

Nelson, Dan

From: Scott King [SKing@spfwater.com]
Sent: Tuesday, March 22, 2016 5:12 PM
To: Nelson, Dan
Subject: RE: Parma Ponds

Dan,
I see what I did on seepage by making a copy of the spreadsheet for 63-33643 (1 acre) and not changing the water right number under the "FILE NUMBER" and printing that one out when writing the letter. I certainly agree on the 9.7 af for seepage.

Thanks also for checking with the other climate station and for this explanatory email.

Scott

From: Nelson, Dan [<mailto:Dan.Nelson@idwr.idaho.gov>]
Sent: Friday, March 18, 2016 12:47 PM
To: Scott King <SKing@spfwater.com>
Subject: Parma Ponds

Hi Scott,

When I reviewed your spreadsheet, I found that you used a different ET site, and you only counted 1 acre for the seepage instead of the 23 acre of pond surface area. I did some recalculations, and came up with the following. I spoke with Shelley, and we can proceed with these numbers. I wanted to give you a look at them before you see them on the license, so you are not surprised. If you have any issues, please let me know. Here is an excerpt from my memo:

Mr. King originally determined the storage volume as 10 af for permit 63-32226 and 34 af for permit 63-32608 or a total of 44 af when the two permits are combined. The capacities of the 5 ponds were calculated to be 44 af. See the attached spreadsheets. Mr. King also didn't provide a volume for the wildlife use. The storage calculated by Mr. King did not include any seepage or evaporation losses. Therefore, we needed determine the actual volume of the storage components when including the seepage and evaporation, and the volume of the wildlife flow through amounts.

In Mr. King's email dated 12/15/2015, he stated that the water from the drain is delivered to the ponds non-stop for 181 days during the non irrigation season. This would supply a diversion volume of 1,375af (3.83 cfs X 1.9835 X 181 days = 1,375 af). There is 1,375 af of water we have to work with to provide adequate storage volumes and a volume for the wildlife use.

On February 26, 2016, Mr. King supplied a information to provide the evaporation and seepage rates for the ponds. Mr. King came up with a seepage volume of 0.5 af and evaporation rate of 9.7 af. The seepage volume that Mr. King compiled was only for a 1 acre pond. The ponds for these two permits have a surface area of 23 acres. I redid the pond spreadsheet using the correct surface area, and I found that 12.5 af is lost to seepage. When I did a calculation of the evaporation losses, I came up with a higher evaporation rate. I used the Parma Experimentation Station and Mr. King used the Parma AgriMet station. Mr. King came up with a evaporation rate of 9.7 af, and I came up with an evaporation rate of 10.4 af. I will license the permits based on the 10.4 af to ensure the permit holder is covered.

With a flow through volume of 1,375 and a total storage volume of 66.9 af (44 af capacity + 12.5 af seepage + 10.4 af evaporation = 66.9 af storage), the wildlife flow through for these permits would be 1,308 af (1375 af total available – 66.9 af storage = 1,308 wildlife volume). This leaves the calculations for the volumes for each permit. I did this based on the permit and the percentage amounts.

Permit 63-32226 was limited to 1.03 cfs and 10 af of storage. A diversion rate of 1.03 cfs provides 370 af of the total 1,375 af. The 10 af of storage allowed by this permit covers 22.7% of the storage allowed. Therefore, 22.7 % of the seepage and evaporation rates should be allocated to this permit. 12.5 af of seepage X 0.227 = 2.8 af of seepage, and 10.4 af of evaporation X 0.227 = 2.4 af of evaporation. This permit should provide 15.2 af of storage (10 af capacity + 2.8 af seepage + 2.4 af evaporation = 15.2 af total storage). The wildlife use should be limited to 1.03 cfs and 355 af (370 total volume – 15.2 af storage = 354.8 af).

Permit 63-32608 was limited to 2.80 cfs and 34 af of storage (per the field report). A diversion rate of 2.80 cfs provides 1,005 af of the total 1,375 af. The 34 af of storage allowed by this permit covers 77.3% of the storage allowed. Therefore, 77.3 % of the seepage and evaporation rates should be allocated to this permit. 12.5 af of seepage X 0.773 = 9.7 af of seepage, and 10.4 af of evaporation X 0.773 = 8.0 af of evaporation. This permit should provide 51.7 af of storage (34 af capacity + 9.7 af seepage + 8.0 af evaporation = 51.7 af total storage). The wildlife use should be limited to 2.80 cfs and 953 af (1005 total volume – 51.7 af storage = 953.3 af).

I am hoping to have it on Shelley's desk next week for licensing. Permit 63-33643 has been ready for licensing, so I won't change anything from what I told you about earlier.

Thank you Scott.

Daniel Nelson
Staff Hydrologist
Idaho Department of Water Resources
Telephone (208) 287-4856
Fax (208) 287-6700 (attn: Dan Nelson)

Nelson, Dan

From: Nelson, Dan
Sent: Friday, March 18, 2016 12:47 PM
To: 'Scott King'
Subject: Parma Ponds

Hi Scott,

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In Mr. King's email dated 12/15/2015, he stated that the water from the drain is delivered to the ponds non-stop for 181 days during the non irrigation season. This would supply a diversion volume of 1,375af ($3.83 \text{ cfs} \times 1.9835 \times 181 \text{ days} = 1,375 \text{ af}$). There is 1,375 af of water we have to work with to provide adequate storage volumes and a volume for the wildlife use.

On February 26, 2016, Mr. King supplied a information to provide the evaporation and seepage rates for the ponds. Mr. King came up with a seepage volume of 0.5 af and evaporation rate of 9.7 af. The seepage volume that Mr. King compiled was only for a 1 acre pond. The ponds for these two permits have a surface area of 23 acres. I redid the pond spreadsheet using the correct surface area, and I found that 12.5 af is lost to seepage. When I did a calculation of the evaporation losses, I came up with a higher evaporation rate. I used the Parma Experimentation Station and Mr. King used the Parma AgriMet station. Mr. King came up with a evaporation rate of 9.7 af, and I came up with an evaporation rate of 10.4 af. I will license the permits based on the 10.4 af to ensure the permit holder is covered.

With a flow through volume of 1,375 and a total storage volume of 66.9 af (44 af capacity + 12.5 af seepage + 10.4 af evaporation = 66.9 af storage), the wildlife flow through for these permits would be 1,308 af (1375 af total available – 66.9 af storage = 1,308 wildlife volume). This leaves the calculations for the volumes for each permit. I did this based on the permit and the percentage amounts.

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Thank you Scott.

Daniel Nelson
Staff Hydrologist
Idaho Department of Water Resources
Telephone (208) 287-4856
Fax (208) 287-6700 (attn: Dan Nelson)



RECEIVED

MAR 07 2016

DEPARTMENT OF
WATER RESOURCES

February 26, 2016

Idaho Department of Water Resources
Eastern Regional Office
900 North Skyline Drive, Suite A
Idaho Falls, ID 83702-1718

Attn: Dan Nelson

Subject: Additional information for Thorpe 63-32226, 63-32608, 63-

Dan,

As you requested, here is some additional information on the above-referenced permits regarding seepage and evaporation.

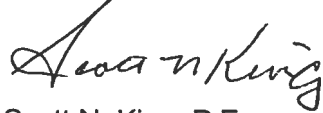
The total water surface area under 63-32226 & 63-32608, which represent the same system, is 23 acres. Based on the Parma climate station, positive precipitation-deficit evaporation for shallow ponds during the season of use totals 129 mm/yr (0.42 ft/yr). Total evaporation is calculated at 9.7 afa. The predominant soil is Moulton Loam (MwA) with a suggested seepage rate of 0.003 ft/day per IDWR Pond Spreadsheet. Total seepage is calculated at 0.5 afa.

The surface area under 63-33643 is 1 acre. Precipitation-deficit evaporation for the 365-day season of use is 663 mm/yr. Total evaporation is calculated at 2.2 afa. As this system is part of a drain where the system is expected to gain flow from shallow ground water, seepage is expected to be negligible or negative.

February 26, 2016

Please let me know if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "Scott N. King". The signature is fluid and cursive, with the first name "Scott" and last name "King" clearly distinguishable.

Scott N. King, P.E.
Supervising Engineer

cc:

File: 1214.0010

Found at: <http://data.kimberly.uidaho.edu/ETIdaho/>

Precipitation Deficit

Station: Twin Falls 2 NNE (NWS -- 109294)

Month	mm/day ¹	Days per month	mm/Month
Jan	-0.43	31	0.00
Feb	0.38	28	10.64
March		31	0.00
April		30	0.00
May		31	0.00
June		30	0.00
July		31	0.00
August		31	0.00
September	2.67	30	80.10
October	1.13	31	35.03
November	0.10	30	3.00
December	-0.54	31	0.00

PLEASE NOTE: The seasonal average for precipitation deficit should not be used for calculations because precipitation often exceeds evaporation during wetter months of the year. If the pond is kept full, excess precipitation during wetter months does not serve to refill the pond during drier months.

For example, see Sandpoint KSPT (NWS -- 108137), the annual precipitation deficit is -106 mm. However, April through September have positive precipitation deficit values. To properly estimate the annual volume of water necessary to refill a pond due to evaporation losses, the table will automatically enter a zero (0) for each month that the precipitation value is reported as a negative value.

As described above, precipitation offsets evaporation in winter months, so the net effect is that wintertime precipitation deficit is usually zero.

Total mm/year = 128.77

Evaporation is based on the 181 days of evaporation use.

$$[(\text{mm/yr}) \div (\text{convert to feet})] \times (\text{Surface area of pond, in acres}) = \text{Evaporation Loss in Acre Feet}$$

$$(128.77 \div 304.8) \times 23.00 = 9.7 \text{ AFA}$$

Seepage Loss Calculations

This spreadsheet has been designed by Idaho Department of Water Resources to estimate the total annual seepage losses from a pond.

FILE NUMBER	63-32226
REVIEWER	Scott King
DATE	2/1/2016

User Input
Calculated value
Formula Explanations

Seepage is based on the 181 days of the season of use.

INPUTS

Pond Surface Area (AC.)	1	AC.
-------------------------	---	-----

Pond Surface Area (SQ. FT.)	43560	SQ. FT.
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I used the following method to obtain my Soil Classification Information:	NRCS Web Soil Survey	
My Soil Classification is	CL	
Suggested Seepage Rate (FT./DAY)	0.0030	FT./DAY

Formula: (Surface Area X Seepage Rate) X 7.48 = Gallons Per Day Loss

Convert to GPD	977	GPD
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Total Seepage Loss (AFA)	0.5	AFA
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Print Page to PDF

Though sand and gravel seepage rates may actually be higher, the maximum allowable rate is 0.2 ft/day, pursuant to Administrative Memo "Seepage Loss Standards for Ponds and Reservoirs."

Suggested Seepage Rates for Different Soil Types:

GW, GP, GM, GC, SW, SP and SM (silty sand, sand silt mixtures and gravel mixtures) = 0.2 ft per day

OL and ML (inorganic silts - very fine sands, silty, or clayey fine sands) = 0.02 ft per day

SC (clayey sands, sand clay mixtures) = 0.007 ft per day

CL (Low to medium plasticity clays) = 0.003 ft per day

MH, OH, PT and CH (high plasticity clays) = 0.0003 ft per day

LINED PONDS (liners can be chemical, fabric, or bentonite) = 0 ft per day

Ponds Intercepting Groundwater (excavated ponds filled by ground water) = 0 ft per day

Found at: <http://data.kimberly.uidaho.edu/ETIdaho/>

Precipitation Deficit

Station: Twin Falls 2 NNE (NWS -- 109294)

Month	mm/day ¹	Days per month	mm/Month
Jan	-0.43	31	0.00
Feb	0.38	28	10.64
March	1.28	31	39.68
April	2.00	30	60.00
May	2.63	31	81.53
June	3.42	30	102.60
July	4.29	31	132.99
August	3.80	31	117.80
September	2.67	30	80.10
October	1.13	31	35.03
November	0.10	30	3.00
December	-0.54	31	0.00

PLEASE NOTE: The seasonal average for precipitation deficit should not be used for calculations because precipitation often exceeds evaporation during wetter months of the year. If the pond is kept full, excess precipitation during wetter months does not serve to refill the pond during drier months.

For example, see Sandpoint KSPT (NWS -- 108137), the annual precipitation deficit is -106 mm. However, April through September have positive precipitation deficit values. To properly estimate the annual volume of water necessary to refill a pond due to evaporation losses, the table will automatically enter a zero (0) for each month that the precipitation value is reported as a negative value.

As described above, precipitation offsets evaporation in winter months, so the net effect is that wintertime precipitation deficit is usually zero.

Total mm/year = 663.37

Evaporation is based on the 181 days of evaporation use.

$$[(\text{mm/yr}) \div (\text{convert to feet})] \times (\text{Surface area of pond, in acres}) = \text{Evaporation Loss in Acre Feet}$$

$$(\text{663.37} \div \text{304.8}) \times \text{1.00} = \text{2.2 AFA}$$



State of Idaho

DEPARTMENT OF WATER RESOURCES

322 East Front Street • P.O. Box 83720 • Boise, Idaho 83720-0098

Phone: (208) 287-4800 • Fax: (208) 287-6700 • Website: www.idwr.idaho.gov

C.L. "BUTCH" OTTER
Governor

GARY SPACKMAN
Director

January 26, 2016

SPF WATER ENGINEERS
ATTN SCOTT KING
300 E MALLARD DR SUITE 300
BOISE ID 83706

RE: Field exam report for water right permits 63-32608 AND 63-32226

Dear Mr. King:

I have reviewed the field exam you supplied for water right permits 63-32608 and 63-32226. During my review I discovered that you did not provide any volume for wildlife portion of this permit. You also neglected to supply documentation addressing the seepage and evaporation losses accrued by these ponds.

On November 19, 2015, I emailed you with my concerns about the volume calculations. On December 15, 2015 you replied to email with a volume amount for the wildlife use. However, this calculation didn't include evaporation and seepage amounts for the ponds. Therefore, they were not acceptable. I responded to your email on December 15, 2015 informing you that you needed to address the evaporation and seepage losses for the ponds and remove that amount from the wildlife use volume you determined. I haven't received a response from you, since my December 15, 2015 email. The Idaho Administrative Code Beneficial Use Examination Rules, IDAPA 37.03.02.035.01j (in-part) addresses these issues as follows:

j. For each use of water the examiner shall report an annual diversion volume based on actual beneficial use during the development period for the permit. The method of determining the annual diversion volume shall be shown. The annual diversion volume shall account for seasonal variations in factors affecting water use, including seasonal variations in water availability. For irrigation, the volume shall be based on the field headgate requirements in the map titled Irrigation Field Headgate Requirement appended to these rules (see Appendix A located at the end of this chapter). Annual diversion volumes for heating and cooling uses may be adjusted to account for documented weather conditions during any single heating or cooling season from among the fifty (50) years immediately prior to submitting proof of beneficial use for the permit. For storage uses that include filling the reservoir and periodically replenishing evaporation and seepage losses throughout the year, the annual diversion volume shall be the sum of the amounts used for filling and for replenishment. Volumes may include reasonable conveyance losses actually incurred by the water user. The following water uses are exempt from the volume reporting requirement: (3-29-12)

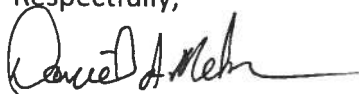
As you can see from the IDAPA rule shown above, we do need these issues concerning the volume addressed before we can move forward with processing this permit.

The Idaho Beneficial Use Examination Rules 37.03.02.035.02.c also states that field exams that need further clarification are allowed an additional 30 days to supply additional information to clarify the field exam report as stated below.

If the Director determines that a field report prepared by a certified water right examiner is acceptable but that additional information is needed to clarify the field report, he will notify the examiner in writing of the information required. If the additional information is not submitted within thirty (30) days or within the time specified in the written notice, the priority date of the permit will be advanced one (1) day for each day the information submittal is late. Failure to submit the required information within one (1) year of the date of the department's request is cause for the Director to take action to cancel the permit.

Therefore, please supply the above information by February 26, 2016. If you have any questions, please don't hesitate to contact me.

Respectfully,

A handwritten signature in black ink, appearing to read "Daniel Nelson", with a stylized flourish at the end.

Daniel Nelson

Staff Hydrologist

Idaho Department of Water Resources

Telephone (208) 287-4856

Fax (208) 287-6700 (attn: Dan Nelson)

Nelson, Dan

From: Nelson, Dan
Sent: Tuesday, December 15, 2015 10:50 AM
To: 'Scott King'
Subject: RE: 63-32608 and 63-32226

Hi Scott,

Thank you for the wildlife volume calculation. According to this calculation, they keep the ponds full for 181 days, so there would be some seepage and evaporation losses. We will need to account for those losses in the storage component of the permit. Did you do the calculations for the increase in storage needed?

Thank you

Dan Nelson

From: Scott King [<mailto:SKing@spfwater.com>]
Sent: Tuesday, December 15, 2015 8:40 AM
To: Nelson, Dan
Subject: RE: 63-32608 and 63-32226

Dan,

If my calculations are correct, the flow through volume should be 1308 acre feet. This is based on a diversion rate of 3.83 cfs over 181 days less storage requirements of 66.8 acre feet (storage volume, evaporation and seepage).

Thank you,
Scott

From: Nelson, Dan [<mailto:Dan.Nelson@idwr.idaho.gov>]
Sent: Thursday, November 19, 2015 9:12 AM
To: Scott King
Subject: 63-32608 and 63-32226

Hello Scott,

I have made it through file 63-33643, and made my recommendation for this water right. Our pond spreadsheet showed a bit more evaporation, so I used my calculations and gave them 4.9 total storage volume instead of the 4.4 af you recommended. It is still below the permitted amount, and it will give them the ability to cover all of their evaporation. I agreed with you that there would be no seepage loss on the drain, since it is a gaining conveyance structure.

I am still struggling a bit with permits 63-32608 and 63-32226. I plan to give you a call after I write this email to discuss, but I will give you some of the talking points below.

- 1.) We need a volume for the wildlife flow through.
- 2.) If you look only at the storage component, the ponds were only allowed to fill once and then the water would evaporate and seep out and with no further water usage. However, the wildlife component suggests that the ponds are kept full for a period of time, so there is evaporation and seepage during the time that

the ponds are completely full. We need to account for the portion of evaporation and seepage that occurs during the time that ponds are kept full, and the volume of water that flows through the ponds. According to the evaporation and seepage loss rates, it appears as though a portion of the ponds would need to be drained at the end of the year, so some of the storage water may be able to be accounted to the seepage and evaporation. We could also adjust the total storage volume higher than permitted if the wildlife volume covered a portion of the evaporation and seepage losses.

As you can see from above, the volume needs to be determined for the wildlife use. We also need to address any volume lost to seepage and evaporation. I am assuming that some of that water could be counted as a portion of the storage water, but we also need to account for the evaporation and seepage losses while the wildlife use is being used. This is assuming that the wildlife use is only used when the ponds are full.

This is all a bit confusing, so I plan to call you after I send this email. Hopefully, we can figure something out.

Thanks Scott.

Daniel Nelson
Staff Hydrologist
Idaho Department of Water Resources
Telephone (208) 287-4856
Fax (208) 287-6700 (attn: Dan Nelson)

Nelson, Dan

From: Nelson, Dan
Sent: Thursday, November 19, 2015 9:12 AM
To: 'Scott King'
Subject: 63-32608 and 63-32226
Attachments: 001 Pond Spreadsheet 63-32608 and 63-32226.xlsm; Pond calculations.xlsx

Hello Scott,

I have made it through file 63-33643, and made my recommendation for this water right. Our pond spreadsheet showed a bit more evaporation, so I used my calculations and gave them 4.9 total storage volume instead of the 4.4 af you recommended. It is still below the permitted amount, and it will give them the ability to cover all of their evaporation. I agreed with you that there would be no seepage loss on the drain, since it is a gaining conveyance structure.

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Thanks Scott.

Daniel Nelson
Staff Hydrologist
Idaho Department of Water Resources
Telephone (208) 287-4856
Fax (208) 287-6700 (attn: Dan Nelson)

Volume Comparisons for Water Rights 63-32608 and 63-32226

Pond	Volume in AF	Surface Area in Acres	Average Depth in Feet	Soil Type
A	14.7	5.9	2.5	CL
B	6.1	2.4	2.5	CL
C	2.2	1.1	2.0	CL
D	1.6	0.8	2.0	CL
E	19.3	12.8	1.5	CL
TOTALS	43.9	23		

Permit allows = 23 acres surface area

Permit allows = 45 af pond capacity

Permit allows = 45 af total storage volume

Permit allows = 3.83 cfs wildlife

The pond spreadsheet data is based on a 181 day season of use.

Pond Spreadsheet Shows = 43.9 af pond capacity

Pond Spreadsheet Shows = 12.5 af pond seepage

Pond Spreadsheet Shows = 10.4 af pond evaporation

Pond Spreadsheet Shows = 66.8 af total total storage volume required.

Field Exam shows = 23 acres surface area

Field Exam shows = 44 af pond capacity

Field Exam shows = 44 af total storage volume

Field Exam shows = 3.83 cfs wildlife*

* wildlife use was for flow through, but no volume was assigned to the flow through use by the field examiner.

NOTES:

1.) We need a volume for the wildlife flow through.

2.) If you look only at the storage component, the ponds were only allowed to fill once and then the water would evaporate and seep out and with no further water usage. However, the wildlife component suggests that the ponds are kept full for a period of time, so there is evaporation and seepage during the time that the ponds are completely full. We need to account for the portion of evaporation and seepage that occurs during the time that ponds are kept full, and the volume of water that flows through the ponds. According to the evaporation and seepage loss rates, it appears as though a portion of the ponds would need to be drained at the end of the year, so some of the storage water may be able to be accounted to the seepage and evaporation.

Total Storage Calculations

FILE NUMBER	69-83843
REVIEWER	Don Nelson
DATE	11/18/2015

This spreadsheet has been designed by Idaho Department of Water Resources to estimate the total seepage, evaporation and fill capacity required for a pond.

User Input
Calculated values
Formula Explanations

Surface Area (AC.)	23	"Surface Area" is automatically carried over from the "Seepage Loss" sheet.
Average Pond Depth (FT.)	1.91	"Average Pond Depth" depicts the actual depth of the pond either measured or estimated. Note: If you know the maximum depth and not the average depth, the Field Examiner's Handbook suggests multiplying the maximum depth by 0.4 to get the average depth, or you can use any method that seems reasonable to attain average depth.
Pond Capacity (AF)	43.9	Pond Capacity is calculated by multiplying the Pond Surface Area by the Average Pond Depth. If you know the capacity, divide the capacity by surface area and enter the average pond depth in the space above. Note: If pond capacity is determined using a method shown on the "Pond Capacity" sheet, the user may need to modify the value of "Pond Capacity" (cell B9) manually. Note that if the value is modified manually, the formula will be altered for future use.
Multiple Fill Volume Above Initial Fill to Fulfill From Storage Needs- "Multiple Fills" (AF)	0	The "Multiple Fill Volume Above Initial Fill" is the acre-feet of water required to meet a <i>from storage</i> component if the <i>from storage</i> component exceeds a one time fill. This section should not include the amount of water needed to fill the pond initially or the amount of water needed to maintain the pond level due to evaporation or seepage. For example: if a pond has a capacity of 5 acre feet and 2.5 acre feet of seepage and evaporation, but the pond is used for irrigation that requires 10 acre feet of from storage for the irrigation use, then you would insert 5 acre feet into this location (10 acre feet needed - 5 acre feet from the initial fill = 5 acre feet of additional storage needed). Note: You must have a "From Storage" component exceeding the initial fill on the permit to include a volume in this space.
Estimated Seepage Loss (AF)	12.5	The "Estimated Seepage Loss" is automatically carried over from the "Seepage Loss" sheet.
Estimated Evaporation Loss (AF)	10.4	The "Estimated Evaporation Loss" is automatically carried over from the "Evaporation Loss" sheet.
Total Volume Required (AF)	66.8	The "Total Volume Required" is calculated by adding the Pond Capacity, Multiple Fills, Seepage Loss, and Evaporation Loss amounts to determine the total amount of storage required.

Seepage Loss Calculations

This spreadsheet has been designed by Idaho Department of Water Resources to estimate the total annual seepage losses from a pond.

FILE NUMBER	63-33643
REVIEWER	Dan Nelson
DATE	11/19/2015

Seepage is based on the 181 days of the season of use.

User Input
Calculated value
Formula Explanations

INPUTS

Pond Surface Area (AC.)	23	AC.
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Pond Surface Area (SQ. FT.)	1001880	SQ. FT.
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I used the following method to obtain my Soil Classification information:	NRCS Web Soil Survey	
My Soil Classification is	CL	
Suggested Seepage Rate (FT./DAY)	0.0030	FT./DAY

Formula: (Surface Area X Seepage Rate) X 7.48 = Gallons Per Day Loss
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Convert to GPD	22482	GPD
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Total Seepage Loss (AFA)	12.5	AFA
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Though sand and gravel seepage rates may actually be higher, the maximum allowable rate is 0.2 ft/day, pursuant to Administrative Memo "Seepage Loss Standards for Ponds and Reservoirs."

Suggested Seepage Rates for Different Soil Types:

GW, GP, GM, GC, SW, SP and SM (silty sand, sand silt mixtures and gravel mixtures) = 0.2 ft per day

OL and ML (inorganic silts - very fine sands, silty, or clayey fine sands) = 0.02 ft per day

SC (clayey sands, sand clay mixtures) = 0.007 ft per day

CL (Low to medium plasticity clays) = 0.003 ft per day

MH, OH, PT and CH (high plasticity clays) = 0.0003 ft per day

LINED PONDS (liners can be chemical, fabric, or bentonite) = 0 ft per day

Ponds Intercepting Groundwater (excavated ponds filled by ground water) = 0 ft per day

PLEASE NOTE: The initial basis for the Suggested Seepage Rates in the table above is found on Page 16 of Seepage from Fish Ponds, Bulletin 599, August 1989 Alabama Agricultural experiment Station, Auburn University, Auburn University Alabama. If you don't know the soil type, please refer to the map provided at the NRCS Web Soil Survey (Tab #1), an ArcMap Soil Classification Map (Tab #1.1), or published NRCS Soil Survey (Tab #1.2). Use "0" if the pond fill relies on the water table.

Evaporation Loss Calculations

This spreadsheet has been designed by Idaho Department of Water Resources to estimate the annual evaporation losses from a pond.

FILE NUMBER	62-83648
REVIEWER	Don Nelson
DATE	11/13/2015

User Input
Calculated value
Formula Explanations

The acronyms used on the Kimberly Research Center website are defined below:

P = Precipitation
ET = Evapotranspiration
P _d = Precipitation deficit
P _d = ET - P

USING THIS SPREADSHEET

Use the link below to access the Kimberly Research Center website. This website provides the Precipitation Deficit for a station most representative of the pond under examination. The Precipitation Deficit is the total amount of free water surface evaporation minus the precipitation for a given area, which gives the total amount of evaporative losses incurred by the pond. There are several weather sites that are used throughout the state. IDWR staff can find the nearest site using Arc Map. The shape file containing the sites can be found at X:/Spatial/Climate/ETIdahostations.shp.

Instructions:

1. Use the link below to navigate to ET Idaho 2012.
2. Select the station which is most representative to your pond location.
3. Click Submit Query.
4. Under "Land Covers with Evapotranspiration Estimates," select "Open Water - Shallow Systems (ponds, streams)" or "Open Water - small stock ponds" depending on the pond size.
5. Click the link to "Precipitation Deficit."
6. Reference and copy (ctrl + C) the first subheading "Mean" values.
7. Click the "Paste Values from ET Idaho" button. The table will automatically enter a zero (0) for any

Found at: <http://data.kimberly.uidaho.edu/ETIdaho/>

Precipitation Deficit

Station: Twin Falls 2 NNE (NWS - 109294)

Month	mm/day ¹	Days per month	mm/Month
Jan	-0.71	31	0.00
Feb	0.10	28	2.80
March	0.00	31	0.00
April	0.00	30	0.00
May	0.00	31	0.00
June	0.00	30	0.00
July	0.00	31	0.00
August	0.00	31	0.00
September	2.88	30	86.40
October	1.56	31	48.36
November	0.00	30	0.00
December	-0.59	31	0.00

PLEASE NOTE: The seasonal average for precipitation deficit should not be used for calculations because precipitation often exceeds evaporation during wetter months of the year. If the pond is kept full, excess precipitation during wetter months does not serve to refill the pond during drier months.

For example, see Sandpoint KSPT (NWS - 108137), the annual precipitation deficit is -106 mm. However, April through September have positive precipitation deficit values. To properly estimate the annual volume of water necessary to refill a pond due to evaporation losses, the table will automatically enter a zero (0) for each month that the precipitation value is reported as a negative value.

As described above, precipitation offsets evaporation in winter months, so the net effect is that wintertime precipitation deficit is usually zero.

Total mm/year = 137.56

Evaporation is based on the 181 days of evaporation use.

$$((\text{mm/yr}) \div (\text{convert to feet})) \times (\text{Surface area of pond, in acres}) = \text{Evaporation Loss in Acre Feet}$$

(137.56 ÷ 304.8) X 23.00 = 10.4 AFA

Surface Area of Pond is automatically carried over from the Seepage Loss Sheet.

Example Data: