the elevation as high as 1082.2 to achieve quality waterfowl habitat.
Stable or slowly rising pool above target elevation may be needed to protect fisheries, April 15 to July 1
10/1/18
11/1/18
12/1/18
1/1/19
2/1/19
3/1/19
4/1/19
5/1/19
6/1/19
7/1/19
8/1/19
9/1/19
10/1/19
Conservation Pool
WY19 WLMP Elevation

TUTTLE CREEK LAKE

One of the main objectives of water level management at Tuttle Creek is to increase recruitment of crappie in the lake. The success or failure of past management plans in many cases has been out of human control due to uncontrollable inflow rates, storage of water in the flood control pool for T&E species in the summer months, and late season releases in support of navigation on the Missouri River. However, coordination between state and Federal agencies during moderate flood and drought events can minimize damage to the lake's shoreline habitat that is essential for crappie spawning success from such uncontrolled events. The request for the lake level to be lowered in the winter months is to serve primarily as additional storage for frequent spring rises in lake levels which would require untimely releases. This request was intended to lessen the probability of untimely reservoir releases that adversely impact crappie spawning success.

October 1 to December 5: Maintain lake level at elevation 1079 NGVD for the attraction for migrating waterfowl. It may be necessary to increase the elevation as high as 1082.2 NGVD to achieve quality waterfowl habitat. The necessary elevation will be coordinated with the wildlife biologist.

December 5 to January 1: Lower the lake level to elevation 1072 NGVD to reduce ice damage and provide additional water storage. Drawdown dates are approximate and will depend on the fall waterfowl needs and the potential for icing. The drawdown will be coordinated with the State resource managers.

January 1 to March 20: Maintain lake level at 1072 NGVD.

March 20 to April 15: Allow lake level to rise to conservation pool (1075 NGVD) to enhance lake boating access.

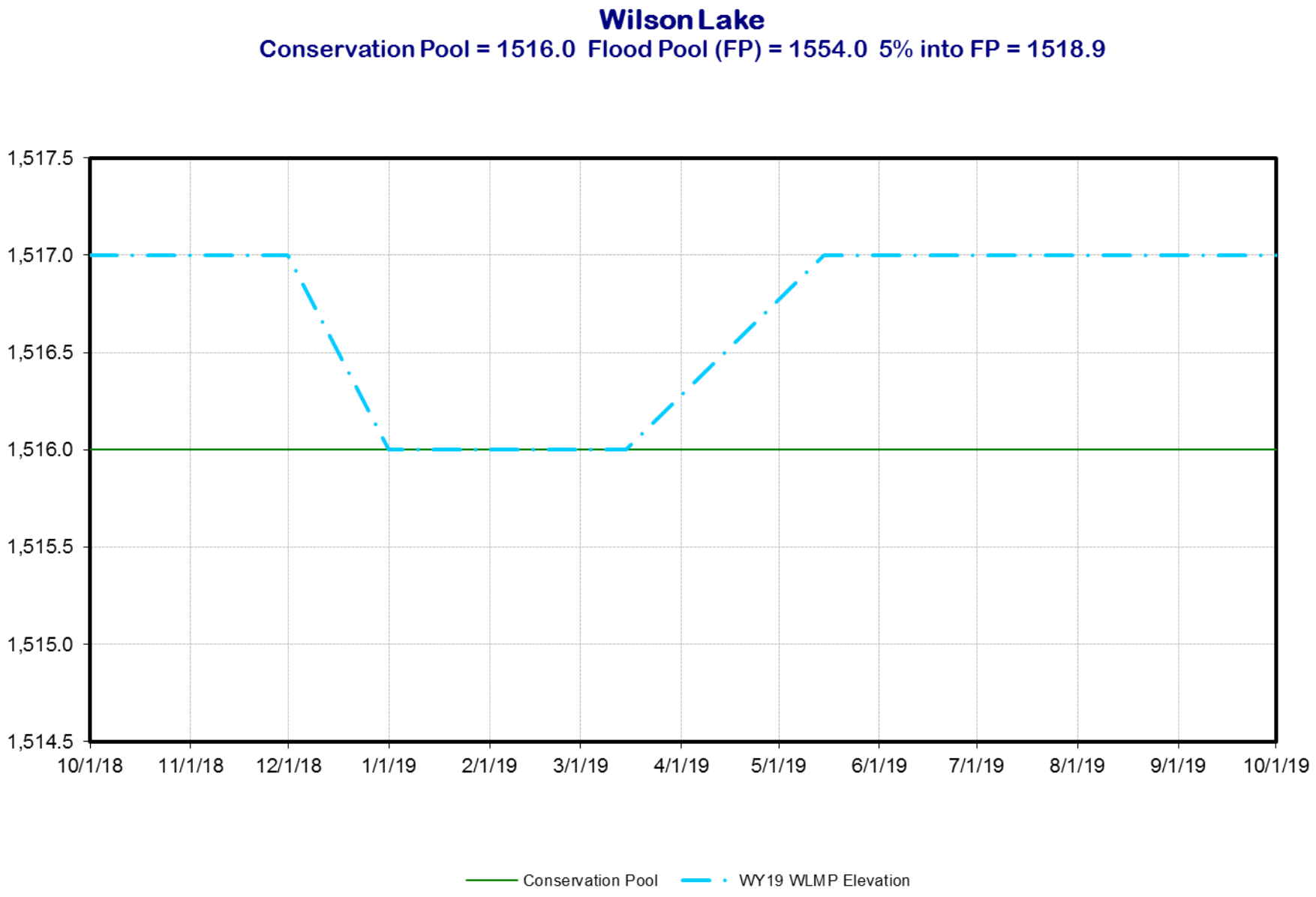
April 15 to July 1: Coordinate evacuation of flood water to enhance potential for crappie population recruitment.

Note: Holding water above multipurpose pool level during crappie spawning and nursery periods has improved crappie recruitment into the lake fishery. Storage of water in the flood control pool in late spring has also been required due to the presence of threatened and endangered terns and plovers nesting on the Kansas River's sand bar habitat downstream of the lake. Maximum sustained pool elevation during this period will be 1082.2.

July 1 to September 1: Maintain lake elevation at conservation pool (1075 NGVD) to allow shoreline habitat to re-vegetate. *Consideration will be given to any forecasted navigation demands before evacuating flood storage that may exist on or around July 1.*

September 1 to September 30: Allow lake level to rise to 1079 NGVD to inundate wetland habitat and attract migrating waterfowl.

Note: When necessary, the water level management plan at Tuttle Creek Reservoir will provide support for navigation. Changes in lake levels will be coordinated to support additional reservoir uses such as fish spawning, recreation, and waterfowl management.


Wilson Lake
Conservation Pool = 1516.0 Flood Pool (FP) = 1554.0 5% into FP = 1518.9
1,517.5
1,517.0
1,516.5
1,516.0
1,515.5
1,515.0
1,514.5
10/1/18
11/1/18
12/1/18
1/1/19
2/1/19
3/1/19
4/1/19
5/1/19
6/1/19
7/1/19
8/1/19
9/1/19
10/1/19
Conservation Pool
WY19 WLMP Elevation

WILSON LAKE

October 1 – December 1: Hold level at 1517 NGVD to flood aquatic vegetation for waterfowl management purposes.

December 1 - January 1: Lower the water level to 1516 NGVD before icing of the lake occurs.

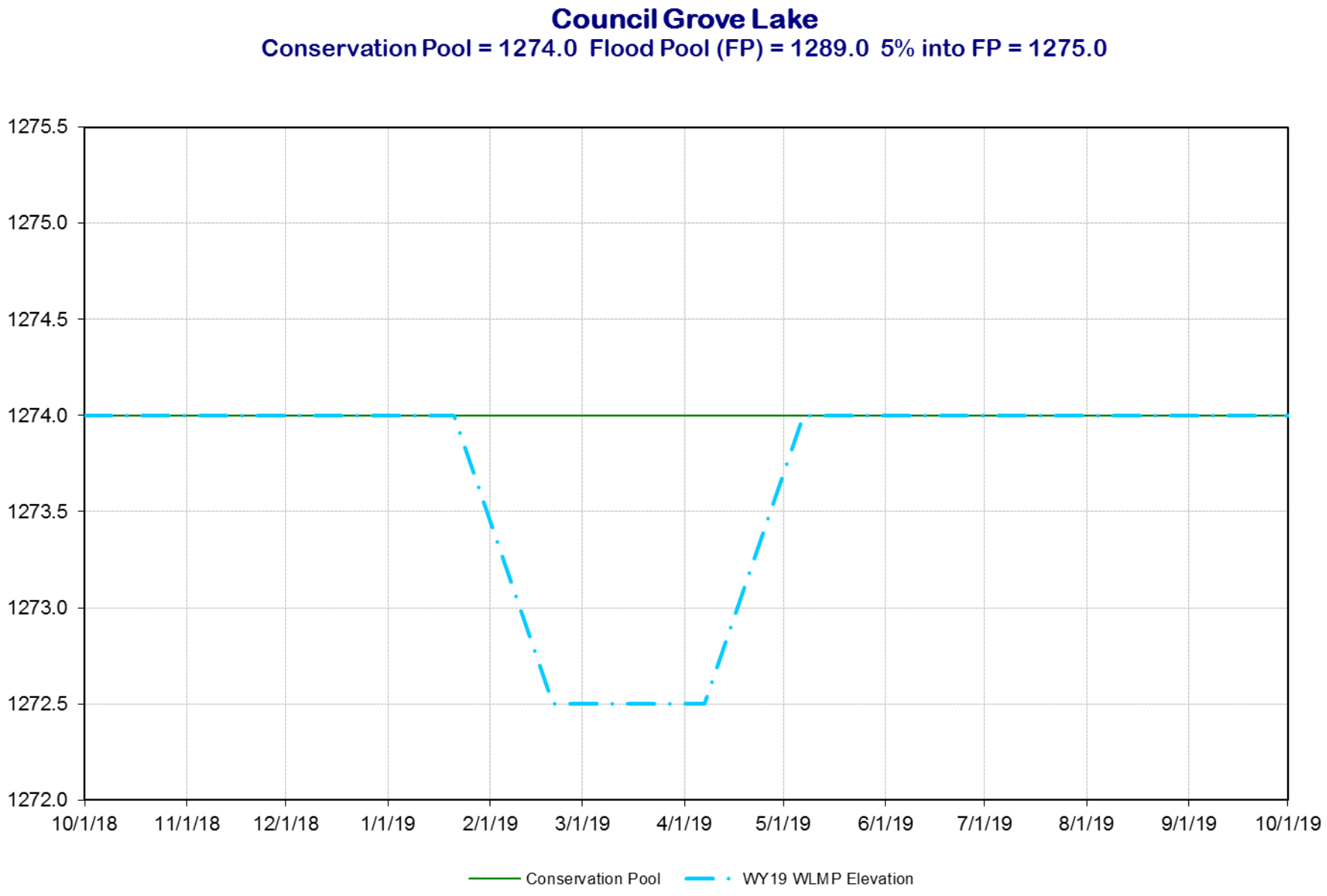
January 1 – March 15: Maintain the water level at 1516 NGVD to reduce shoreline erosion in the Park areas and to provide buffer for spring rains.

March 15 – August 15: A stable or slightly rising water level up to 1517 NGVD is preferred for game fish spawning purposes. Rapid drawdowns should be avoided during March, April, and May, if possible.

August 15 – Sept. 30: Hold inflow to raise level to 1517 NGVD for waterfowl.

U.S. Army Corps of Engineers, Tulsa District

Water level management plans may be implemented in whole or in part depending on the needs of other project purposes based on the hydrologic conditions that exist at the time. This may be critical if either drought or severely wet basin conditions occur. If wet basin conditions prevail, the retention of even a modest amount of water in the flood pool during the primary flood runoff season will have to be adjusted lower or forgone. Periods of drought may preclude targeted drawdowns below the top of conservation pool.


Council Grove Lake
Conservation Pool = 1274.0 Flood Pool (FP) = 1289.0 5% into FP = 1275.0
1275.5
1275.0
1274.5
1274.0
1273.5
1273.0
1272.5
1272.0
10/1/18
11/1/18
12/1/18
1/1/19
2/1/19
3/1/19
4/1/19
5/1/19
6/1/19
7/1/19
8/1/19
9/1/19
10/1/19
Conservation Pool
WY19 WLMP Elevation

COUNCIL GROVE LAKE

The plan is designed to enhance fishery production and recruitment benefits and accommodate a diverse recreational constituency. The 1.5 foot drawdown beginning in January will provide a buffer to allow for stable or rising water levels throughout much of the sport fish spawning period. Spring inflows are typically sufficient to inundate the drawdown zone and elevations frequently exceed conservation pool elevation. White crappie (the most sought after species as determined by creel survey) recruitment has been positively correlated to such events, therefore emphasizing the importance of minimizing (as much as feasible) release rates to encourage production. To minimize negative impacts to fish populations releases designed to remove water in excess of 1274.0 NGVD should be completed as slowly as possible.

October 1 - January 21: Maintain lake level at 1274.0 feet NGVD.

January 22 - February 19: (Beginning date of drawdown may be adjusted based upon lake and weather conditions). Lower water 1.5 feet, to elevation 1272.5 NGVD, to reduce ice damage to the shoreline and infrastructure, and provide a buffer for spring storage.

Note: Council Grove Lake is an important source for municipal water supply. The drainage basin is relatively small and during times of drought it may not be advisable to evacuate storage. The Kansas Water Office will be contacted prior to the winter drawdown. Conditions may warrant a decision not to evacuate storage.

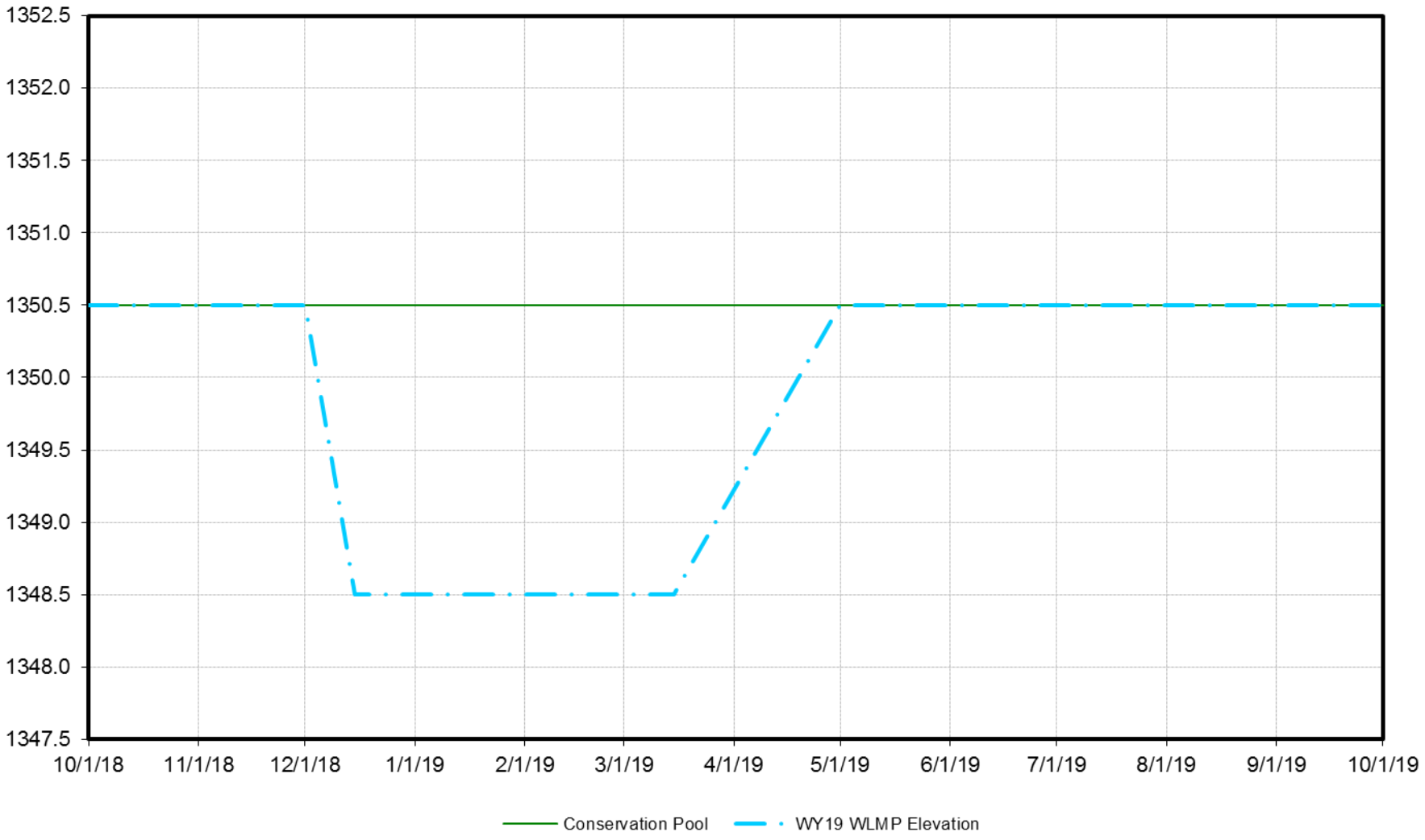
February 20 - April 6: Maintain lake at elevation 1272.5 NGVD.

April 7 - May 6: Allow lake to rise to elevation 1274.0 NGVD to inundate terrestrial vegetation to enhance fish spawning habitat and subsequent recruitment.

May 7 - September 30: Maintain lake elevation at 1274.0 NGVD, to provide continued spawning and nursery habitat for fish

Marion Reservoir

Conservation Pool = 1350.5 Flood Pool (FP) = 1358.5 5% into FP = 1351



MARION RESERVOIR

October 1 – December 1: Maintain lake at elevation 1350.5 NGVD. Fall rise has been omitted due to severe shoreline erosion in the campgrounds caused by prevailing autumn winds and holding the lake high.

Note: Marion Reservoir is an important source of water for several communities. The drainage basin is relatively small and during times of drought it may not be advisable to evacuate storage. The Kansas Water Office should be contacted prior to the winter drawdown. Conditions may warrant a decision not to evacuate storage.

December 1 – December 15: Lower lake level to elevation 1348.5 NGVD. The anticipated discharge for drawdown will be, approximately, 600 cfs.

December 15 - March 15: Maintain lake at elevation 1348.5 NGVD. A winter drawdown will provide a wide variety of benefits.

Fisheries – Enhance walleye fishing by decreasing the likelihood that adult walleye fry will be pulled through the gates during floodwater releases and provide a clean substrate for walleye to spawn upon. The rock riprap of the face of the dam (where the walleye spawn) is normally covered with filamentous green algae. By exposing the rocks, the algae will die and be weathered away to provide a clean substrate.

Water quality – Lessen blue-green algae blooms. By drying the bottom sediments, phosphorous is more tightly bound to the sediments. The phosphorous is less likely to become available in the water column where it enhances blue-green algae growth.

Operations & maintenance – Lessen ice damage to park facilities; Provide extra flood storage for heavy spring rainfall; Lessen downstream bank erosion by releasing water at a reduced rate and at a time when the stream banks are dry; Enhance opportunity for bank revetment (riprap) projects.

Zebra Mussels – Kill individuals shallower than two feet deep.

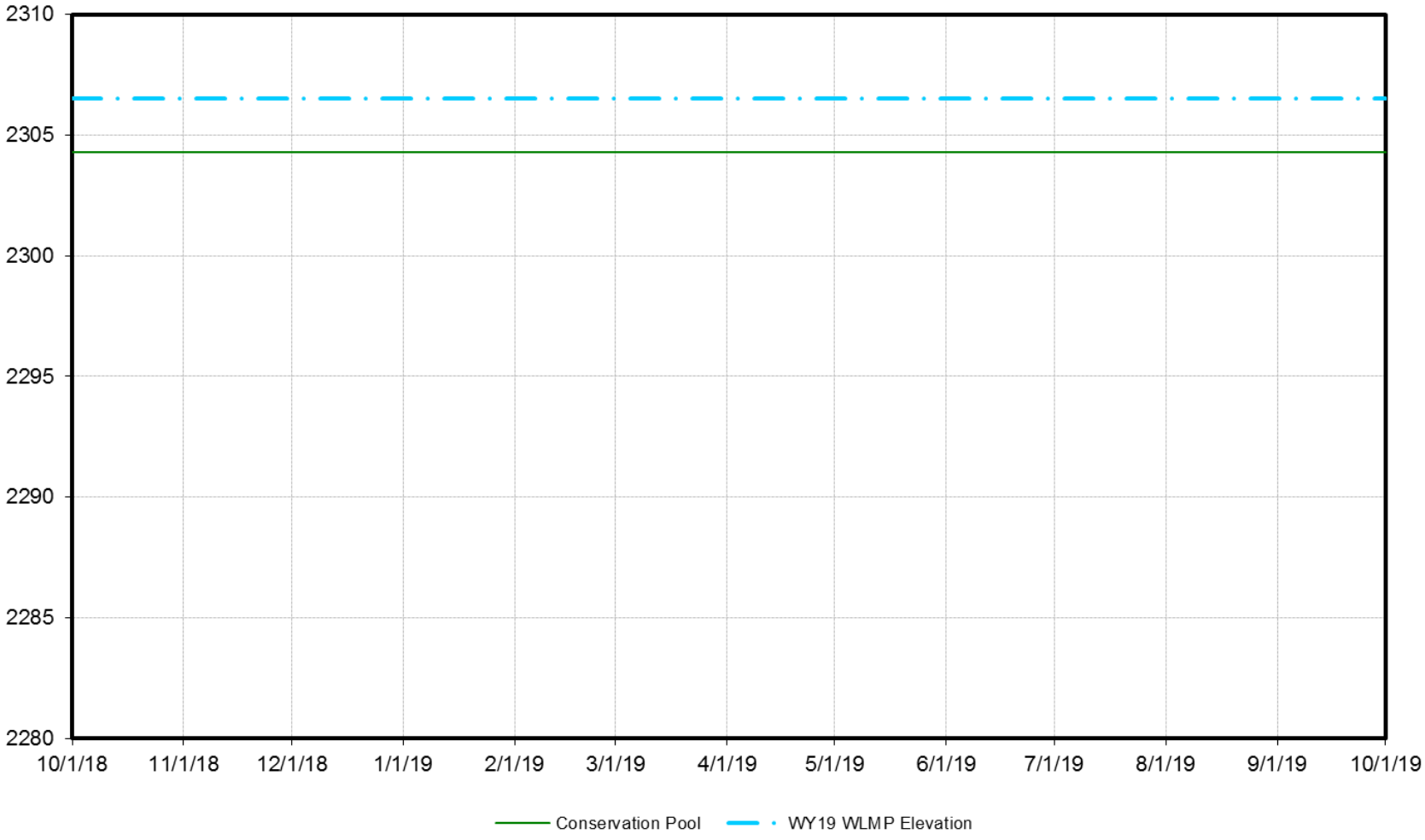
March 15 – May 1: Allow pool rise to 1350.5 NGVD.

May 1 – October 1: Maintain lake at elevation 1350.5 NGVD.

U.S. Bureau of Reclamation, Nebraska-Kansas Area Office

Keith Sebelius Lake

Conservation Pool = 2304.3 Flood Pool (FP) = 2331.4 5% into FP = 2306.4



KEITH SEBELIUS LAKE

Kansas Department of Wildlife and Parks are responsible for providing quality recreational opportunities to all users of Keith Sebelius Lake, Prairie Dog State Park, and Norton Wildlife Area. The opportunities provided to the public must be consistent with the conservation of those resources.

Keith Sebelius Lake was designed to provide flood control, irrigation, municipal, fish, wildlife and recreation benefits. Throughout the history of this reservoir (Figure 1), irrigation drawdowns and evaporative losses in excess of inflow have caused significant decreases in fishing; water based recreation and park visitation. Low water levels are benefiting wildlife but having an adverse impact on the available fish habitat that currently exists within the reservoir.

Above average rainfall during the 1990s created inflows sufficient to refill the reservoir. Holding the reservoir two feet above conservation elevation destroyed the trees around the perimeter of the reservoir and eliminated their value as shade and wind protection for park visitors and eliminated the wildlife habitat that took several decades to establish. However, holding water levels above conservation has also reduced the impact of irrigation losses in the short term and extend the quality of fishing, water based recreation and park visitation.

Water levels remaining at or above conservation level in the future are remote. Water levels have returned to the declines seen in the past with irrigation releases and inadequate inflow. Holding water levels 5% in the flood pool in the immediate future when possible will provide significant short-term benefits for fishing, park visitation and water based recreation. However, habitat redevelopment around conservation elevation in the longer-term future may impact decisions on the overall benefits of holding water above conservation level.

The Water Level Management Plan specifically addresses storage of five percent of the flood pool, whenever inflow can reach this elevation, which is at (2304.3 msl). If wet basin conditions prevail, the retention of even a modest amount of water in the flood pool will have to be adjusted lower or foregone. Holding the reservoir five percent into flood pool will raise the elevation pool 2.16 feet above conservation elevation. The following table was derived from the Bureau of Reclamation (BOR) daily hydrological sheets and BOR capacity and surface area tables.

	Elevation Feet	Area (Acres)	Content (Acre Feet)
Conservation Elevation	2304.30	2181	34510
5% Above	2306.46	2409	39469
Difference	2.16	228	4959

This plan proposes to continue to store 5% of the flood pool whenever possible. Irrigation releases and evaporation will lower lake levels. Recharge will only occur with significant inflows.

Positive impacts associated with this plan include:

1) Provides a buffer against the effects of irrigation withdrawals and conservation of the surface water supply.
2) Increases productivity of the aquatic environment thereby enhancing the fishery resource: The fisheries resource has been adversely impacted by erratic fluctuations, extreme drawdowns and high content withdrawals associated with the irrigation function throughout periods of inadequate recharge. The importance of water level fluctuations in regards to the prosperity of the Sebelius Reservoir fishery is documented in Region 1 Fisheries Progress Reports, Kansas Department of Wildlife and Parks, 1979 – 1998.
3) Optimizes the economic benefits associated with the sport fishery: In a study conducted by the Kansas Department of Wildlife and Parks for the U.S. Bureau of Reclamation (Mosher, 1997), the total estimated economic value of the Sebelius fishery was $4,134,450 in 1995 and $3,908,502 in 1996. This resource is an important component of the local economy. The proposed water level management plan would extend and enhance the economic value of this fishery.
4) Increases revenue and visitation at Prairie Dog State Park: Since 1965, records indicate that the parks' revenue and visitation increase with higher water levels. The opposite is also indicated where the revenue and visitation decrease during times of low water levels and during reservoir drawdown. Record visitation has always occurred when the reservoir was at or near conservation pool.
5) Increases the ease and usability of boat ramps and floating docks: The boat ramps within the State Parks and the Wildlife Area are usable when water levels are maintained as proposed in this plan. As water levels decline to five feet

below conservation level; the ramps within the park became increasingly longer and make launching boats more difficult; the wildlife area ramps become unusable.

6) Extends water based recreational opportunities and the economic benefits to the local economy.
7) Improves park aesthetics: Development of permanent campgrounds, roads, and docks has already occurred. The park facilities have been adjusted to accommodate the increase in water storage.

Negative impacts associated with this plan include:

1) Destruction of 218 acres of terrestrial habitat with the potential destruction of more: Conservation elevation was established to provide for water storage for irrigation, water-based recreation, fishing and park visitation. It also establishes the area above conservation for wildlife habitat as mitigation for habitat lost in the establishment of the reservoir.
2) Loss of flood protection for wildlife habitat: A flood experienced when the reservoir is 5% above conservation elevation would affect an undetermined amount of habitat. A one-foot increase above 5% would also affect through roads in three locations, make one boat ramp unusable, and flood three toilets.
3) Increases the long-term expansion of noxious weeds above conservation elevation.

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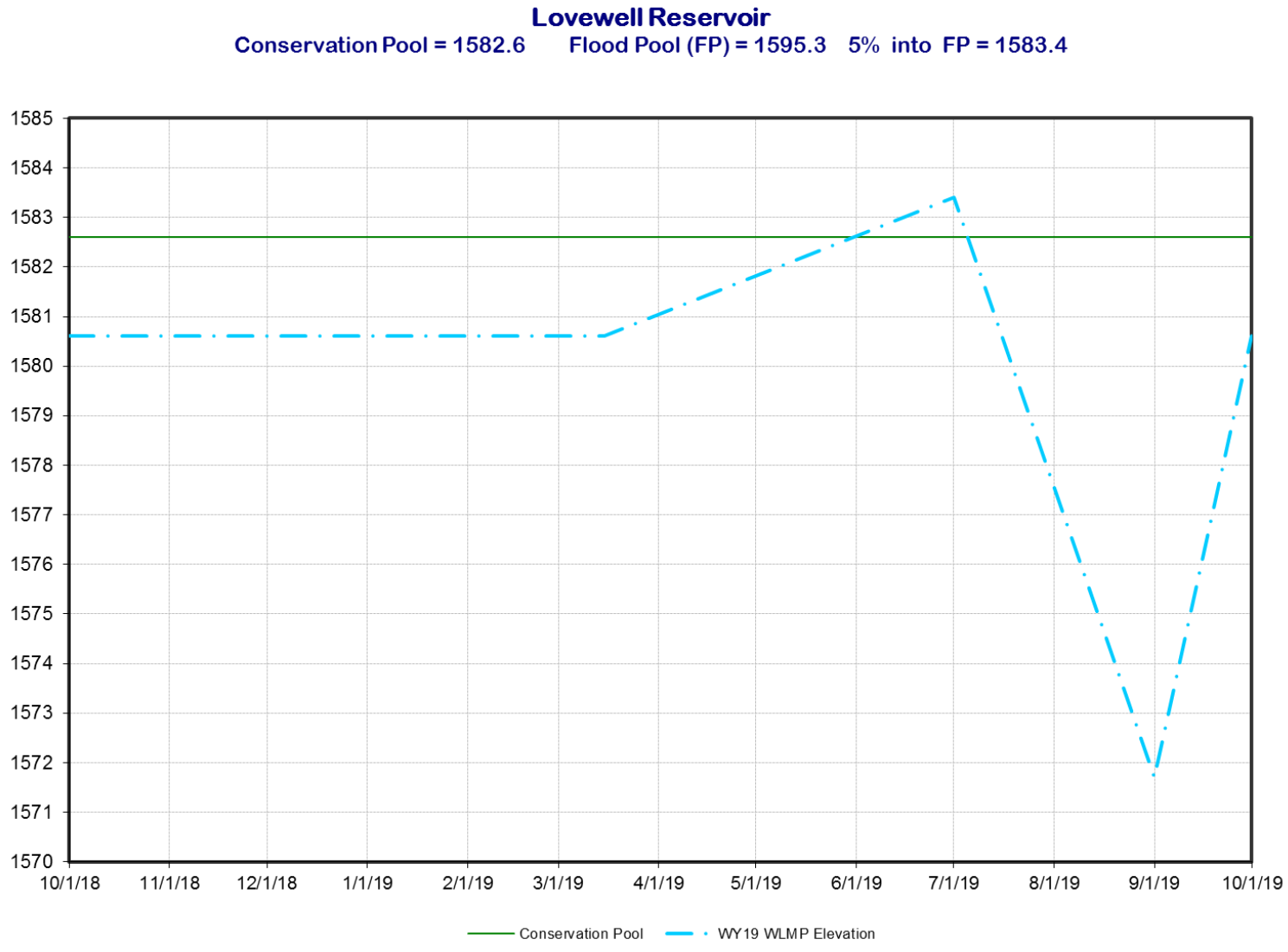
Mosher, T.D. 1997. A creel survey summary for the Republican River, Lovewell Reservoir, and Sebelius Reservoir, Kansas 1995 and 1996. Kansas Department of Wildlife and Parks, Pratt, Kansas USA.


Lovewell Reservoir
Conservation Pool = 1582.6 Flood Pool (FP) = 1595.3 5% into FP = 1583.4
1585
1584
1583
1582
1581
1580
1579
1578
1577
1576
1575
1574
1573
1572
1571
1570
10/1/18
11/1/18
12/1/18
1/1/19
2/1/19
3/1/19
4/1/19
5/1/19
6/1/19
7/1/19
8/1/19
9/1/19
10/1/19
Conservation Pool
WY19 WLMP Elevation

LOVEWELL RESERVOIR

The Kansas Bostwick Irrigation District (KBID) is the main user of the water resource at Lovewell. The goal of the Lovewell Reservoir Water Level Management Plan is for all users to benefit from water levels ranging from .8 foot above conservation pool to 10.9 feet below conservation pool, while addressing both positive and negative impacts of these water levels.

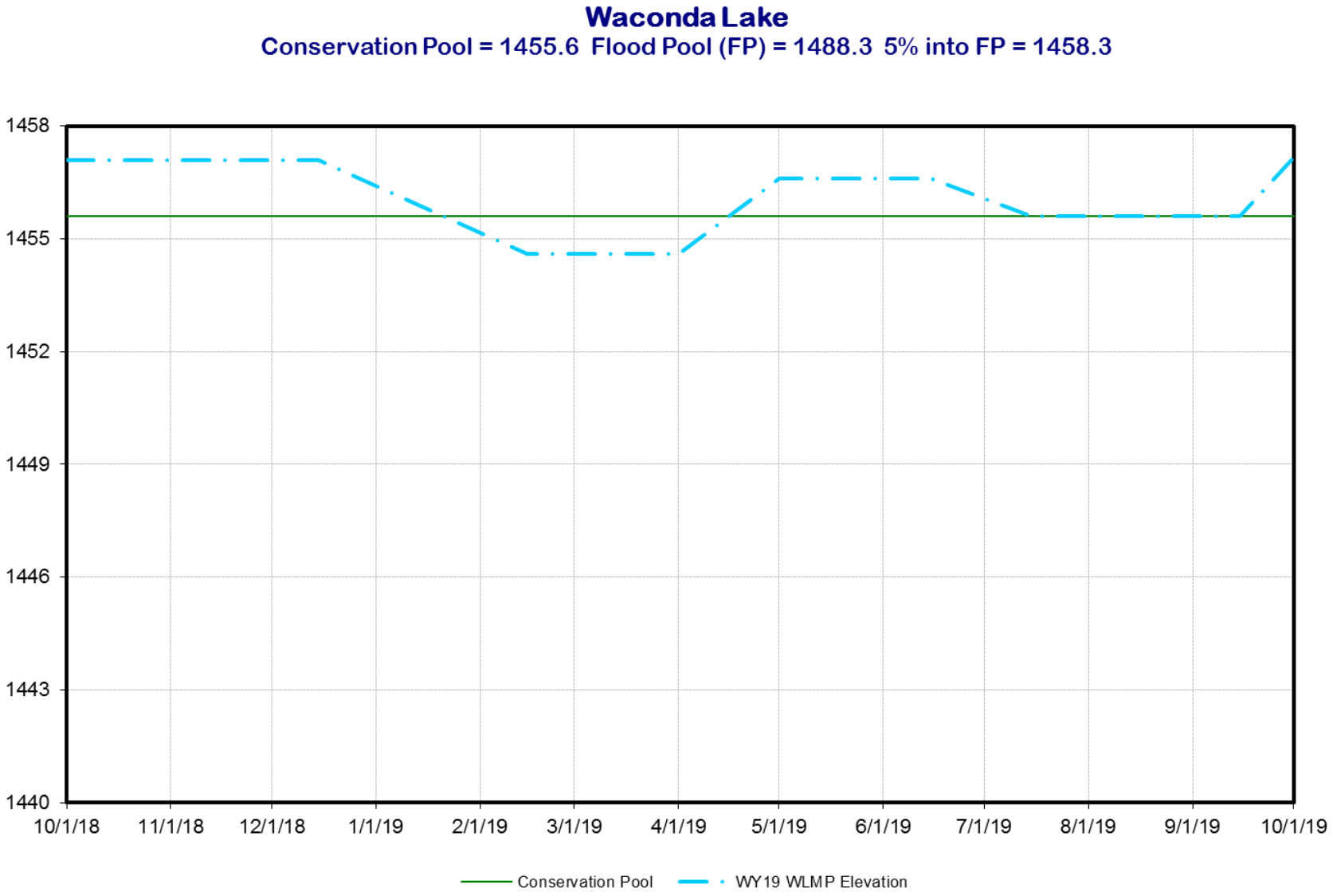
This reservoir level management plan proposed for Lovewell Reservoir is designed to coordinate with Kansas Bostwick Irrigation District's past operations, and will continue to request specific water levels below conservation pool. Spring elevations greater than 2 feet above conservation pool damage the reservoir shoreline, park and wildlife area recreation facilities and flood important wildlife habitat. Summer lake levels more than 10.9 feet below conservation pool reduce access to the reservoir by rendering the boat ramps, docks, and swimming beach inoperable. These levels also de-water the upper end of the reservoir and feeder creeks. When these areas have water in the fall, they provide excellent marshy areas, which are conducive to waterfowl retention and fisheries rearing areas. When these areas are too dry or too wet, fisheries, wildlife, recreation resources and reservoir capacity are reduced for all users.

Lovewell Reservoir was designed to provide flood control, irrigation, recreation and fish and wildlife habitat. In this way it is similar to the other five western Kansas BOR reservoirs. What makes Lovewell Reservoir unique from the other reservoirs is the ability to dependably refill the reservoir with water via the Bostwick Irrigation District's Courtland Canal. The 33 mile long canal and diversion dam begin at Guide Rock Nebraska, and bring Republican River water from Nebraska to Lovewell Reservoir. This system allows Lovewell to refill after irrigation season with the exception of an extreme drought year like 1991. This dependability allows Lovewell to have more detailed water level management then the other 5 reservoirs.

Lovewell Reservoir's past water levels have experienced record lows in 1991 and record high in 1993: fisheries were stressed in 1991, whereas facility damage and severe shoreline erosion occurred in 1993.

October 1- December 15: Allow water level to rise to elevation 1580.6 NGVD. If waterfowl habitat conditions warrant, it may be requested to increase the lake level to conservation pool (1582.6 NGVD) by October 15.

December 15- March 15:	Maintain a stable water level at or near elevation 1580.6 NGVD.
March 15 - July 1:	Water level recharges slowly, from natural run-off or recharging by Irrigation District, to elevation 1583.4 NGVD, if necessary.
July 1- September 1:	Allow evaporation and irrigation releases to lower the lake level to elevation 1571.7 NGVD (10.9 feet below conservation pool).
September 1 – September 30:	Following the irrigation season begin refilling of reservoir


Waconda Lake
Conservation Pool = 1455.6 Flood Pool (FP) = 1488.3 5% into FP = 1458.3
1458
1455
1452
1449
1446
1443
1440
10/1/18
11/1/18
12/1/18
1/1/19
2/1/19
3/1/19
4/1/19
5/1/19
6/1/19
7/1/19
8/1/19
9/1/19
10/1/19
Conservation Pool
WY19 WLMP Elevation

WACONDA LAKE

When the water level is below 1454.6 NGVD, hold as much water as possible while still meeting downstream needs. The purpose of the lake management plan is to make use of the available water for benefit of fish, wildlife and recreational uses.

October 1 - December 15: Maintain a level of 1457.1 NGVD, 1.5' rise will enhance waterfowl habitat throughout the season.

December 16- February 15: Lower the water level to 1454.6 NGVD to crowd and allow for increasing pool levels in the spring to contain outflows while improving spawning conditions for walleye. Discretion may dictate the actual discharge period and volume. If weather conditions permit, a gradual drawdown is much preferred, however discharges may have to be increased and the period constricted to prevent marina and shoreline damage before heavy icing occurs.

February 16- March 31: Maintain lake level between 1454.6 NGVD for reasons stated above.

April 1 – April 30: Increase water level to 1456.6 NGVD to enhance forage production and maintain nursery habitat.

May 1 – June 15: Maintain water level at 1456.6 NGVD for fish and recreational benefits.

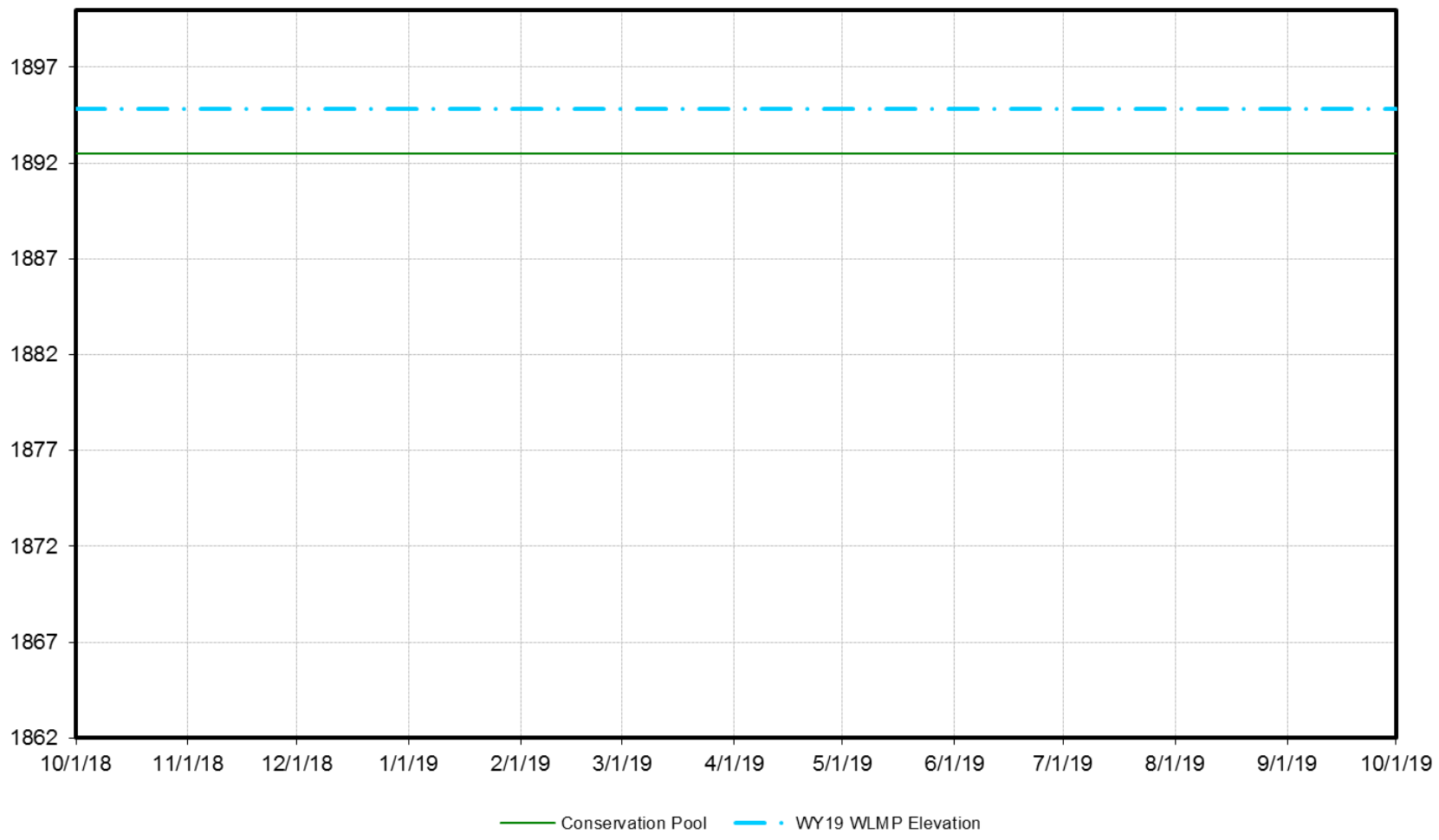
June 16 – July 15: Decrease water level to 1455.6 NGVD to initiate establishment of terrestrial vegetation.

July 16 – August 31: Maintain water level at 1455.6 NGVD to allow re-growth of vegetation.

September 10 – September 30: Allow pool rise to 1457.1 NGVD to improve waterfowl habitat. This water level rise not to be conducted until after Labor Day weekend.

Webster Reservoir

Conservation Pool = 1892.45 Flood Pool (FP) = 1923.7 5% into FP = 1894.8



WEBSTER RESERVOIR

Webster Reservoir has a history of not recharging after irrigation drawdowns. Such recharges have happened in the past, but are infrequent. In 1993 and 1995, the lake elevation rose up to 15 feet over conservation pool (1892.45 NGVD). Recharges to five percent of flood pool (1894.8 NGVD) occurred from 1996 to 2000.

Webster Reservoir was designed to provide flood control, irrigation, and recreational opportunities. Throughout the history of this reservoir, low supplies of water have limited the ability of the resource to satisfy all demands. The Webster Irrigation district has experienced water shortages and the fisheries resource has been adversely impacted by erratic fluctuations, extreme drawdowns and high content withdrawals associated with the irrigation function throughout periods of inadequate recharge.

The Webster Reservoir water supply issue is addressed in the State Water Plan and is an important concern among managing entities and the general public. Numerous efforts to deal with this problem have thus far been unsuccessful. The five-percent storage plan, while not a solution, is a positive move towards wise use of surface water supplies whenever above-average reservoir recharge occurs. Five percent of the flood pool (9,161 acre-feet) represents nearly 50% of the average annual diversion required for full irrigation.

The chances of maintaining lake elevations at or above conservation level in the future are remote. Water levels have returned to the declines seen in the past with irrigation releases and inadequate inflow. Holding water up to 5% into the flood pool in the future will provide significant short-term benefits for fishing, park visitation and water based recreation. However, habitat redevelopment around conservation pool elevation in the longer-term future may impact decisions on the overall benefits of holding water above conservation level.

This plan proposes to continue to store five percent of the flood pool whenever possible. If wet basin conditions prevail, the retention of even a modest amount of water in the flood pool will have to be adjusted lower or foregone. Irrigation releases and evaporation will lower the lake level. Recharge in the fall that is sustained to the start of the irrigation season would be of the most benefit to all aspects of the reservoir but will only occur with significant natural inflow.

Positive impacts associated with this plan include:

1) Provides a buffer against the effects of irrigation withdrawals.

2) Increase productivity of the aquatic environment thereby enhancing the fishery resource: The conditions depicted by the proposed water level management plan are considered ideal the fisheries management at Webster Reservoir. Rising or stable water levels during the spring promote reproduction, survival and growth of various fish species by providing quality spawning habitat and nursery cover and enhancing primary productivity. Drawdown during the summer and early fall allows natural re-vegetation of exposed areas which can be subsequently flooded whenever recharge is adequate. Utilizing the five-percent option provides greater shoreline development and increased angler access to both the State Park and Wildlife Area throughout the year by maintaining a higher annual water level trend. The importance of water level fluctuations in regards to the prosperity of the Webster Reservoir fishery is documented in Region 1 Fisheries Progress Reports, Kansas Department of Wildlife and Parks 1979 – 1998.

3) Optimizes the economic benefits associated with the sport fishery: In a study conducted by the Kansas Department of Wildlife and Parks for the U.S. Bureau of Reclamation (1998), the total estimated economic value of the Webster fishery (stilling basin included) was $11,129,238 during the 20 month period of evaluation (March, 1995, October, 1996 and March, 1997 – February, 1998.) This resource is an important component of the local economy. The proposed water level management plan would enhance the economic value of this fishery.

4) Increases visitation at the State Park: Past visitation records at Webster State Park, show that the higher the water level, the higher the visitation. This is highly dependent on a healthy fishery created by high water levels. Other activities enhanced by the higher more stable lake levels are boating, skiing, swimming, and camping. Park aesthetics are improved by developing permanent campgrounds and other facilities near the water edge. All these activities increase park customer satisfaction, which increases visitation and optimizes the economic benefits associated with the State Park and the local economy.

5) Increases the ease and usability of Webster Reservoir boat ramps: The boat ramps within the State Park and the Wildlife area are usable when water levels are maintained as proposed in this plan. As water levels decline to five feet below conservation level, the ramp on the Wildlife Area becomes unusable and the ramps within the State Park become increasingly longer and make launching boats more difficult.

Negative impacts associated with this plan include:

1) Loss of terrestrial, riparian and wetland acreage: Storing five percent of flood pool inundates 266 acres of terrestrial, riparian and wetland habitats, which are part of the wildlife mitigation acreage surrounding the reservoir. Recovery of this acreage is delayed by repeated flooding. Migrating waterfowl and shorebirds benefit if recharge occurs in the fall and inundates vegetation. However, high water levels in the spring, reduced slowly by irrigation, destroy vegetation established the previous year and expose the shoreline, which enhances germination of less desirable plants. Mechanically reseeding these areas to date has generated marginal success.

Expanding range of Canada thistle: The distribution of Canada thistle around the reservoir is directly related to water levels. Continued flooding and drawdowns above the conservation level creates a new area that allows the expansion of Canada thistle.

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APPENDIX A: BACKGROUND ON THE 2019 MILFORD LAKE MANAGEMENT PLAN

[October 2018 to September 2019]

In proposing the 2019 Water Level Management Plan, the Kansas Department of Health and Environment noted the light-to-moderate blue-green algae (cyanobacteria) blooms in 2012, 2013, 2017 and, none thus far, in 2018. By coincidence or otherwise, these corresponded to periods when the conservation storage pool level was maintained or managed to remain below the 1144.4' elevation demarcating conservation pool from Milford's flood pool.

While the drawn down conditions of 2012 – 2013 were induced by drought and the Corps use of conservation storage to supplement navigation support flows on the Missouri River in Autumn 2012, pool level management in 2017 and 2018 maintained a three-foot drawdown in Spring of each year followed by maintenance of pool levels over the Summer within 1' – 1.4' of the top of conservation storage. Even as runoff caused the pool to rise above desired target elevations, the Corps managed releases to return to those planned elevations as quickly as possible and as conditions permitted. The rationale behind the 2017 – 2018 drawdowns was to create a cushion of storage to hold high flows and not allow them to inundate lakeside lands and introduce any deposited nutrients into the lake.

An unforeseen, but fortuitous result of managing the pool level plan in 2017 was high outflow releases (but staying below the 2000 cuffs threshold to protect the fishery spawn and fry). Those releases moved water that had accumulated in the lower portions of the flood pool out of the lake and, in doing so, caused longitudinal movement of water from the causeway area of Zone C down toward the dam outlet in Zone A. This resulted in stretching the developing algal bloom in Zone C into Zone B, thereby preventing the bloom from reaching a critical mass and density in Zone C. During 2014, 2015 & 2016, the algal bloom in Zone C accumulated into such a high density that it was resilient to dispersion from wind or late summer inflow events. Coincidentally, the large mass of cyanobacteria manifested into offensive odors that curtailed outdoor activities near Wakefield. Cell counts and microcystin toxin concentrations also elevated to warning and closure levels for the duration of the summer and well into the fall of those years. That phenomenon did not occur in 2017 and the movement of water through the lake zones is one factor that may have contributed to that outcome.

So far in 2018, no bloom has occurred on Milford as the pool remained below conservation level until mid-May and then was only within the first foot of the flood pool. The proposed 2019 pool level management plan intends to build on these empirical results of the past two years. The 2018 Legislature appropriated funds to KDHE to investigate in-lake treatment strategies to combat harmful algal blooms such as seen in the past in Milford. After investigating other efforts in states such as Florida and Ohio, KDHE has decided to pilot test planting of vegetation on shallow mud flats in Zone C of Milford Lake to compete against the algal population for the accumulated nutrients in those sediments. Additionally, application of some chemical treatment on those shallows to lock up available phosphorus or effectively kill off algal cells before they coalesce into a harmful bloom will be investigated.

To implement these strategies, the mudflats near the Wakefield causeway need to be exposed through drawing the lake down. Discussions were held with the Kansas Department of Wildlife, Parks and Tourism and the Kansas Water Office over an acceptable magnitude and duration of such a drawdown that would not impede access to the lake by the recreating public. The result of those discussions was agreement that continuation of the three-foot drawdown managed in 2017 & 2018 during the late winter and spring would be sufficient to facilitate the planting strategies. Additionally, the drawdown would be attempted to be maintained up to Memorial Day to maximize the chances of the planted vegetation taking hold in the exposed sediments before they were inundated. The pool over the summer would be held to within 1’ – 1.4’ of the top of the conservation pool as it had the previous two years. Rises would then be allowed in the latter part of the summer to prepare for the waterfowl migration season in the fall, inundating the upper wetlands to accommodate the migration. The impact of this proposed plan should be minimal for recreation access and will hopefully build on the success of the past two drawdowns to mitigate the impact of the harmful algal blooms in the lake.