

Return Flows by Beneficial Use Type

Data Processing Module: Beneficial_Use_Return_Flow

Description: Some of the beneficial uses that water rights divert water under can be considered non-consumptive or partially-consumptive, depending on the use. When demand analysis of water use is calculated, any water returned to the system would be calculated using the percentages from this flag.

Examples:

- Power use, meaning water diverted for hydropower generation, does not actually “consume” water to generate power, thus once the water leaves the hydropower facility it is “returned” and available for reuse. Realistically this may need deeper analysis as many water rights with power use are coupled with consumptive uses either in the same water right or by separate water right, but for simple analysis power use would return 100% of water diverted.
- Irrigation use has the potential to return water to the stream system depending on factors such as how the water is applied to crops, how saturated the soil is at the time of application, and how close the use is to surface water (i.e., does runoff from irrigation flow directly into a stream or ditch, or is the ground saturated enough that groundwater accretion in a neighboring stream is increased at an equivalent rate to what irrigation water is added to the groundwater). The general assumptions made under this flag are co-opted from the 1977 Water Use Report which applied a range of return flow percentages from 20% to 0% with the greatest return being made at the beginning and end of the irrigation season and the least returned during the driest months (mid to late summer).
- Many storage dominant uses, such as stockwatering, are considered fully consumptive with zero return as there is no functional way water is returned to surface water during the use, or water is used from storage or diversion (e.g, dust control) at a rate that any water returned to the land does not cause runoff or groundwater absorption at a rate significant enough for the water to be available for other downstream users.

What (is being flagged): Water rights use types.

Why: Demand analysis should consider any water returned to the surface water system by uses that have a measurable return flow component.

How: Using the table below, each water right would have a new field added by use type for each month that would allow calculations to be made from water usage reports to quantify water returned to the surface water system.

Resolution: Some water rights that are considered non-consumptive, primarily power, are often combined with consumptive use, which could lead to demand analysis based on this flag over-representing the amounts of water returned to the system. Manual

staff review of large quantity power water rights may be needed to find water rights that should be made consumptive because of associated uses. Additionally a filter could be added that removes specific combinations of use types within one water right from being non-consumptive.

Data Source:

- [ewrims flat file use season.csv](#)

Existing Fields (verify for accuracy):

- USE_CODE – ewrims_flat_file_use_season.csv
- APPLICATION_NUMBER – ewrims_flat_file_use_season.csv

New Fields (include definitions):

- ASSIGNED_BENEFICIAL_USE -Assigned primary beneficial use based on the priority ranking system in 'Use_Code_Ranking' sheet (exceptions apply)
- JAN_PERCENT_RETURN_FLOW– Calculates an estimate of the percentage of return flow for the month of January
- FEB_PERCENT_RETURN_FLOW– Calculates an estimate of the percentage of return flow for the month of February
- MAR_PERCENT_RETURN_FLOW– Calculates an estimate of the percentage of return flow for the month of March
- APR_PERCENT_RETURN_FLOW– Calculates an estimate of the percentage of return flow for the month of April
- MAY_PERCENT_RETURN_FLOW– Calculates an estimate of the percentage of return flow for the month of May
- JUN_PERCENT_RETURN_FLOW– Calculates an estimate of the percentage of return flow for the month of June
- JUL_PERCENT_RETURN_FLOW– Calculates an estimate of the percentage of return flow for the month of July
- AUG_PERCENT_RETURN_FLOW– Calculates an estimate of the percentage of return flow for the month of August
- SEP_PERCENT_RETURN_FLOW– Calculates an estimate of the percentage of return flow for the month of September
- OCT_PERCENT_RETURN_FLOW– Calculates an estimate of the percentage of return flow for the month of October
- NOV_PERCENT_RETURN_FLOW– Calculates an estimate of the percentage of return flow for the month of November
- DEC_PERCENT_RETURN_FLOW– Calculates an estimate of the percentage of return flow for the month of December

Attachment A

Description of Use Codes and Return Flow Assumptions by Use

Overall note about return flow assumptions, the standard percentage is based on the amount of water that is returned to the system when the water is used. This is straightforward for users that are only direct diverters, but many appropriations have some type of storage to allow water collection during the wet season for use during the remainder of the year to supplement direct diversion variation. If we were to analyze monthly water returns based on the whole of the water right, the results for uses like power would be more complicated, as much of the water stored in the winter is not used until the summer. This could cause the return flow to be less than 100% in the winter for a non-consumptive use and greater than 100% when it is released from storage. The key here is whether the temporal aspect is included with the analysis, as the storage component of any water right could cause the amount of flow being returned in a given month appear to be much greater than what the individual water right is allowed to divert or store in that month.

This is significant depending on how the face value amount is distributed for a simple analysis, if it was distributed evenly among allowed months and then the return flow percentage was applied, it could cause more water to appear available in wetter months and less water to appear available in dryer months. For now the basic assumption is that the return flow percentage is being applied to water when it is used.

See the example of power use return flows above and compare the amount directly diverted or collected to storage with the amount used. To further complicate the analysis, consider that, though the water is used for power under the example right, it is part of the Central Valley Project, so even though the water is "returned" to the American River, it is still likely appropriated for use after rediversion in the delta and thus not actually available for other appropriative users.

Dust Control: The common use of water for dust control is as applied to disturbed ground or roads to limit the uptake of particles into the air during construction activities or, in the case of some logging operations, during heavy vehicle traffic on dirt roads. The water is usually applied via a sprinkler type system, often from a water hauling truck. As the water is usually applied in amounts that only wet, but do not muddy, the soil, it can be assumed runoff and groundwater intake is negligible and most water is lost to evaporation.

Domestic: Water used for household needs including cooking, washing, septic, and incidental irrigation (usually defined as irrigation of decorative vegetation and trees surrounding a home and small gardens). It could be argued that there would be a small amount of return flow through wastewater, either municipal or through leeching in a septic system, or runoff from domestic irrigation. However, at the statewide level these

returns would be negligible and, even if considered, would likely be only returns to groundwater in rural areas (which are likely the majority for domestic use water rights), and temporally offset returns via municipal wastewater treatment in urban areas. Later analysis could consider the municipal wastewater treatment; however, this would likely be captured under the “municipal” water use code.

Irrigation: Water applied to large scale crops (as opposed to the incidental irrigation included in domestic use) or for large landscapes such as golf courses. There are documented return flows from traditional irrigation practices like flood irrigation and overhead sprinklers, but application of return flows under this analysis must make broad assumptions. Many farming operations have moved to using water conservation practices such as drip irrigation and moisture level monitoring to avoid runoff. However, as the biggest irrigation water users likely still apply water using flood irrigation, and the majority of irrigation water right users (as opposed to users of irrigation water delivered via the State Water Project, Central Valley Project, or other large irrigation districts) in sensitive water use areas have been examined for return flow before, broad assumptions can be made using previous analysis.

This is one of the water use types that could use much closer examination in future efforts. Irrigation practices are constantly evolving as water supplies lessen, which would have a direct affect on return flow analysis. Irrigation return flow, as examined after the 1977 drought, has likely shifted to groundwater return or evaporation only as water application practice gets more refined, however a survey of irrigation water right users would be needed to quantify this change. It should also be noted that from a water quality perspective, runoff from irrigation is discouraged as that runoff may contain fertilizers and pesticides. Additional note, similar to municipal use the runoff from irrigation could be a combination of groundwater and surface water returning to surface water, which could use further data research, but big picture return flows, regardless of source, are available for reuse.

Power: Water used in hydroelectric generation. It seems like a simple non-consumptive use, but in reality most of the water used for power is a combination of direct diversion and collection/withdraw from storage. On a basic level the return flow is always 100%, but this depends on the assumptions made for any analysis. See the general discussion above.

Municipal: Water diverted or stored by cities/irrigation/water districts for distribution as domestic water to homes/businesses and for other municipal uses such as fire hydrants and public pools. The water is often separated by raw and treated circulation systems and has the potential to return to the surface water via stormwater or wastewater systems. The initial analysis would treat this return as zero simply because there is not enough information on hand (in water rights) to apply a reasonable percentage. There is likely significant information on returns in the state and regional water quality databases, however it would take a significant effort to tie the water quality permits/data to the water rights records.

This would be a worthwhile effort in later version of this analysis as it could result in returns between 10%-50% depending on the location and season. Ironically this is one area where returns lessen during drought as water conservation measures are adopted in water districts, which further bolsters treating the return flow as zero for the initial analysis. Additional note, analysis of return flows here would likely involve returns of both groundwater and surface water as many municipal system use a combination, but for practical analysis returned water is available for appropriate reuse regardless of whether it began as groundwater or surface water.

Fish and Wildlife Preservation and Enhancement: Usually this use means “leave the water in the stream for fish and wildlife”. This goes hand in hand with the 1707 dedication process, it is essentially a water right that reserves a portion of the water to be used by not being consumptive. Based on this the return flow should be 100%, but there is also the potential that this use has been added on top of storage rights, meaning that the return flow in those cases should be zero. This could be solved by filtering any water rights with this use combined with uses like stockwatering out of the return flow analysis.

Stockwatering: Relatively straightforward use, usually a pond storing winter water for raising livestock year-round. These often have associated fire protection, recreation, and aesthetic uses. Overall these should be treated as fully consumptive as any water “returned” would be through groundwater seepage or evaporation and would not contribute to instream return. Even if the pond was onstream, the water being bypassed through or around the pond is not a return but rather the “natural” flow of the stream after any diversion to storage is filled.

Industrial: This use type represents a wide range of actual uses. The majority appears to be a secondary use associated with municipal water rights to allow for the variety of possible end uses for the municipal customers, and includes agriculture adjacent fields such as dairy or other livestock care and processing. However there is a smaller subset of water rights that have industrial as their only use, these appear to represent the same type of uses plus others such as water use associated with timber operations. Functionally these uses likely have zero return and are similar to (and potentially were applied for in other water rights as) uses like milling and dust control. Overall it would be hard to separate out the large water right holders with this use as it is often a subset of a more dominate use such as municipal.

Mining: The uses for mining vary greatly depending on where in the watershed the mining occurs. Some mines use water underground and around the mine site in general for dust control and washing debris, which largely would not be returned to the stream (or shouldn't be due to contamination). Other mining operation occur in-stream and thus would be completely returned, though CDFW largely halted suction dredging and other in-stream mining. Big picture, the water rights with mining as one of many uses should be analyzed using the primary use type, while spot checks of water rights

with mining as the only use show that most of these are revoked, and if licensed do not provide enough information to give a good sense of return flow.

Recreational: Often recreational use, meaning contact and non-contact use of water (e.g., swimming, boating, fishing), is a secondary use associated with storage of water in ponds and reservoirs. Occasionally there are recreational use water rights with no storage aspect, meaning they are in-stream. As with many of the secondary uses, the primary use should be considered first for return analysis. The water rights with recreation as the only use should be examined for a storage aspect, as this would not likely be returned, however in-stream uses could be considered as fully returned past the place of use.

Fire Protection: A common secondary use for ponds, fire protection use ponds are often made available to the US Forest Service or Cal Fire for use in fighting rural and back county fires. Regardless of whether fire protection is the primary or secondary use, the use is by storage and thus is not returned. If the water is not used it likely contributes to groundwater recharge and evaporation.

Incidental Power: A secondary use by name, this refers to hydropower generation using water passing between other uses. While it would seem that this should be considered as returned flow, it has to be considered with the other uses it is associated with. Like most of the secondary uses, the primary use should control the analysis. As for water rights with incidental power as the only use, there are only three, they are all riparian claims, and the use is, well, interesting but probably not worth our analysis here.

Frost Protection: Most often associated with areas that grown wine grapes, the frost protection use involves spraying water on the crops during hours when the air temperature is low enough to form frost on the crops or freeze the crops themselves (see thermodynamics). Often this occurs between midnight and dawn. This use is usually a sub use of irrigation and the irrigation use would be dominant as far as return flow analysis. Another aspect is that this use does not usually occur during the “dry” season but rather from January to April and only when fruit is present. It is likely that, due to ground saturation during frost protection use, there would be runoff returned, but again it is unlikely to occur during times when overall water supply is low.

The major exception is that there was a whole regulation program in water rights dedicated to frost protection use because so many diverters on the Russian River would directly divert at the same time to protect their grapes, causing streams to run close to dry and denying downstream diverters during heavy frosts. Again though our return analysis is not likely concerned with this spring period but rather the dry months after the frost season, just a note that if we ever go further into the frost protect use we should start with that program’s work.

Another note, while spot checking water rights with frost protection as the only use it seems that appropriate rights are largely additions to existing water rights or were added during the Russian River investigation period and may need further analysis before including. Spot checks of riparian claims with frost protection as the only use shows that the divertors usually meant general irrigation rather than frost protection, or the use was again filed during the height of the Russian River problems and are really covered by other appropriate rights.

Aquaculture: This use is interesting as it was intended to either represent commercial fish raising for food or fish stocking programs. However, a spot check of water rights shows that water rights that included aquaculture as part of a large number of other uses probably threw it in as a “just in case” use, which is seen in many water rights where the applicants wanted to cover any future use and threw in as many uses as possible. Also, a number of riparian claims with this use seems to have misunderstood its meaning as looking at yearly reporting shows no actual aquaculture use, but rather irrigation and other traditional uses. A review of water rights with aquaculture as the only use shows an expected array of federal, state, or private fish hatcheries, who’s reports also confirm that the water use is largely non-consumptive. This use should be included in the return flow analysis for verified fish hatcheries, but other water rights with this use should refer to the primary use listed such as irrigation or municipal.

Snow Making: Exactly what it sounds like, there are only a handful of snowmaking water rights and, while it could be argued that the water used is returned when the snow melts, there are so few of these and they are located relatively high in watersheds, they wouldn’t add a significant amount of water to the analysis. Potential to return to these if we ever get hyper focused on water uses.

Milling: This appears to be an obscure use that only a handful of water rights even use. It has been associated with lumber operations and was initially for wetting the log decks at holding yards during the late summer, the stacks of lumber could catch fire if excessively dry. Spot checking these water rights, it appear one of the largest users (Sierra Pacific Industries) doesn’t use it much anymore and assumes it is for dust control on roads, which is the most common lumber associated water right these days. Regardless this is a zero return use, similar to dust control.

Heat Control: As with frost control, this use is often concurrent with irrigation and is for the lowering of heat around crops during times of high air temperatures. As this is applied during the summer months and is likely to be in the form of a mist, it is assumed that there is no return.

Other: This is a catch all that was applied to many water rights simply because the applicant put “other”, usually this is not the only use listed but an addition to it. Because it is captured in other uses and is not quantifiable it should not be included with the return flows.

Aesthetic: Often applied as a “flavor” along with other uses, it really just means that the water is nice to look at. This water is usually accounted for with other uses, or applies to minor ponds and streams that would not be valuable with this analysis.

Water Quality: This use code has only been applied to seven water rights, and most of them are groundwater recordations that don’t apply to return flow. The other three appropriate water rights have water quality listed as one of many uses, so there would be a more dominant use to evaluate if needed on those rights. As a side note, the groundwater recordation records with water quality use were probably intended to mean ground water recharge.