Questions and Answers: Water Drafting Workshops[1]

December 1, 2016

1. Does an entity (as defined under section 1601(d) of the Fish and Game Code) need to notify the California Department of Fish and Wildlife (DFW) before blocking culverts in an emergency? To further clarify, "emergencies" include specific actions taken without delay to prevent or lessen risks for life or property.

   According to Section 1610(a) of the Fish and Game Code, an entity need not notify the DFW pursuant to section 1602 of the Fish and Game Code before beginning the following emergency work: 1) immediate emergency work necessary to protect life or property; 2) immediate emergency repairs to public service facilities necessary to maintain service as a result of a disaster in an area in which the Governor has proclaimed a state of emergency; and 3) emergency projects undertaken, carried out, or approved by a state or local governmental agency to maintain, repair, or restore an existing highway, within the existing right of-way of the highway, that has been damaged as a result of fire, flood, storm, earthquake, land subsidence, gradual earth movement, or landslide, within one year of the damage. Although notification is not required before beginning the emergency work, the entity performing the emergency work described in subdivision (a) shall notify the DFW of the work, in writing, within 14 days of beginning the work.

   Examples of "immediate emergency work" include, but are not limited to:

   - Placement of rock, earthen material or sand bags to confine floodwaters or protect structures from flooding
   - Removal of debris during a flood to protect structures such as bridges and roadways
   - Actions to control wildfire

[1] Interagency water drafting workshops were held in March and April, 2016 in Korbel, Willits, Redding, and Rancho Cordova, CA. A one hour PowerPoint presentation was given on water drafting at the Redwood Region Logging Conference in Ukiah, CA on March 18, 2016.

Immediate emergency work generally does not include:

- Actions undertaken weeks or months after stream or lake levels return to normal conditions to stabilize, rebuild or replace a facility, except as specified in FGC 1610(a)(3)
- Actions undertaken weeks or months after a fire is extinguished to rebuild or replace a facility unless decreed by Governor's Executive order
- Actions that expand or relocate a damaged facility
- Routine or necessary maintenance of an existing facility
- New construction for projects to prevent future emergencies (e.g. flood retention or detention basins or sediment basins)

2. What communication does the DFW require before drafting water for fire suppression?

   If water is to be used under circumstances that do not constitute an emergency, then notification pursuant to Fish and Game Code section 1602 is likely warranted.
   Under circumstances that constitute an immediate emergency, a person or entity can draft or divert water from lakes and watercourses to suppress fire without first notifying DFW. However, within 14 days after commencing the diversion of water under these circumstances, the entity diverting water must notify DFW that the water under the emergency notification process was or is being used. The form to be used to notify DFW pursuant to Fish and Game Code section 1610 of the Fish and Game Code is available at: https://www.wildlife.ca.gov/Conservation/LSA/Forms ("LSA Emergency Form").

3. Explain how the California Department of Forestry and Fire Protection (CAL FIRE), DFW, Regional Water Quality Control Board staffs, and those of other agencies coordinate on active inspections.

   CAL FIRE typically assumes lead responsibility for scheduling active inspections, including, contacting the landowner or its representative to arrange access to private property. Agencies coordinate on timing and location of inspections. Some inspections are carried out independently by the various regulatory agencies under their respective authorities.

4. Discuss water drafting on federal land for timber operations and clarify to whom DFW would issue a notice of violation if Fish and Game Code section 1600 *et seq.* is not followed.

   An entity that is drafting water on federal land who is not an agent of or acting on behalf of a federal agency, which is doing so for his or her own purposes, is subject to Fish and Game Code section 1600 *et seq.* The entity carrying out the activity, whether it failed to notify or

failed to comply with the terms of a Lake or Streambed Alteration Agreement (Agreement), would likely receive the notice of violation from DFW.

CAL FIRE does not have jurisdiction for activities conducted on federal forestland, whether by the federal government or by a private entity, including those activities that are discussed within a THP. As a result, CAL FIRE will not issue violations that occur on federal land.

14 CCR § 1032.7 of the Forest Practice Rules describes the notification process for adjacent landowners. This causes the federal agencies in many cases to respond to the Review Team with a notification that federal permits are required for drafting or road use. Many of these federal use permits contain the statement that "any violation of applicable state law is a violation of the terms within the federal permit." It is very easy for federal law enforcement officers to issue notification of "stop-work" on their land. All CAL FIRE has to do is make observations in the field and engage the federal law enforcement officers.

5. What is the requirement to map drafting sites? What about those on federal land?

   14 CCR § 1034 (x)(4)(C) of the Forest Practice Rules states that maps shall show logging roads that provide access to rock pits and water drafting sites, and the location of water drafting sites.

   This regulation includes those drafting sites on federal land. Whether or not the project is located on federal land is irrelevant. What does matter in this regard is who the entity is carrying out the activity and its exact location.

6. Discuss violations related to water drafting and stream diversions: Who is held liable, how are they best avoided, and what are the most common types?

   Liability is situation-specific and depends on who is the responsible party and who performed the violation. Violations can be avoided through pre-consultation, training, and communication among the registered professional forester (RPF), licensed timber operator (LTO), and individuals employed by the LTO, CAL FIRE and DFW.

   The best way to avoid violations related to water drafting is to clearly disclose the activity in the THP (or other type of commercial harvesting plan). THPs need to clearly state who is responsible for what type of activity. Without this information, the LTO becomes the default

entity expected to comply with all operational provisions in the FPRs and the contents of the THP. THPs need to clearly state who is responsible for any of the following activities:

a) State who will notify DFW to secure an Agreement if deemed warranted.
b) Secure and prepare any federal agreements, such as special use permits. State who will do this and who will notify if it is required.
c) State water drafting thresholds, flow determination method(s), and when periodic measurements are to be made. Also include who will perform the measurements, and how the notifications for the LTO to stop or alter drafting rates will be made.
d) State if a water drafting log will be kept, who would be responsible for maintaining the log, to whom (which agencies) the log will be submitted, and when it will be submitted.

One of the most common violations in Fish and Game Code section 1600 is failure to notify before drafting water. Some common violations in the Forest Practice Rules are 14 CCR § 1035.3 (a) and (d), which require an LTO to sign the plan and major amendments to the plan, and comply with all provisions of the Act, State Board of Forestry and Fire Protection rules and regulations, the applicable approved plan, and any approved amendments to the plan.

7. Who is responsible for measuring, determining, and monitoring flow rates and thresholds, and modifying the drafting and watering activity to fit the existing condition (signatories on the Agreement vs. operators working under the plan)?

   The responsible party should be identified in the Agreement. The signer of the Agreement is ultimately responsible. Please see #6 above.

8. Explain enforcement authorities for the water drafting rules (e.g., 14 CCR § 923.7 [943.7, 963.7] (l), and 14 CCR § 1034 (x)(4)(C)).

   CAL FIRE has the authority to enforce water drafting rules under the Forest Practice Rules and enforceable provisions of Plans and exemption notices. DFW enforces all Fish and Game Code sections, which includes those referenced in the Forest Practice Rules.

9. What agency takes enforcement action if an entity is not following what is specified in an Agreement?

   DFW has primary enforcement responsibilities for the provisions contained in an Agreement. If the Agreement is included as enforceable under the THP ("part of the plan"),

then CAL FIRE can enforce the "operational requirements" as contained in the plan. CAL FIRE would typically issue a violation to a specific entity (RPF, LTO, landowner, or plan submitter) for not following the contents of the plan, or something more specific if it could be tied to a certain Forest Practice Rule section; e.g., 14 CCR § 923.7 [943.7, 963.7] (l)(1) of the Forest Practice Rules .

10. Who's responsible (LTO, RPF, landowner) for submitting drafting logs?

    14 CCR § 923.7 [943.7, 963.7] (l)(3)(F) of the Forest Practice Rules states the drafting operator shall keep a log. It follows, then, that the same entity would be responsible for ensuring that the log is submitted to CAL FIRE. Agreements often specify that drafting logs be maintained. In those cases, the Agreement will specify who would be responsible for submitting the log and to whom. See the answer above to #6

    CAL FIRE is developing a process for submission of drafting logs.

11. What happens to the water drafting/diversion logs submitted to CAL FIRE? Can CAL FIRE or DFW release drafting logs to the public?

    CAL FIRE reviews and stores water drafting/diversion logs prepared per 14 CCR § 923.7 [943.7, 963.7] (l)(3)(F) of the Forest Practice Rules in the THP project file. DFW reviews and maintains on file drafting logs prepared when specified under an Agreement. DFW is not likely able to withhold water drafting information if requested by a member of the public through proper procedures (e.g. through Public Records Act procedures).

    CAL FIRE is working to develop a process for submission of drafting logs and posting of this information.

12. Are water truck records required in all cases? What is the chain of custody for the water drafting records? Who is responsible for producing the records when they are requested? Who decides at what point a water source is not producing sufficient water for drafting?

    Water drafting logs are required in areas subject to the Anadromous Salmonid Protection rules pursuant to section 14 CCR § 923.7 [943.7, 963.7] (l)(3)(F) of the Forest Practice Rules. They can be and often are specified under Lake or Streambed Alteration Agreements; their necessity is determined by DFW and the entity notifying DFW on a site-specific basis.

    14 CCR § 923.7 [943.7, 963.7] (l)(3)(F) of the Forest Practice Rules does not specify a chain of custody. The operator is held responsible for maintaining water drafting logs. When the

requirement for a water drafting log is specified in an Agreement, the Agreement identifies who is responsible for maintaining the log, and to whom and when the log must be submitted.

14 CCR § 923.7 [943.7, 963.7] (I)(3)(F) of the Forest Practice Rules specifies minimum bypass flows for Class I watercourses in watersheds with listed salmonids. The RPF and/or operator are responsible for ensuring that sufficient bypass flows are maintained while drafting water to comply with this rule. The RPF, when preparing the THP, should include measures to ensure that impacts to aquatic resources and the beneficial uses of water from water drafting are avoided or less than significant. Such measures should include criteria for when the source of water is sufficient for drafting for the operator to understand. When preparing an Agreement, thresholds are usually established on a site-specific basis through agreement between the entity for which the Agreement is prepared or its authorized agent and DFW to ensure substantial adverse effects on aquatic resources or listed species are avoided. If the entity notifying DFW does not propose minimum flows for water drafting in its notification, DFW will work with the entity to ensure the Agreement specifies such flows.

13. Discuss how CAL FIRE and DFW would like to see the information related to water drafting disclosed in THPs and Agreements (e.g., formatting, tables, and specifications).

    There is no recommended or required format for disclosure of water drafting information in THPs. Any operational measures should be included in Section II of the plan and the RPF should provide water drafting information that is required based on whether they are working in Anadromous Salmonid Protection (ASP) or non-ASP areas. Consultation with DFW is available.

    For Agreements, DFW recommends the entity include water drafting information by completing "Attachment C Water Diversion Questionnaire", available at https://www.wildlife.ca.gov/Conservation/LSA/Forms ("Attachment C - Water Diversion").

14. What is the definition of substantial? How does DFW determine what is substantial when advising RPFs when to notify, and when/how does DFW determine that an Agreement is necessary?

    In general, "substantial" means an ample or considerable amount, quantity, or size considering the particular environmental context. There is no legal or specific technical definition for "substantial." Substantial depends on the project, and site-specific conditions

and context, including flow requirements and sediment minimization measures for species-specific situations.

The term "substantial" is used in the context of:

- The entity's requirement to notify the Department
- When after notification, the Department decides whether issuing a draft Agreement is warranted
- The Department's requirement to automatically renew an Agreement

A diversion of water resulting in an appreciable change in stream flow, depth, or wetted width could constitute "substantial" in the context of deciding whether notifying the Department is warranted. Upon receiving the notification, the Department determines whether the proposed activity could substantially adversely affect a fish and wildlife resource. If the Department determines that the proposed activity would have such an effect, the Department determines an Agreement is warranted.

15. Are there circumstances where DFW has deemed a proposed encroachment or diversion of water from a stream or lake as not substantial?

    Section 1602(a) of the Fish and Game Code refers to substantial diversion or obstruction of the natural flow of, or substantial change or use of, any materials from the bed, channel or bank of any river, stream or lake.

    Depending upon the circumstances, notification and an Agreement may or may not be necessary. DFW would likely consider stream morphology, stream flow regime, and the number of other water drafting sites and the quantities of water withdrawn from them affecting the flow regime and/or encroachments on a stream. The more water already diverted from a stream, the more likely an additional proposed diversion would be deemed substantial. If a proposed diversion would appear to reduce the stream stage (i.e. water depth) or wetted perimeter at or below the diversion point, DFW would likely regard it as substantial. As discussed above, what is substantial depends on project and site-specific conditions.

    For timber operations under an approved document, this determination is made in consultation with other agencies. However, each situation may or may not warrant multi-agency review. Many of these issues are resolved during the PHI.

16. Does an entity need to notify before drafting water from a pond?

    A pond can be considered a type of lake. The Fish and Game Code does not provide a definition for "pond" or "lake." Lakes are waterbodies that have different names, including but not limited to ponds, reservoirs, lochs, tarns, and playas. The Fish and Game Code requires notification before substantially diverting water from any river, stream, or lake.

17. Does water diversion or drafting from a pond fall under the jurisdiction of Fish and Game Code section 1600 *et seq.* if the pond is not connected to a stream?

    Yes, a pond may be jurisdictional if it is not connected to a stream. Fish and Game Code section 1600 *et seq.* jurisdiction pertains to lakes and streams. While there is no definition of a pond in the Fish and Game Code, a pond could be considered a lake.

18. Is drafting from man-made waterholes and Class IV watercourses subject to Section 1600 *et seq.*? Does this apply to waterholes that have already been constructed but are fed by Class II watercourses?

    Fish and Game Code section 1600 *et seq.* could apply to the diversion of water from a stream to a man-made waterhole or Class IV watercourse. If subsequent drafting of water from the waterhole or Class IV watercourse does not substantially affect the flow of the stream that is the water source, Section 1600 *et seq.* would not apply. Other authorities, however, may apply (e.g., California Endangered Species Act if listed species are present).

19. When would notification be warranted when drafting water from a well?

    Notification is necessary when drafting water from a well substantially affects the quantity of water in a stream. This usually happens when the well water is continuous with the water of a nearby stream's hyporheic zone (which occurs below the streambed). Pump test results may be required to indicate whether the well is jurisdictional.

20. How can one determine when well water is continuous with the hyporheic zone of a stream?

    Where there is in-stream flow, observe the stage (stream water depth) while pumping from the well. If the stage drops, the pumping activity is diverting water from the stream.

21. Is notification warranted before installing weirs and flumes? Where should they be installed in relation to the point of water drafting or diversion?

    After the Department receives a complete notification package, it will determine whether an Agreement is needed for a specific activity. An Agreement will be required if the activity could substantially adversely affect an existing fish and wildlife resource. If an Agreement is required, the Department will conduct an onsite inspection, if necessary, and submit a draft Agreement to the applicant. The draft Agreement will include measures to protect fish and wildlife resources while conducting the project.

    Weirs and flumes should be installed below the point of diversion as a means for measuring changes in flow before and during diversion or drafting.

22. Explain how to use the critical riffle method for measuring stream discharge.

    The critical riffle method is used to identify the minimum stream flow rates necessary for the passage of salmon and trout through critical riffles (CDFW 2013). Please refer to the following sources:

    Gabriel Jacob Rossi. 2012. Developing hydraulic relationships at the riffle crest thalweg in gravel bed streams. Humboldt State University Master's Thesis:
    http://humboldt-dspace.calstate.edu/handle/2148/1273

    CDFW Instream Flow Program's Standard Operating Procedure for Critical Riffle Analysis for Fish Passage in California:
    https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=57462

23. Explain diurnal fluctuations in stream flow.

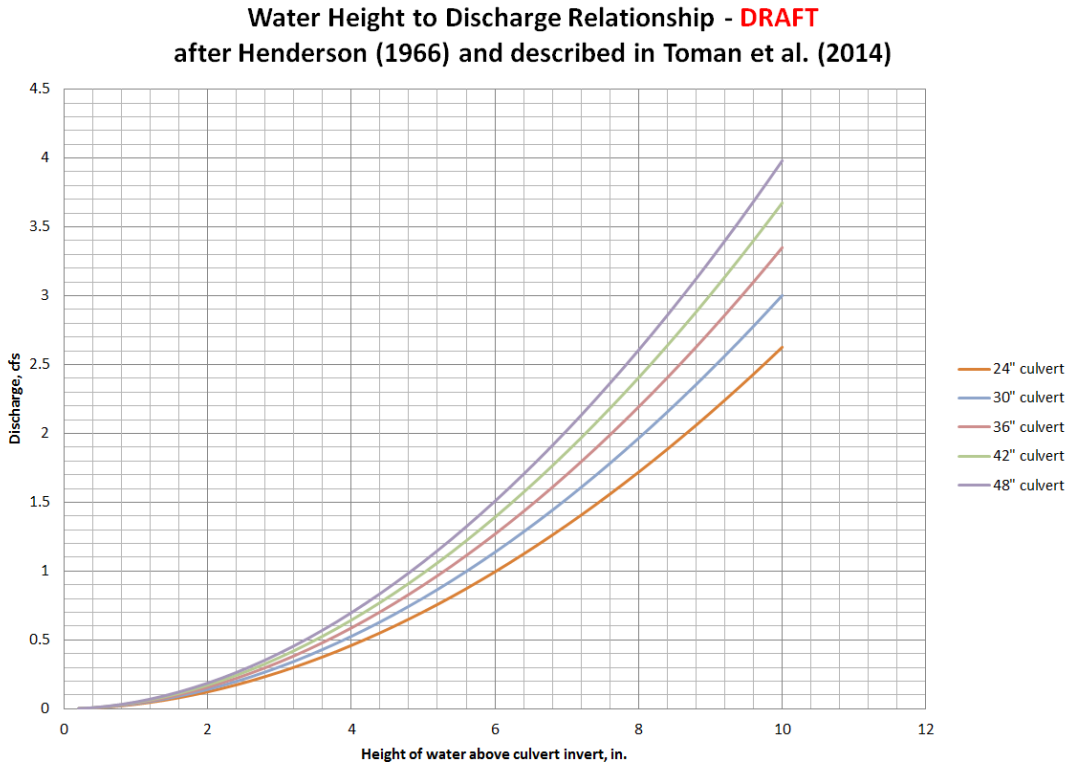
    Diurnal fluctuations in stream flow are caused by daily variations in solar radiation and temperature, which regulate the amount of water added to or removed from watercourses. Diurnal fluctuations can be caused by changes in evapotranspiration or snowmelt.
    Please refer to the Protection Measures/Best Management Practices section in the Water Drafting Workshop PowerPoint presentation, available at:
    http://calfire.ca.gov/resource_mgt/resource_mgt_forestpractice_pubsmemos_memos .

    Also see:
    http://meteora.ucsd.edu/~cayan/Pubs/65_Lundquist_J_Hydrometeorology_2002.pdf

24. Does the Rational Method work as an approach for calculating streamflow?

No. The Rational Method is one approach to determine an appropriate culvert size, but not for an estimate of streamflow. It predicts flood peaks for watercourse crossing design (e.g., 100-year flood flows).

The appropriate method for predicting streamflow is the flow transference method, which is explained in two documents: (1) Waanen and Crippen 1977 and (2) Cafferata et al. 2004. An approach to easily determine a rough estimate of stream discharge where the watercourse flows through a culvert near the drafting site is to use the method suggested by Toman et al. (2014). Flows were measured between 0.003 and 0.2 cubic feet per second (cfs), and the method was shown to be accurate within 10 percent of flumes and tracers. For round pipes under inlet control[2], measure the height of the water at the culvert inlet and the culvert diameter. Then use the following nomograph:[3]



[2] Inlet control means that the culvert has a slope great enough that discharge is only controlled by hydraulic factors at the pipe's inlet (i.e., inlet geometry and headwater depth). Culverts operating under inlet control will always flow partially full. A culvert that has a slope greater than 1.5% to 2% will normally exhibit inlet control.

[3] An electronic version of this nomograph is available from DFW and CAL FIRE staff.

25. What is the relative accuracy of various stream discharge measurement techniques? Generally, if a stream flow discharge estimate is within 10 percent of the actual amount it is considered reasonably accurate. *SonTek FlowTracker* (acoustic Doppler velocimeter) accuracy is reported to be + or – 1%. Portable flumes can achieve 2 to 3% accuracy during free flow conditions (3-inch flume). For the float method, measurement results can be + or - 10% under ideal conditions and > 25% in a non-uniform reach. The most accurate method for small flow is the volumetric or bucket method. For more information, see: http://www.state.nj.us/dep/wms/shvanda_stream_gaging.pdf

26. Provide very low flow (e.g., when riffles are <0.2 cfs) measurement alternatives to help ensure compliance.

    If a culvert is located near the drafting site, use the nomograph shown above. Losing flow beneath (subsurface) or around the pipe can be quite common. Comparing flow measurements above and below a culvert can provide a good sense of whether all (or most) of the stream flow is being concentrated through the pipe. Alternately, use the float method for very low flow measurement. If possible, the most accurate method for low flow is the volumetric or bucket method.

27. Explain the 2 cfs minimum bypass flows required on Class I anadromous fish bearing streams.

    When flows drop fall below 2 cfs, the likelihood for dewatering riffles downstream of drafting sites become greater. This is due to the spatial variability in streamflow dynamics in gravel bed channels. A current study (Simpson 2016) showed variability between measurements sites ranged up to 80 percent. An upstream site flowing at 1.2 cfs was simultaneously shown to be 0.2 cfs at 500 feet downstream.

    See the following for NOAA's Water Drafting Specifications: http://www.westcoast.fisheries.noaa.gov/publications/hydropower/water_drafting_specification_guidelines.pdf

28. Would it be better to have a bypass or flow through system?

    Flow through systems consistently reduce flow within the reach between the intake and outfall, whereas bypass or float valve systems divert flow when the tank is being filled.

    A bypass or float valve water tank system is less likely to cause substantial impacts downstream of the intake compared to a flow-through system. In locations where the tank

is exposed to the sun, flow through systems can cause increases in downstream stream temperatures.

29. Does DFW have a list of preferred dust palliatives?

    No, but the "Dust Palliative Selection and Application Guide" by USDA Forest Service can help guide decisions:
    http://www.fs.fed.us/eng/pubs/html/99771207/99771207.html

30. Provide discussion on how to most efficiently apply water to roads (timing of application, rate of application, number of treatments per day, etc.).

    Application times and rates are site-specific. Determine the appropriate application rate and frequency to water roads only as needed. In general, it is best to (1) water in the early morning (1 to 3 am) to infiltrate the road, and (2) use regular, light watering instead of less frequent, heavy watering.

31. Where is chytrid fungus found in California?

    Chytrid fungus is an infectious disease that has caused severe population declines in California's native amphibians. The fungus can spread from waterbody to waterbody by infected animals, field equipment, and potentially transported water.

    Chytrid fungus has been found throughout California. An interactive map with positive and negative detections can be found here: http://www.bd-maps.net/maps/

32. Is transporting invasive weeds a concern when drafting water?

    Yes. Invasive plants can out-compete native plants, leading to habitat alterations that impact wildlife species. Equipment and vehicles used in drafting water are potential vectors for invasive plant spread. Knowing what invasive weeds are present and how to clean equipment can aid in prevention. See the following links for more information:

    http://www.cal-ipc.org/ip/prevention/PreventionBMPs_LandManager.pdf
    https://www.cdfa.ca.gov/plant/ipc/encycloweedia/weedinfo/winfo_table-sciname.html

    Just as with chytrid fungus and invasive weeds, the spread of Sudden Oak Death (SOD) is also a concern. SOD is a highly contagious disease that has devastating effects on California's native oaks. It's important to be aware if you are working in an area where SOD

is known, ensure that measures to avoid the spread of SOD (do not take water from an infected area to a non-infected area, clean equipment, etc.) are taken. More information can be found at:
http://www.suddenoakdeath.org/

33. What are the minimum requirements for a drafting pad?

The following specifications are in the Forest Practice Rules addressing Anadromous Salmonid Protection. However, they are standard best management practices everywhere:

14 CCR § 923.7 [943.7, 963.7] (I)(3)(B): Approaches and associated drainage features to drafting locations within a WLPZ or channel zone shall be surfaced with rock or other suitable material to minimize generation of sediment.

14 CCR § 923.7 [943.7, 963.7] (I)(3)(C): Barriers to sediment transport, such as straw wattles, logs, straw bales, or sediment fences, shall be installed outside the normal high water mark to prevent sediment delivery to the watercourse and limit truck encroachment.

14 CCR § 923.7 [943.7, 963.7] (I)(3)(D): Water drafting trucks parked on streambeds, floodplains, or within a WLPZ shall use drip pans or other devices such as adsorbent or absorbent blankets, sheet barriers, or other materials as needed to prevent soil and water contamination from motor oil or hydraulic fluid leaks.

34. Discuss the use of treated water for watering roads.

Treated wastewater may be used under specific circumstances, but usually only where it cannot flow into a stream or lake. Under some circumstances wastewater may be allowed to flow into a stream or lake after filing a Report of Waste Discharge (ROWD) with a Regional Water Quality Control Board. Also, wastewater use may be permitted under a region-wide Waiver in certain situations. The County Department of Health and the appropriate Regional Water Quality Control Board may need to be notified. To find out what is allowed under the permit of your local treatment plant, see:
http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/requirements.shtml

35. How long can a tank store water under riparian water rights?

Water may be stored in a tank for 30 days.

36. Does the e-WRIMS website show how much water users are allowed to divert?

Yes. The website can generate reports on details such as applications, registrations, petitions, etc. and filter for records through a query. However, the e-WRIMS interactive map only shows the point of diversion and its status (e.g. adjudicated, inactive, licensed, pending, temporary, etc.).

To browse this information, see:
https://ciwqs.waterboards.ca.gov/ciwqs/ewrims/EWMenuPublic.jsp

37. Provide specifications for screened intakes, especially intakes that can work in shallow pools, including the openings and screen surface area requirements.

In watersheds with listed anadromous salmonids, water drafting specifications are located in 14 CCR § 923.7 [943.7, 963.7](l) of the Forest Practice Rules. There are no specifications for screened intakes in non-anadromous watersheds. However, it is recommended that all intakes should be screened to avoid uptake any life stage of fish and amphibians into the pump. Screens should also be cleared of leaves and twigs during drafting operations to maintain adequate flow and reduce impingement of aquatic species on the screen. CDFW recommends Class II watercourse drafting intakes screens openings are less than 1/8 inch diameter (horizontal for slotted or square openings) or 3/32 inch for round openings to avoid impingement of Class II species.

See 14 CCR § 923.7 [943.7, 963.7] (l)(3) on the NOAA Water Drafting Specifications:
http://www.westcoast.fisheries.noaa.gov/publications/hydropower/water_drafting_specification_guidelines.pdf

38. Discuss how to purchase and build screens for foot valves.

A foot valve is a one-way valve at the inlet of a pipe. Numerous websites provide opportunities for purchasing and making screens for foot valves.

Here are some examples of screens:

This screen is suitable for Class II watercourses and was brought for demonstration purposes by Sierra Pacific Industries to the Rancho Cordova Water Drafting Workshop, April 2016

This screen meets the CDFW specifications for Class I diversions

39. Give examples of off-channel drafting sites other than above ground tanks, e.g., lined ponds.

    Off-channel excavated basins near active stream channels can be a reasonable alternative in some situations (unconfined alluvial channels only), but should be screened to avoid impingement of amphibians and reptiles.

Here are some examples of off-channel excavated basins:

Sump by Mendocino Redwood Company near South Fork Albion River, August 2003

Off-channel water hole by Humboldt Redwood Company, near Dyerville Bar on the Eel River, Humboldt County

Off-channel water hole by Gualala Redwood Timber on the South Fork Gualala River, September 2015

Off-channel waterhole on Esmeralda Creek near Fresh Pond, CA on Sierra Pacific Industries, April 26, 2016

40. Is reducing the pump rate enough with drought conditions?

    This is site-specific and can consider many factors. Consulting with your local DFW representative is recommended to develop the appropriate mitigations to reduce impacts during drought conditions.

41. Is it a significant diversion if the impacts are short term (e.g., 20 minutes in various locations) vs. a continuous diversion dewatering a riffle for days?

    Each water drafting location has many variables associated with it, so significant impacts can occur in both short-term and continuous diversions.

42. Are off-channel drafting methods preferable to in-channel methods?

    Off-channel methods could pose less risk to aquatic resources. However, excessive off-channel waterholes on one watercourse may have adverse effects on streamflow. Preferences vary by region and specific locations. The topography and hydrology of a system may not make creating an off-channel waterhole a practical option.

43. Provide information on proper temporary damming techniques to either increase the depth of an in-channel drafting site or to divert water into a pipe for charging an off-channel water hole.

    In general, temporary damming of the watercourse is not recommended because of the difficulty in maintaining appropriate bypass flows.

Temporary damming of a fish-bearing stream may be an option to create pools for water drafting. One main consideration in this circumstance is ensuring that upstream and downstream fish passage is maintained.

For non-fish bearing streams, it is possible to use sand bags filled with sand or native gravel (but not soil). Care should be taken to ensure streams are not dewatered downstream from the temporary dam or that fill slopes at culvert crossings are not saturated.

In both cases, any temporary structure and/or material used to create a dam should be removed prior to the winter period. It's also best to work with your local CDFW representative to develop mitigations for temporary damming.

Resources

Aanensen, D., and M. Fisher. 2016. Bd-Maps. Department of Infectious Disease Epidemiology, Imperial College London, United Kingdom. <http://www.bd-maps.net/maps/> Accessed 1 Dec. 2016

Bolander, P., and A. Yamada. 1999. Dust Palliative Selection and Application Guide, Project Report. 1977-1207-SDTDC. U.S. Department of Agriculture, Forest Service, San Dimas Technology and Development Center, CA. <http://www.fs.fed.us/eng/pubs/html/99771207/99771207.html> Accessed 1 Dec. 2016

Cal-IPC. 2012. Preventing the Spread of Invasive Plants: Best Management Practices for Land Managers (3rd ed.). Cal-IPC Publication 2012-03. California Invasive Plant Council, Berkeley, CA <http://www.cal-ipc.org/ip/prevention/PreventionBMPs_LandManager.pdf> Accessed 1 Dec. 2016

California Department of Fish and Wildlife. 2013. Standard Operating Procedure for Critical Riffle Analysis for Fish Passage in California. Instream Flow Program, Sacramento, CA. <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=57462> Accessed 1 Dec. 2016

California Department of Fish and Wildlife. 2016. LSA Notification Forms and Instructions. Lake and Streambed Alteration Program, Sacramento, CA. <https://www.wildlife.ca.gov/Conservation/LSA/Forms> Accessed 1 Dec. 2016

California Department of Forestry and Fire Protection. 2016. Memorandums: 2016 Water Drafting Workshop-Rancho Cordova. Sacramento, CA. <http://calfire.ca.gov/resource_mgt/resource_mgt_forestpractice_pubsmemos_memos> Accessed 1 Dec. 2016

California Department of Food and Agriculture. 2016. California Noxious Weeds. Sacramento, CA. <https://www.cdfa.ca.gov/plant/ipc/encycloweedia/weedinfo/winfo_table-sciname.html> Accessed 1 Dec. 2016

California Oak Mortality Task Force. 2014. Sudden Oak Death Guidelines for Forestry. Berkeley, CA. <http://www.suddenoakdeath.org/> Accessed 1 Dec. 2016

California Water Resources Control Board and Regional Water Quality Control Boards. August 2016. Hauling Water Flier. Sacramento, CA. <http://www.waterboards.ca.gov/northcoast/water_issues/programs/cannabis/pdf/160816/HaulingWater.pdf> Accessed 1 Dec. 2016

Lundquist, D., and D. Cayan. 2002. Seasonal and Spatial Patterns in Diurnal Cycles in Streamflow in the Western United States. Journal of Hydrometeorology 3: 591-603

<http://meteora.ucsd.edu/~cayan/Pubs/65_Lundquist_J_Hydrometeorology_2002.pdf> Accessed 1 Dec. 2016

National Marine Fisheries Service, Southwest Region. 2001. Water Drafting Specifications. Engineering Section, Santa Rosa, CA. <http://www.westcoast.fisheries.noaa.gov/publications/hydropower/water_drafting_specification_guidelines.pdf> Accessed 1 Dec. 2016

Rossi, Gabriel Jacob. 2012. Developing Hydraulic Relationships at the Riffle Crest Thalweg in Gravel Bed Streams. A Thesis Presented to the Faculty of Humboldt State University, Arcata, CA. <http://humboldt-dspace.calstate.edu/handle/2148/1273> Accessed 1 Dec. 2016

Shvanda, Jason. 2011. Streamgaging: Measuring Stream Velocity and Discharge. U.S. Geological Survey, New Jersey Water Science Center, Hydrologic Data Assessment Program, West Trenton, New Jersey. <http://www.state.nj.us/dep/wms/shvanda_stream_gaging.pdf> Accessed 1 Dec. 2016

State Water Resources Control Board. 2016. Water Reclamation Requirements for Recycled Water Use. Sacramento, CA. <http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/requirements.shtml> Accessed 1 Dec. 2016

State Water Resources Control Board. 2016. E-WRIMS Public Data Access Menu. Sacramento, CA. <https://ciwqs.waterboards.ca.gov/ciwqs/ewrims/EWMenuPublic.jsp> Accessed 1 Dec. 2016

References

California Department of Fish and Wildlife. 2013. Standard Operating Procedure for Critical Riffle Analysis for Fish Passage in California. Instream Flow Program, Sacramento CA

Cafferata, P.H., T.E. Spittler, M. Wopat, G. Bundros, and S. Flanagan. 2004. Designing watercourse crossings for passage of 100-year flood flows, sediment, and wood. California Forestry Report No. 1. California Department of Forestry and Fire Protection. Sacramento, CA. 34 p.

Simpson, N.P 2016 Effectiveness of a maximum 25 percent streamflow diversion rate in maintaining macroinvertebrate communities in small headwater streams in Northern California. California Department of Fish and Wildlife Technical report (in review).

Toman, E.M., A.E. Skaugset, and A.N. Simmons. 2014. Calculating discharge from culverts under inlet control using stage at the inlet. J. Irrig. Drain Eng., 2014, 140(2): 06013003.

Waananen, A.O. and J.R. Crippen. 1977. Magnitude and frequency of floods in California. U.S. Geological Survey. Water Resources Investigation 77-21. Menlo Park, CA. 96 p.