ADMINISTRATIVE MEMORANDUMS INDEX

As of January 26, 2016

Please note that these Administrative Memorandums will include many memos that have become outdated due to changes in rules, statutes or current Department policy. Some memos have been amended or superseded by others, and some may no longer be applicable.

WATER SUPPLY BANK			
No.	**Title**	**Signed**	**Amended or Superseded**
1.	**Organizational Structure of the Water Supply Bank**	**3-14-14**	
2.	**Establishing Timeframes and Priorities for Receiving and Reviewing Rental Applications, Guidance on Rental Fee Refund Requests and Guidance on Requests to Release Lease Contracts from the Board's Bank.**	**3-21-14**	
3.	**Seepage Loss Standards for Ponds and Reservoirs Spreadsheet - Pond Loss Calculation** Memo establishing guidelines for reviewing seepage losses from ponds and reservoirs to ensure that water rights for storage promote efficiency by meeting a reasonable conservation standard.	**3-5-15**	

Administrator's Memorandum

Water Supply Bank Memo No. 1

To: Idaho Department of Water Resources

From: Jeff Peppersack

Brian Patton

Re: **Organizational Structure of the Water Supply Bank**

Date: 3/14/2014

The Idaho Water Supply Bank is a temporary water marketing program operated by the Idaho Water Resource Board (IWRB or Board). Through the Water Supply Bank, water right holders who have temporarily ceased beneficial use of water can provide an opportunity for beneficial use by other users. There are two Water Supply Bank initiatives: distribution of natural flow and surface water storage rights in local rental pools, and a statewide water bank (the Board's Bank) for distribution of surface water and groundwater rights. Rental pools are administered by local committees established by the Board. The Department of Water Resources administers the statewide water bank for the Board. Within the Department, the Water Supply Bank program is coordinated by the Water Supply Bank Coordinator, a member of the Water Planning Bureau and day-to-day activities of the Board's Bank are administered by the Water Allocation Bureau.

Bank Background

Water banking in Idaho began with the formation of informal rental pools in Eastern Idaho along the Snake River. These rental pools allowed individuals with surplus surface water storage rights to make water available for users who needed additional water. The first recorded annual rental pool transfers occurred during the drought period of the 1930s.

In 1979 the Idaho Legislature formalized water banking activity through legislation authorizing the Idaho Water Resource Board to oversee and operate the Water Supply Bank. The Board has delegated administration of rental pools to local committees and administration of the Board's Bank to the Department of Water Resources. The Water Supply Bank Coordinator works with local committees and IDWR staff to coordinate the Water Supply Bank on behalf of the IWRB.

Water Supply Bank Personnel

The Water Supply Bank Coordinator is an IDWR employee and member of the Water Planning Bureau. The Water Planning Bureau works closely with the Water Resource Board to carry out its duties and initiatives, including developing and implementing policies, standards and guidelines for rental pools and the Board's Bank. The Coordinator researches, drafts and presents policies, rules, resolutions and reports on water banking for the Board and for the Idaho Legislature. The Coordinator collaborates with rental pool committees and IDWR staff administering the Board's Bank to ensure optimal operation of the Water Supply Bank.

Administrator's Memorandum

Within the Department, the Water Allocation Bureau is responsible for day-to-day processing of water right applications and water right record-keeping. Within the Water Allocation Bureau, members of the Water Rights Section process Water Supply Bank applications for lease and rental of water rights. Application processing is typically conducted by a Senior Water Resource Agent (Lead Agent) responsible for application processing within the Board's Bank but other Water Rights Section staff members also work on Bank items when the need arises. The Lead Agent serves as a primary point of contact for IDWR staff and members of the public regarding application processing for the Board's Bank. Additionally, the Lead Agent assists the Water Supply Bank Coordinator in monitoring Bank performance and tracking statistics, and communicates to Water Allocation Bureau leadership and to the Water Supply Bank Coordinator any issues associated with Bank program administration.

Local committees administer surface water rental pools. Local committees are comprised of different individuals and may consist of IDWR staff, members of the public and Water District Watermasters, Board Members, Secretaries and Treasurers. Rental Pool Committees are responsible for development of procedures and processing applications for water in rental pools, as well as for monitoring, tracking and reporting rental pool activities to the Water Supply Bank Coordinator. Rental Pool Committees serve as the primary point of contact for inquiries about local rental pool operational procedures.

Administrator's Memorandum

Water Supply Bank Memo No. 2

To: Water Allocation Bureau

From: Remington Buyer

Re: Establishing Timeframes and Priorities for Receiving and Reviewing Rental Applications, Guidance on Rental Fee Refund Requests and Guidance on Requests to Release Lease Contracts from the Board's Bank.

Date: March 21, 2014

The following memo pertains to the processing of applications to lease or rent water through the Idaho Water Resource Board's Water Supply Bank (Board's Bank). The memo addresses three administrative topics: 1) the establishment of timeframes for submitting rental applications and prioritization of processing rental applications; 2) establishing a policy on the refunding of rental fees; and, 3) clarifying procedures for considering Lease Contract release requests. The Idaho Water Resource Board made a unanimous motion to approve this procedural guidance at Board Meeting 3-14 on March 21, 2014.

Establishing a Time and Date for Receiving Rental Applications and Priorities for Application Review

The greatest demand to rent water rights through the Board's Bank occurs November through April of every year and Bank personnel prioritize the processing of rental applications during this period. To sustain operational efficiencies, it is imperative that opportunities to improve application processing times be explored and instituted. Rental application processing can be improved by encouraging rental applications to come into the Bank during November through April, as well as by establishing a policy for prioritizing rental applications. It is thus desirable to establish a timeframe for receiving rental applications and a method for prioritizing the processing of rental applications.

Water Supply Bank rules are authorized under Idaho Code 42-1762 and Water Supply Bank Rule 30.01 establishes that the Bank may establish a time and date for receiving applications. Because it is desirable for achieving processing efficiencies, and because it authorized by Water Supply Bank rules, the Bank here and now establishes that applications to rent water from the Water Supply Bank will be accepted no earlier than November 1 in the year preceding the use of rental water and no application to rent water will be accepted if the season of use authorized under the rental water right has concluded. Furthermore, whereas Rule 30.07 establishes that water rights should be prioritized for rental from the Bank based on the order in which they have been leased into the Bank, the Bank will similarly prioritize the processing of rental applications based on the order in which they are received.

Water Supply Bank staff reserve the right to employ alternative metrics for prioritizing rental applications if such methods will further improve overall processing efficiencies, however extenuating circumstances such as the desire to resolve water use violations through Water Supply Bank Rental Agreements are not considered a valid reason for superseding processing priorities. Any and all such rental applications will be processed based on the application's priority, established by its place in the processing queue. Finally, rental processing priorities will not limit Bank staff from processing companion applications (joint applications to both lease in and rent out a specific water right) and

companion applications can continue to be accepted and processed together, consistent with this policy, and all other rules governing the Bank.

Regarding Refunds of Rental Fees for Rental Applications

The Water Supply Bank transacts in a specific good: the right to divert water under Idaho law. Through Lease Contracts and Rental Agreements, Water Supply Bank staff authorize the temporary transfer of the right to divert the state's water resources as per the conditions of licensed and decreed water rights. Unlike access to a water right, which is easily accounted for and enforced through Bank agreements, the volume of water that might actually be diverted under a Bank agreement is variable and subject to ecosystem conditions beyond the control of Departmental staff.

If a renter decides the risk of renting a water right subject to potential curtailment is unacceptable, they can cancel their Rental Agreement in advance of the rental fee due date. There is currently no penalty for cancelation of a Rental Agreement. As such, it is hereby expressed that rental fees for a Water Supply Bank Rental Agreement are due on the date specified in the Rental Agreement and the Bank will consider that the beneficial use of water has occurred once rental fees have been paid and the date specified for commencement of the use of water has passed. No rental fees will be refunded once the fee is collected and the start date for a Rental Agreement has passed.

Policy on Accepting Requests to Release a Water Right from the Board's Water Supply Bank

A Water Supply Bank Lease Contract is a binding agreement between the owner of a water right and the Idaho Water Resource Board. Water Supply Bank Rule 25.08.c establishes that a water right, once accepted into the Board's Bank, shall remain in the Bank unless removed by a resolution of the Board. The Bank currently allows water right owners to petition the Board for early release of water rights from the Bank through submission of a Request to Release a Water Right from the Water Supply Bank form, however no Water Supply Bank rule or statute requires the Board consider early release requests.

Releasing a water right from the Bank alters the balance of water rights and water volume available for rental from the Bank. Releasing a water right prior to the culmination of a Lease Contract is problematic for Bank administration because it alters the water supply accounting of the Bank as a whole. Enforcing the terms of a Lease Contract provides Bank staff with the certainty needed to make a full account of all water rights available in the Bank and enables them to more efficiently approve rental applications. Releasing rights from the Bank alters water supply accounting and slows down rental applications.

In light of the aforementioned, the Bank hereby establishes that all Lease Contracts, indefinite or finite, are to remain in force for the full duration of the Lease Contract and requests to release a water right from the Board's Bank in advance of a contract's termination will only be considered by the Board's authorized representative after a justifiable need to release the right is demonstrated and it is determined that a release will not adversely impact application processing times or water supply accounting.

ADMINSTRATOR'S MEMORANDUM

To: Regional Offices
Water Allocation Bureau

Application Processing No. 76
Licensing No. 15
Transfer Processing No. 30
Water Supply Bank Processing No. 3

From: Jeff Peppersack

RE: **SEEPAGE LOSS STANDARDS FOR PONDS AND RESERVOIRS**

Date: March 5, 2015

BACKGROUND

Idaho Code § 42-203A(5)(f) requires the Department to ensure that proposed water uses are not contrary to conservation of water resources when reviewing new water right applications. Idaho Code § 42-222(1) provides a similar requirement for transfer applications. For many water uses, the Idaho legislature or the Department has established standards intended to promote the efficient use of water. For example, irrigation use is limited to 0.02 cfs per acre unless the applicant can show a compelling need for additional water.

The need to address seepage loss has developed as the Department has seen an increase in water right applications and transfers which propose to store water in small impoundments for purposes, such as aesthetics, that require a full reservoir. The ability to keep a reservoir full requires an appropriation of water not just for a one-time early season fill, but also for the replacement of evaporation and seepage losses throughout the year.

On occasion, applicants or permit holders may have a geotechnical or site engineering report describing seepage loss expectations or test results. In such a case, the reviewer should reference and utilize the measured soil properties presented in the report. Oftentimes, no such report is available to the reviewer. This memorandum establishes guidelines for reviewing seepage losses from ponds and reservoirs to ensure that water rights for storage promote efficiency by meeting a reasonable conservation standard. Without a storage efficiency standard, the diversion of water to replace storage losses could reduce the availability of water for other appropriators.[1]

[1] This guidance does not apply to applications seeking one fill annually with no refill provisions.

SEEPAGE LOSS STANDARDS

The Alabama Agricultural Experiment Station Bulletin 599[2] provided the following mean seepage rates for ponds based on the following Unified Soil Classification System groups:

SM (silty sand, sand silt mixtures) = **0.2 ft per day**
SC (clayey sands, sand clay mixtures) = **0.007 ft per day**
ML (inorganic silts – very fine sands, silty, or clayey fine sands) = **0.02 ft per day**
CL (low to medium plasticity clays) = **0.003 ft per day**
CH (high plasticity clays) = **0.0003 ft per day.**

These published seepage rates provide reasonable seepage loss expectations for appropriately designed small ponds and reservoirs. In addition, soil type OL is very similar to ML; use 0.02 ft per day with this soil type. Soil types MH, OH, and PT are very similar to CH; use 0.0003 for these soils.

The maximum allowable seepage rate is 0.2 ft per day. In general, the Department should not authorize the appropriation of water to replace seepage losses in excess of these rates, except as described in this memorandum.

The following soil types are all sandy and/or gravelly soils that would likely exceed 0.2 ft per day.

GW (well-graded gravels and gravel-sand mixtures)
GP (poorly graded gravels and sandy gravel mixtures with little or no fines)
GM (silty gravel and poorly graded gravel/sand-silt mixtures)
GC (clayey gravels and poorly graded gravel-sand-clay mixtures)
SW (well-graded sands and gravelly sands with little or no fines)
SP (poorly graded sands and gravelly sands with little or no fines)

Ponds developed in these soils should be equipped with a liner or other construction modifications to reduce seepage.[3]

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[2] Stone, Nathan M., and Claude E. Boyd. Alabama Agricultural Experiment Station Bulletin 599. Auburn University, Alabama. *Seepage from Fishponds*. 1989.

[3] There are many ways to reduce seepage losses. The United States Department of Agriculture through the Natural Resources Conservation Service ("NRCS") Agriculture Handbook Number 590, *Pond – Planning, Design, Construction* recommends that pond sites should have at least 20 percent clay soils (page 63). If a pond site doesn't have at least 20 percent clay, the NRCS recommends a variety of methods to seal the pond using chemical additives, bentonite, water proof liners, or compaction (pages 62-65).

EXCEPTIONS

There are some circumstances where it is not reasonable to apply the seepage rate standards described above. The following are some situations where the seepage rates listed above may be exceeded without further review:

- Storage facilities being used as infiltration basins for ground water recharge purposes should not be expected to comply with the seepage rate standards listed above. The purpose of recharge is to cause water to seep into the ground, not to maintain a full reservoir for aesthetics or similar purposes. Such uses are mutually exclusive. Water users should not be allowed to exceed the seepage rate standards by referring to ponds for other uses as recharge ponds.
- Excavated ponds filled by intercepting ground water should not be expected to comply with the seepage rate standards listed above. Under normal conditions water seeps *into* these ponds, not out of these ponds.
- Idaho Code §42-202 provides for a maximum of 5 acre-feet of stored water per acre of land irrigated. It is not necessary to apply seepage rate standards to reservoirs used to store water for irrigation purposes. Irrigation storage amounts in excess of 5 acre feet per irrigated acre require justification for the total amounts.

NEW APPLICATONS FOR PERMIT, TRANSFERS, AND WATER SUPPLY BANK RENTALS

The seepage rate standards described in this memorandum should be applied to new appropriations, transfers of water to new ponds or reservoirs, and Water Supply Bank rentals resulting in new ponds or reservoirs. Applications exceeding the standards need to justify the additional seepage amounts by demonstrating that they are consistent with the conservation of water resources or that the exception is necessary to accomplish the proposed beneficial use. If the additional seepage amounts are not justified, the approvals should be based on the standards set forth in this memo.

LICENSING OF EXISTING PERMITS

The seepage rate expectations discussed in this administrative memorandum will be applied when licensing water rights that have already been permitted as of the date of this memorandum. In general, replacement of seepage losses exceeding the standards set forth in this memorandum will not be considered to constitute a beneficial use of water. Therefore, seepage losses factored into the storage volume for water right licenses should not exceed the seepage loss standards listed above unless they meet one of the exceptions listed above, even if the permit pre-dates the issuance of this memorandum. Department staff members authorized to sign water right licenses may evaluate established storage facilities that exceed the seepage rate standards described in this memorandum on a case by case basis to determine if replacement of the additional seepage losses constitutes a beneficial use of water. Such determinations should be documented in the water right file.

SEEPAGE LOSS EVALUATION SPREADSHEET

The Department has developed a spreadsheet for estimating reservoir fill capacity, evaporation losses, and seepage losses. Department staff members are encouraged to share the spreadsheet with prospective applicants, consultants, and certified water right examiners for preparing and evaluating applications, as well as for conducting beneficial use field examinations. Applicants may utilize the NRCS Web Soil Survey, NRCS Published Soil Surveys, or the GIS layer 'PondSoils' found on the Department's website. Other technically sound methods for evaluating seepage losses may also be employed or accepted in IDWR's water right processes; however, alternate methods must consider conservation of water when determining acceptable seepage rates.

Pond Loss Calculation Spreadsheet

March 2015

Note: This macro-enabled workbook was created using Microsoft Excel 2007. The use of macros is optional. To enable macro functionality, access the macro security settings: (1) click the Microsoft Office button, (2) click Excel Options, (3) click Trust Center, (4) click Trust Center Settings, and then (5) click Macro Settings and select the option desired.

Idaho Department of Water Resources designed this spreadsheet in support of the guidance memo *Seepage Loss Standards for Ponds and Reservoirs*. It can be used to estimate the total volume required for a storage use. IDAPA Rule 37.03.08.035.03.b.v requires Department staff to account for all refills of a storage facility. This need has become especially acute with the increased popularity of ponds and reservoirs for aesthetic, recreation, and wildlife (ARW) purposes. Unlike irrigation reservoirs, ponds and reservoirs for ARW purposes are typically kept full all year. This spreadsheet was designed to account for the initial fill volume, refills to replace "from storage" uses, and the volume needed to replace evaporation losses and seepage losses to provide a more accurate accounting of the total water needed for a storage facility.

Tab #1 - Soil Classification with the NRCS Web Soil Survey:

Web Soil Survey (WSS) provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation's counties.

This sheet will give the user instruction on how to efficiently access the soil classification information for their pond location under examination.

Tab #2 - Seepage Loss:

The Seepage Loss sheet guides the reviewer through necessary calculations to determine seepage loss of a pond. The reviewer will need to choose the suggested soil value for the soil that most represents the soil at the location and depth of the pond. The reviewer also must have the surface area of the pond in square feet. The sheet has a calculator to convert the surface area from acres to square feet if you determine the surface area from Arc Map.

For additional background, review pond seepage loss information on page 16 of the "Seepage from Fish Ponds" Bulletin 599, August 1989, Alabama Agricultural Experiment Station, Auburn University, Alabama, Lowell T Frobish Director, written by Nathan M. Stone and Claude E. Boyd. This document can be found in the *Field Examiner's Handbook on our WENET page under Water Right Permits Section - Field Examiner's Handbook - Peer Reviewed section - Library - Elements of water rights - Water use - Storage.*

Tab #3 - Evaporation Loss:

This sheet calculates the evaporation losses based on the University of Idaho Evapotranspiration web page. For Department staff, there are links in the spreadsheet to this web page and you can find the most representative station in Arc map using the ETIdahostations shape in X:/Spatial/Climate/ETIdahostations.shp.

Please Note: For an alternate method to calculate acres required to be retired in a water right transfer from irrigation to storage to cover the evaporative losses, please see Transfer Processing Memo # 26.

Tab #4 - Total Storage:

This sheet automatically takes the seepage volume amount calculated in the Seepage Loss Sheet and the evaporation volume calculated in the Evaporation Loss sheet and combines with the pond capacity to determine total storage volume required for this pond.

Tab #5 - Pond Capacity:

This sheet contains mathematical equations which are helpful in determining the volume of a given pond. Four pond shapes are presented for user reference. If the pond found at the field exam does not conform to any of the example shapes presented, the examiner should utilize other mathmatical equations to determine pond capacity.

This sheet also calculates the minimum flow required to maintain the pond level, and the number of days to fill the pond. The number of days to fill the pond incorporates the seepage and evaporation losses.

Enter Data — All Data that you enter into this sheet will be in yellow boxes with blue text.

Calc'd Data — All calculated data will be in green boxes with red text.

Explanation — All blue boxes will provide explanations, tips and other helpful information.

Tab #6 - Notes and Tips:

This tab supplies useful information and explanations on the spreadsheet. It is recommended that you read this tab prior to filling out the spreadsheet. This tab also contains a diagram showing the items that must be factored into a water balance for a storage water right.

Tab #1.1 - Soil Classification with ArcMap:
(Alternative to Soil Classification with the NRCS Web Soil Survey)
The Soil Classification (GIS) sheet is designed for users with access to ESRI ArcMap and corresponding Geographic Information System software. For reviewers that are already familiar with the functionality of GIS, this sheet explains how to interpret the SSURGO and STATSGO soils layers in order to determine the soil classification at the pond site.

Tab #1.2 - Soil Classification with Published Soil Surveys:
(Alternative to Soil Classification with the NRCS Web Soil Survey)
The Soil Classification (PDF) sheet includes instructions on how to utilize NRCS Published Soil Surveys to obtain subsurface soils data for excavated ponds. Most Idaho Published Soil Surveys are designated by the name of the county. Others are published under multiple county names or by a significant natural feature in the area (ie. Caribou National Forest, City of Rocks National Reserve, Middle Fork Payette River Area, Duck Valley Indian Reservation, etc.). The GIS Layer was taken from the Soil Survey Geographic Data Base compiled by the Natural Resources Conservation Service (NRCS). The reviewer may have to utilize supplemental maps to determine the applicable Soil Survey report for the pond location. This sheet methodically guides the reviewer through the process of how to determine the USCS Soil Classification for use on the sheet entitled "Seepage Loss."

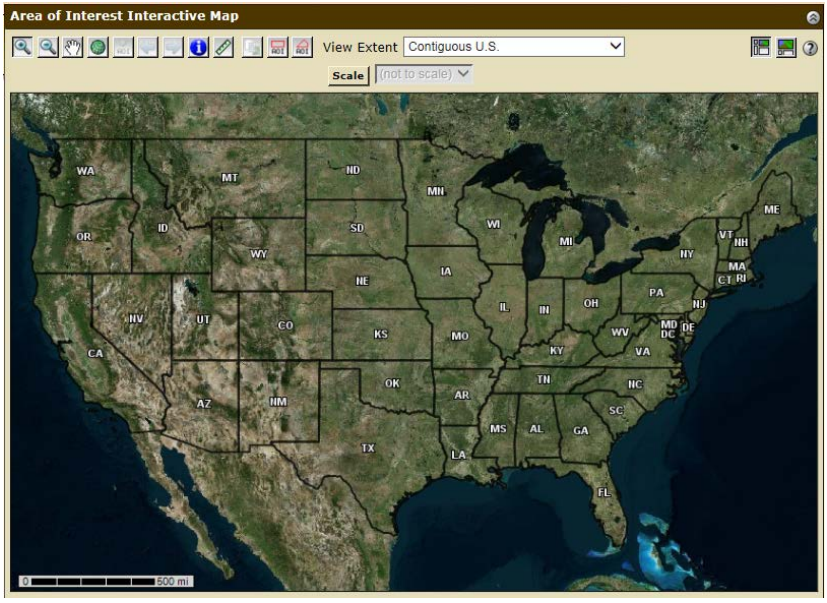
Soil Classification with the NRCS Web Soil Survey

This spreadsheet has been designed by Idaho Department of Water Resources to determine the soil type and classification at the pond site.

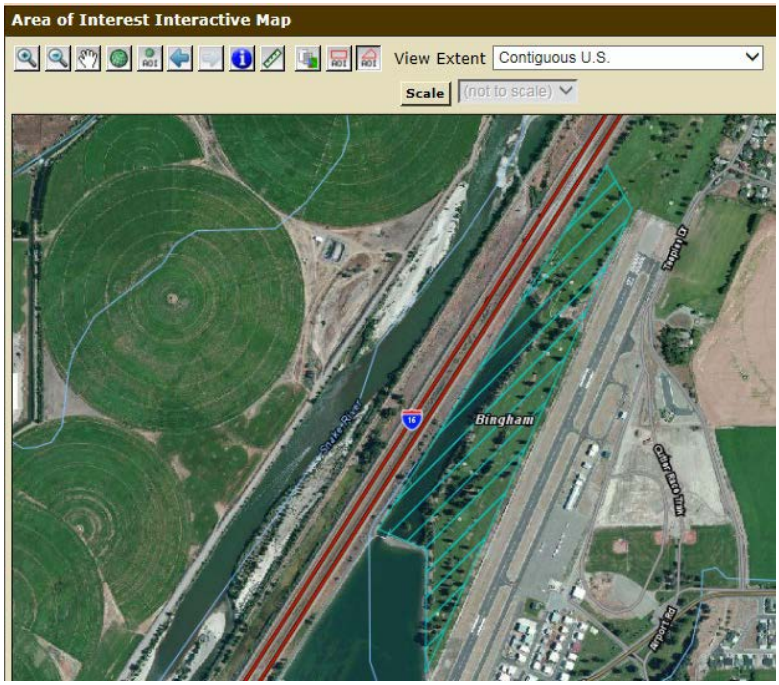
Use the link to access the NRCS Web Soil Survey:
http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

Alternative methods of obtaining soil classification information may be found in the last two tabs of this worksheet.

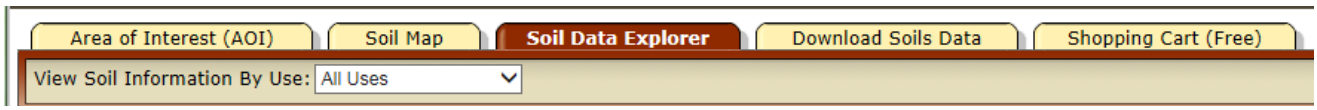
1. Use the { } tool to zoom in to the location of the pond.



2. Under the "Area of Interest" tab, create an Area of Interest (AOI), where you would like information about the soil. Use the following tools to create your area of interest: { } and { }

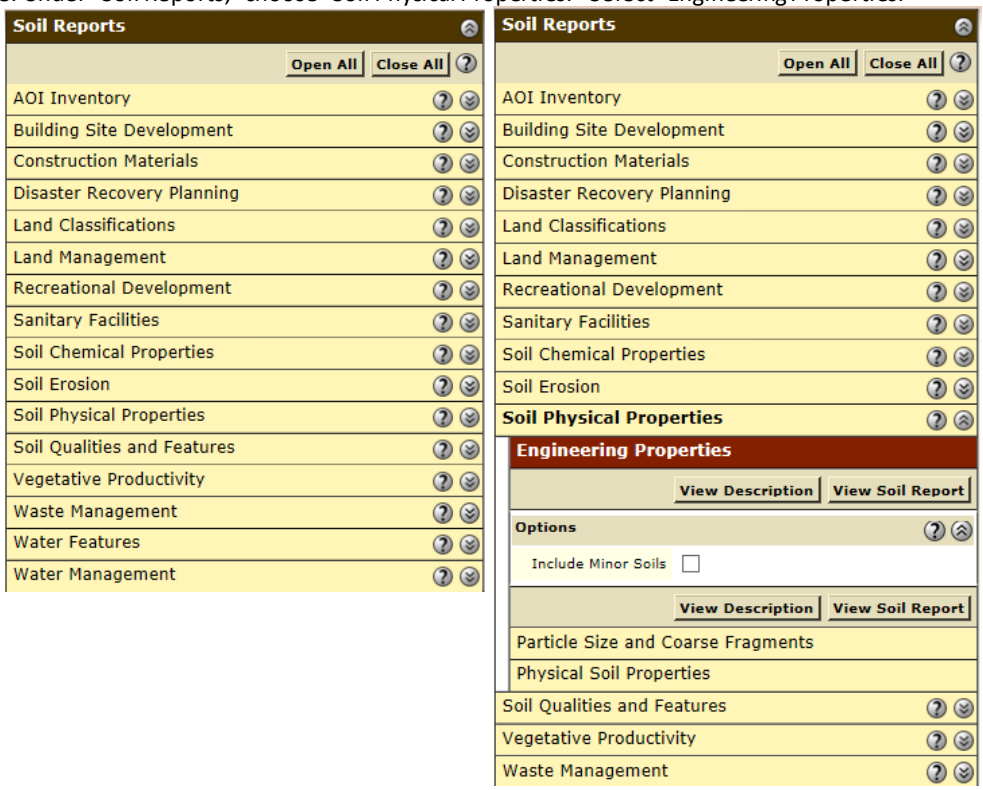


3. Click the "Soil Data Explorer" Tab.

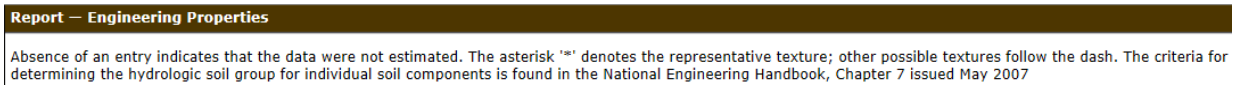


4. Click the "Soil Reports" Tab.

5. Under "Soil Reports," choose "Soil Physical Properties." Select "Engineering Properties."



6. Click the "View Soil Report" button and wait for the WSS to load.



7. View the soil information chart below the map.

Bingham Area, Idaho

Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*Pct*	*Pct*					*Pct*	
HsA—Heiseton sandy loam, 0 to 2 percent slopes														
Heiseton	80	A	0-8	Sandy loam	SC, SC-SM	A-2, A-4	0	0	90-100	90-100	60-85	30-50	20-28	4-10
			8-38	Fine sandy loam	SC-SM, SC	A-4	0	0	90-100	90-100	65-85	40-50	20-28	6-10
			38-45	Silt loam	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	70-85	20-33	6-13
			45-65	Very gravelly sand, very gravelly coarse sand, extremely gravelly coarse sand	GP, GP-GM, GW	A-1	0	0	20-50	10-30	5-10	0-5	0-19	NP-2
Rv—Riverwash														
Riverwash	100		0-60	Stratified sand to gravel	—	—	—	—	—	—	—	—	—	—
Wb—Wardboro soils														
Wardboro	80	A	0-2	Sandy loam	SC-SM, SC	A-2, A-4	0	0	100	100	74-79	36-41	21-28	6-10
			2-11	Sandy loam	SC, SC-SM	A-2, A-4	0	0	100	100	74-79	36-41	21-28	6-10
			11-60	Extremely gravelly coarse sand	GC-GM, GP, GM	A-1	0-15	10-45	15-30	10-25	0-25	0-25	0-22	NP-4

8. Look for the soil type with the greatest "Pct. of map unit" or for the soil which is most representative of the pond location. Choose the depth which most closely corresponds with the depth of the pond under examination. After this, move right across the table to find the Unified Soil Classification System (USCS).

If you find that this depth arrives at more than one classification, choose the classification which is most advantageous to the applicant (highest seepage rate). You may need to toggle between the "Soil Class" and "Seepage" sheets in order to view the table entitled "Suggested Seepage Rates for Different Soil Types."

9. Use this soil classification to find the Total Seepage Loss on the next sheet "Seepage Loss."

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	xx-xxxxx
REVIEWER	Joe Agent
DATE	1/1/00

User Input
Calculated value
Formula Explanations

Print Page to PDF

INPUTS

Pond Surface Area (AC.)	5	AC.
Pond Surface Area (SQ. FT.)	217800	SQ. FT.
I used the following method to obtain my Soil Classification information:	NRCS Web Soil Survey	
My Soil Classification is	GP	
Suggested Seepage Rate (FT./DAY)	0.2000	FT./DAY

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

Convert to GPD	325829	GPD
Total Seepage Loss (AFA)	365.0	AFA

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 NUMBE	xx-xxxxx
REVIEWER	Joe Agent
DATE	1/1/00

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 negative precipitation deficit values.

Paste Values from ET Idaho

Print Page to PDF

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	-1.34	31	0.00
Feb	-0.72	28	0.00
March	-0.29	31	0.00
April	1.09	30	32.70
May	1.77	31	54.87
June	3.33	30	99.90
July	4.41	31	136.71
August	3.81	31	118.11
September	2.28	30	68.40
October	0.89	31	27.59
November	-1.27	30	0.00
December	-1.76	31	0.00
Total mm/year =			538.28

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.

[(mm/yr) ÷ (convert to feet)] X (Surface area of pond, in acres) = Evaporation Loss in Acre Feet

(538.28 ÷ 304.8) X 5.00 = 8.8 AFA

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

Example Data:

ET_{Idaho} 2012 -- Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho

Please send suggestions for improving this site to robison at kimberly dot uidaho dot edu

Data enter negative values above as "0"

Twin Falls 2 NNE (NWS -- 109294)

Statistics based on thirty year normal spans 1943 to 1973 years

For a different land cover or crop click on the above link.
ghlight this table and copy via the clipboard to a Mircosoft Excel or OpenOffice spreadsheet to plot or otherwise work with this data.

Open water - shallow systems (ponds, streams)
Precipitation Deficit (Click here for a graph)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Growing Season[a]	Non Growing Season[b]	Annual
Mean[j]	mm/day												mm		
Monthly[c]	-0.37	0.32	1.19	2.40	3.13	3.73	4.94	4.24	3.11	2.00	0.22	-0.33	751	0	751
15-Day Moving Average[d]	-0.50	0.31	1.19	2.42	3.09	3.74	4.97	4.23	3.08	2.02	0.12	-0.35			
7-Day Moving Average[e]	-0.41	0.32	1.19	2.40	3.10	3.72	4.96	4.25	3.12	2.02	0.16	-0.38			
3-Day Moving Average[f]	-0.37	0.33	1.20	2.41	3.12	3.73	4.94	4.24	3.12	2.01	0.20	-0.35			

The above table is a snap shot of the tables you find at the Kimberly Research Center Webpage. (Use link above.) Copy (ctrl + C) the numbers found in this table.

Total Storage Calculations

FILE NUMBER	xx-xxxxx
REVIEWER	Joe Agent
DATE	1/1/00

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 value
Formula Explanations

Print Page to PDF

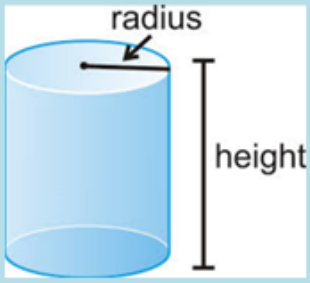
Surface Area (AC.)	5	"Surface Area" is automatically carried over from the "Seepage Loss" sheet.
Average Pond Depth (FT.)	6.8	"Average Pond Depth" depicts the actual depth of the pond either measured or estimated. Note: If you know the maximum depth and not the average depth, the Field Examiner's Handbook 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)	34	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)	5	The "Multiple Fill Volume Above Initial Fill" is the acre-feet of water required to meet a *from storage* component if the *from storage* 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)	365.0	The "Estimated Seepage Loss" is automatically carried over from the "Seepage Loss" sheet.
Estimated Evaporation Loss (AF)	8.8	The "Estimated Evaporation Loss" is automatically carried over from the "Evaporation Loss" sheet.
Total Volume Required (AF)	412.8	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.

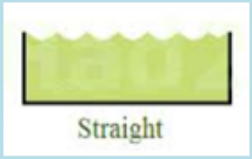
Flow Rate into Pond (CFS)	**1.00**	The "Flow Rate into Pond" depicts the actual flow, either measured or estimated, into the pond. For offstream facilities, this will be equivalent to "diversion to storage" rate.
Highest Daily Evaporation Rate From Evaporation Tab. (mm/Day)	**4.41**	This number is carried over from the "Evaporation Loss" sheet. It is the highest recorded number in the "Precipitation Deficit Table".
Required Daily Maintenance Volume (AF/Day)	**1.07**	"Required Daily Maintenance Volume" is the maximum volume of water needed on any given day during the year to maintain pond volume. It is calculated by adding the highest daily evaporation loss to the average daily seepage loss in acre feet. The average daily seepage loss is calculated by dividing the "Estimated Seepage Loss" by 365 days. This is acceptable, since the seepage rate shouldn't vary throughout the season unless the pond completely freezes over during the winter months. The highest daily evaporation loss is calculated by dividing the Highest Daily Evaporation Rate by the 304.8 conversion factor and multiplying this number by the pond surface area to attain a combined daily acre feet requirement.
Minimum Maintenance Flow (CFS)	**0.54**	The "Minimum Maintenance Flow" is the minimum amount of flow required to maintain the level of the pond. This number is determined by dividing the "Maximum Required Daily Maintenance Volume" by 1.9835. This flow can be used to determine if the flow rate into the pond is adequate to maintain the pond level.
Days Required to Fill the Pond	**37**	The "Days Required to Fill the Pond" is calculated by dividing the "Pond Capacity" by the "Flow Rate" minus "Minimum Maintenance Flow" multiplied by 1.9835. This section will assist you in determining if the flow rate being diverted to the pond is adequate to fill the pond while maintaining the pond level. The length of time to fill the pond will help determine if the flow rate is adequate for the size of pond being proposed. If this number is *approximately* 6 months (180 days) or more, the reviewer should have a discussion with the applicant to make sure he/she understands that it will take a significant length of time to fill the pond.
Days Required to Fill the Pond at 13,000 Gallons per Day	**-33**	Some water users may want to fill a pond under the 13,000 gallons per day domestic exemption. The "Days Required to Fill the Pond at 13,000 Gallons per Day" is calculated by converting the "Pond Capacity" and the "Required Daily Maintenance Volume" to gallons. The "Pond Capacity" is then divided by 13,000 gallons minus the "Required Daily Maintenance Volume" in gallons to determine the number of days to fill pond. If this number is *approximately* 6 months (180 days) or more, the reviewer should have a discussion with the applicant to make sure he/she understands that it will take a significant length of time to fill the pond. Negative values indicate that the supply of 13,000 gallons per day is not enough volume to overcome the required daily maintenance volume; the pond will never fill.

Pond Capacity Determination

Cylinder Shaped

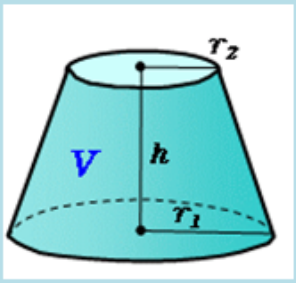
Volume = $\pi \cdot (\text{radius})^2 \cdot \text{height}$
OR
Volume = circular surface area · depth

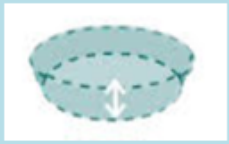




Truncated Cone Shaped

Volume = $(1/3) \cdot \pi \cdot (r_1^2 + r_1 \cdot r_2 + r_2^2) \cdot h$
where h = water depth
r_1 = radius at top of basin
r_2 = radius at bottom of basin



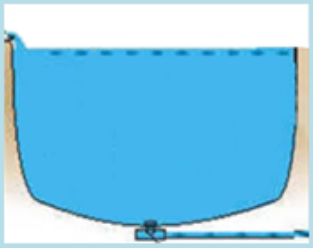


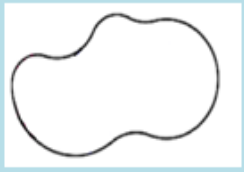
Freeform Polygon with Sloped Sides and Bottom

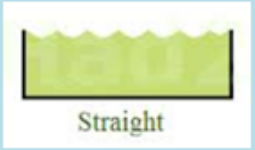
Volume = surface area · (2/5) · maximum depth

Freeform Polygon with Vertical Sides and Flat Bottom

Volume = surface area · maximum depth







The surface area of a freeform polygons should be measured using aerial photography and ArcGIS.

For ponds with an unusual shape and inconsistent depth, the reviewer may be able to combine different shapes to calculate a total pond volume.

Helpful Tips for Determining Pond Volumes

Types of Ponds and Reservoirs

The following is an excerpt from the report that is the basis for the University of Idaho Evapotranspiration Web Page. In this report, evaporation from three classes of open water was estimated:

small, shallow stock ponds: K_c* = 0.7 was used for all months

large, shallow water bodies or deep water bodies that have high turbidity: K_c* = 0.6 for all months. This class may be generally applicable to *relatively shallow* (< 4 m or 13.1 feet in depth) *ponds, reservoirs and streams*

deep systems (relatively clear lakes and reservoirs deeper than 4 m or 13.1 feet): use aerodynamic evaporation algorithms developed for American Falls Reservoir (Allen and Tasumi, 2005). Appendix 10# provides details on the procedure development and application. The evaporation estimations assume that no freezing occurs. If water systems are known to freeze, then the evaporation rate will tend toward zero during the periods of ice cover.

*The crop coefficient (K_c) is defined as the ratio of actual or potential evapotransporation by a specific crop or land cover condition to the reference evapotranspiration value.

#Allen, R., & Robison, C. (2006). Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho. *University of Idaho: University of Idaho Research and Extension Center at Kimberly, ID.*

Components of Storage

To get water to a pond that is not on the stream, you will need a water right component called **"Diversion to Storage."** **"Diversion to Storage"** components only have a rate of diversion. The volume components for this use are described in the **"Storage Component."**

The **"Storage Component"** of a water right allows a one-time fill (also known as **Pond Capacity**) plus the **"Evaporation Losses"** plus the **"Seepage Losses."** The **"Storage Component"** only describes a volume. Any diversion rate is considered under the **"Diversion to Storage"** component. **"Evaporation Losses"** and **"Seepage Losses"** are also described as the amount of water it takes to keep the pond full.

"Seepage Loss" is one of the most overlooked volumes in the **"Storage Component."** It can also be the largest contributor to the **"Storage Component."** When you initially fill a pond that sits above the water table, the pond will lose water. When the soil becomes saturated with water, the **"Seepage Rate"** drops to a steady state. The **"Seepage Rates"** used in this spreadsheet are determined using the saturated soil.

"Evaporation Loss" is simply the amount of water that evaporates from the surface area of the pond, minus the precipitation to the extent it offsets evaporation. We use the evaporation rates described in the University of Idaho Evapotranspiration Web Page. The evaporation web page accounts for variability in evaporation rates throughout the year. The reason that we use a "0" on all negative monthly values from the web page is to show that precipitation exceeded evaporation during that time period, and credit is not given for additional precipitation.

Components of a Storage Water Right

Water rights can also have a **"From Storage"** component. Generally, the **"From Storage"** component is limited to the capacity of the pond. However, there are times that the pond is filled and emptied, refilled and emptied several times if the permit allows. When a pond is filled and emptied several times, this is known as **"Multiple Fills."** This spreadsheet has a space to account for the **"Multiple Fills."** To figure out the additional volume for a **"Multiple Fill"** situation, you simply take the total amount of water needed to supply the **"From Storage"** component and subtract the **"Pond Capacity"** to determine the additional water needed to fulfill the **"Multiple Fill"** requirement. This methodology would leave the water user with a depleted pond at the end of his yearly usage. If the the owner wants to leave the pond full year round, the **"From Storage"** volume should be considered an addition to the **"Pond Capacity."** If this is the case, this needs to be well documented in the file.

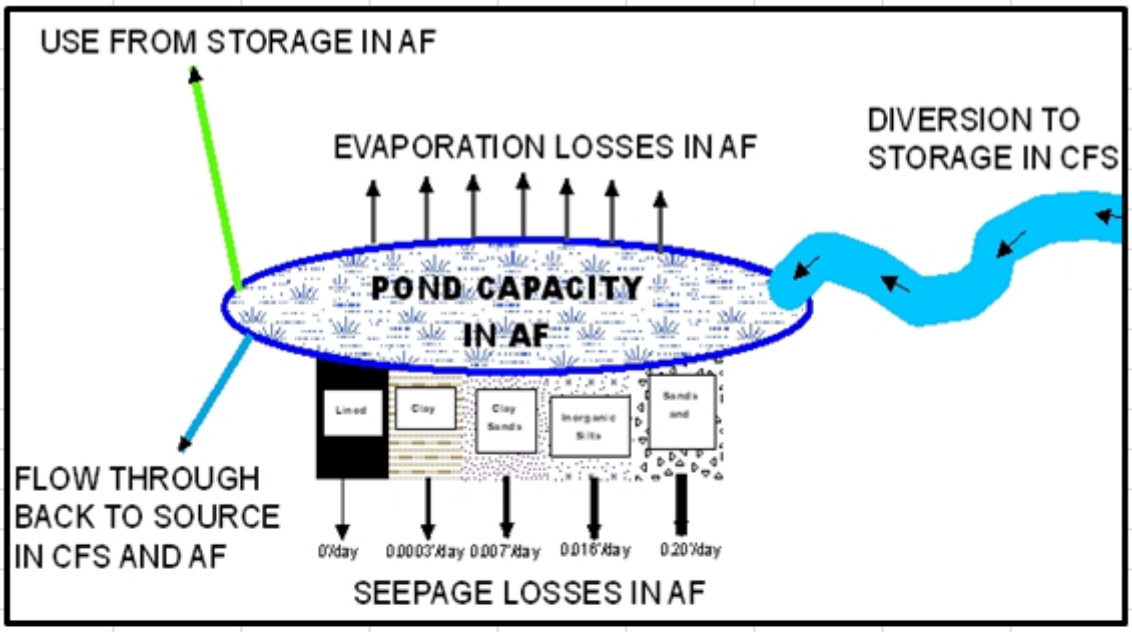
Calculating the **"Total Volume Required"** for storage is done by simply adding the **"Pond Capacity"** plus the **"Seepage Losses"** plus the **"Evaporation Losses"** and any **"Multiple Fills."** It is important to ensure the total volume needed for the uses described in the water right are included. This avoids having to file a second water right application to cover the amount of water not covered by the original water right, which will take additional time and increase the cost of attaining a water right to cover all of the water users needs.

"Time to Fill a Pond" Functions

This spreadsheet has a couple of functions that allow the user to determine if the pond design has a chance of being successful. Please see below for a description of these functions.

"Minimum Maintenance Flow" allows the water user to see the minimum diversion rate that would be required to maintain the pond level in order to overcome seepage and evaporation losses. This is an important tool for agents reviewing the water right application to ensure that the proposal is reasonable. If the diversion rate that the applicant proposes can't maintain the pond, then the applicant should be contacted to discuss the design and intent of the application. This may avoid the need to file and process additional applications.

"Days Required To Fill The Pond" is another tool used to see if a proposed application for permit is reasonable. If it takes too long to fill the pond, the water user will either need to increase the rate of diversion to the pond, reduce the size of the pond, or find an alternate supply to fill the pond.



The Flow Through Component

Another component of a water right would be the **"Flow Through Component."** This component is the amount of water diverted into the pond that is not used for seepage, evaporation or from storage uses, and flows out of the pond back into the source it was diverted from. This use is generally used to keep the pond fresh and free from moss and from going stagnant. This component has a diversion rate and volume. The diversion rate is the amount of water flowing out of the pond, and the volume is calculated by determining the volume of water diverted out of the pond. This is obtained by multiplying the diversion rate by the number of days or hours the water flows through the pond.

If there is a **"Flow Though"** component, then you will need to add this to the Total Volume Required to achieve the total volume that is required for a water right.

Temperature

Though temperature calculations have not been included in this spreadsheet, the Department recognizes temperature as a valid water quality concern for some beneficial uses. For example, aesthetic fish ponds may need to be kept at a specific temperature to preserve aquatic life. At times, ponds may need to be kept full, at a low temperature to minimize evaporation when air temperatures are above average. For such uses, the applicant will need provide scientific justification for each request for additional diversion rate and volume related to temperature concerns.

Soil Classification with ArcMap

Alternative to Soil Classification with the NRCS Web Soil Survey

This spreadsheet has been designed by Idaho Department of Water Resources to determine the soil type and classification at the pond site.

This sheet is designed for users with access to ESRI ArcMap and corresponding Geographic Information System software.

External users will need to download the **PondSoils** layer from the IDWR website.

For IDWR employees, the filename and path for the **PondSoils** layer can be found here:
X:\Spatial\Soils\USCS\PondSoils.mdb

The **PondSoils** layer may also be accessed using the WRedit toolbar (Process > Base Layers > Soils).

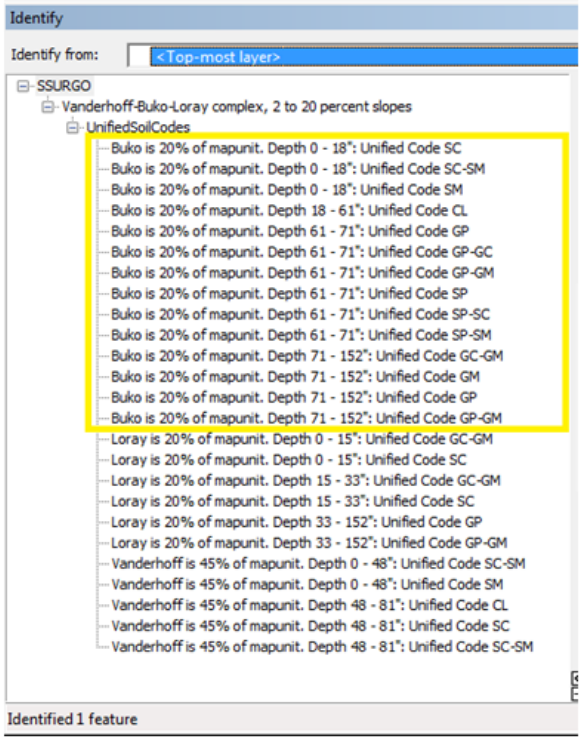
The **PondSoils** layer is comprised of two soils layers:

1. The **SSURGO** (Soil Survey Geographic database) layer contains detailed spatial and attribute data. It covers about $^{2}/_{3}$ of Idaho. If no SSURGO soil polygon is available for an area, the STATSGO soils are shown.
2. **STATSGO** is a more generalized soil layer. It covers about $^{1}/_{3}$ of Idaho. The STATSGO (State Soils Geographic database) layer will provide a few short remarks about the soil classification.

An example from each of the layers is shown below:

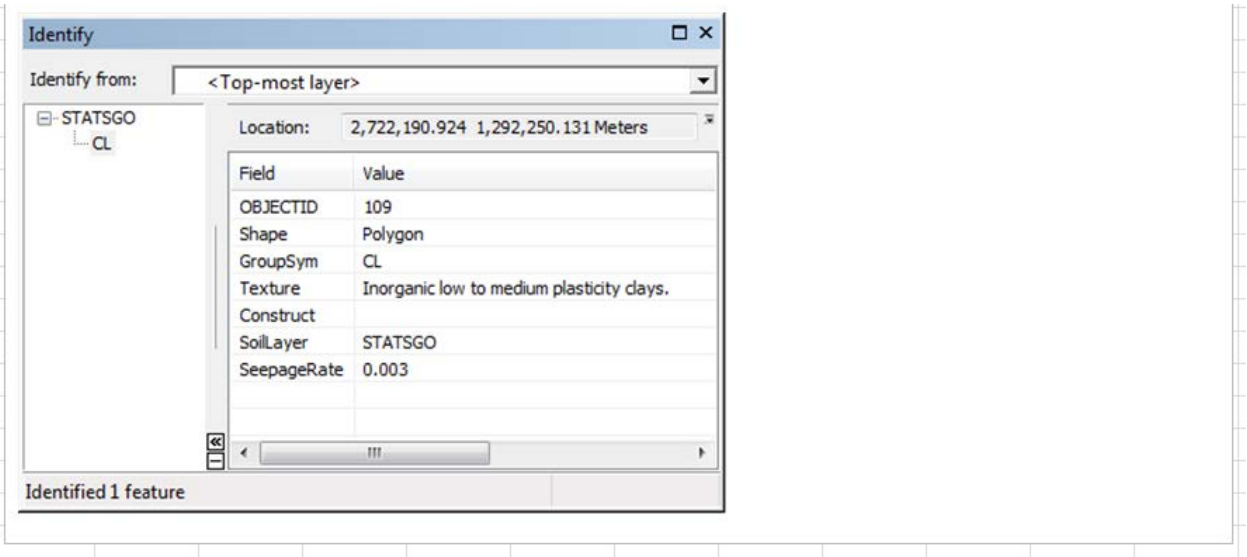
1. **SSURGO**

- The percent (%) each soil component comprises of the soil type is shown. The percentages shown for the soil components may not add up to 100%. Generally the remainder percentage indicates non-soil areas within the soil type (ie. rock outcroppings or bedrock etc) In the example below, the Buko soil component is highlighted; 15% of the soil type polygon may be rock.
- Each soil type (polygon) can have up to 3 soil components (ie. Vanderhoff-Buko-Loray complex, 2 to 20 percent slopes). There is no polygon feature which displays exactly where each soil component is located.
- Each soil component (ie. Buko) can have up to 6 soil horizons. There is no map feature for a soil horizon.
- Each soil horizon will have a depth range and Unified Soil Code (ie SP). When looking at the soil horizons, they may not sort in order of depth.



2. STATSGO

- The STATSGO (State Soils Geographic database) layer will provide the Unified Soil Code, soil texture, remarks on pond ponstruction (if applicable), and an average seepage rate (feet per day) in non-gravelly soils.
- For gravelly soils, a pond liner may be necessary. Even in gravelly soils, 0.2 feet per day is the maximum seepage rate allowable.



Soil Classification with Published Soil Surveys

Alternative to Soil Classification with the NRCS Web Soil Survey

This spreadsheet has been designed by Idaho Department of Water Resources to determine the soil type and classification at the pond site.

FILE NUMBER	xx-xxxxx	Print Page to PDF	User Input
REVIEWER	Joe Agent		Calculated value
DATE	1/1/00		Formula Explanations

County: Ada , Idaho

1. Navigate to the NRCS Soil Survey Website

NRCS Published Soil Surveys for Idaho found at:

http://www.nrcs.usda.gov/wps/portal/nrcs/surveylist/soils/survey/state/?stateId=ID

Reviewer used the Survey entitled: Ada County Area

2. Use GIS and the Soil Survey to determine Soil Type

Utilize ArcGIS to Obtain the Soil Symbol (may be a number or abbreviated name)

The shapefile SSURGOOnePlan is found at X:\Spatial\Soils\SSURGOOnePlan\soils.shp

Soil Symbol (GIS field MUSYM): 116 What if my Soil Symbol is 999?* (see box

Find the name of the soil in the Soil Legend.

The Soil Legend is typically the last bookmark in the Soil Survey report.

The Full Name of This Soil is: Payette-Quincy complex, 15 to 30 percent slopes

3. Use the Soil Survey to determine the USCS Classification

Within the county NRCS Soil Survey report, click the bookmarked link to "Tables."

Scroll down until you reach a table called "Engineering Properties and Classifications" or "Engineering Index Properties." The table is ordered by soil symbol and the soil name.

Scroll down until you reach the soil which matches your soil symbol and name.

The table lists the USCS Classification for each depth in the soil profile.

Be sure to use the predominant soil classification for the pond depth where seepage occurs.

If the pond has a greater depth than the soil survey, use data from the lowest depth reported.

Pond Depth: 4 feet = 48 inches

The Soil Survey states the soil USCS Classification at 48 inches is SM

How to Read Soil Maps in the NRCS Soil Survey s

The reviewer may need to utilize the soil maps found within the NRCS Soil Survey. The desired bookmark will be named "Index to Map Sheets" or "Detailed Soil Map." The index page displays the county divided up into individual map sheets. Click the sheet which represents the location of the pond under examination. The **small** font number found in the center of each polygon is the Soil Symbol.

For example, the soil symbols shown below include 71, 72, 111, 112, 129, 131, 157, 159 and 178. In the map below, the number 32 is not a soil symbol.

***What if my Soil Symbol is 999 or null?**

The SSURGOOnePlan shapefile displays soil types for much of Idaho, but it does not cover all land area. No soil data is available in GIS for areas which display a Soil Symbol Number of 999.

Many of these null regions are located at Idaho's core - harshly mountainous land. The NRCS has not published Soil Surveys for these locations. On this sheet, type in USCS Soil Classification as "unknown." On the next sheet, a seepage loss rate of 0.2 ft. per day should be used.