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**SUBJECT: THP 1-15-042 SON** (Gualala Redwoods Inc. "**Dogwood**" THP) and contiguous **THP 1-15-033 SON** (Gualala Redwoods Inc. "**Apple**" THP) comments with emphasis on timber harvest activities in flood-prone timberlands and wetlands

Dear Cal Fire:

I am submitting comments on the subject "Dogwood" and "Apple" THPs, which are contiguous had have overlapping, related potential significant impact and biological assessment areas. My qualifications to provide expert interdisciplinary comments are attached.

The two interconnected THPs contain much duplicated and overlapping information. CAL FIRE should provide justification why these two contiguous THPs are treated as separate THPs, which itself contributes to underestimation of their collective simultaneous impact to the lower Gualala River mainstem, Wheatfield Fork, and tributary reaches. This is particularly significant because of the exceptionally large and unprecedented floodplain area ("flood prone area" under Anadromous Salmonid Protection rules of the Forest Practices Act, Section 916.9) proposed for timber harvest in the "Dogwood" THP, especially in view of the antecedent smaller THPs overlapping with its footprint, which were either denied or withdrawn because of their controversial high impacts. The antecedent THP application history within the same THP areas should be disclosed in the "Dogwood" THP.

## 1.0 Special-status species impacts

The "Dogwood" and "Apple" THPs fail to provide basic, current (relevant to THP public circulation and potential THP 5 year operation period), adequate baseline evidence and analysis regarding the distribution, abundance, sensitivity, and regional significance of special-status plant, wildlife and fish species. They generally also fail to provide objective species-specific criteria or thresholds of significance for direct, indirect, or cumulative impacts for any of the special-status species that may occur in the THP, which precludes meaningful and objective analysis or public comments.

The THP substitutes only "scoping" compilation of outdated database information on special-status plants (CNDDB database compiling incidental observations from regional historical reports, some well over 100 years old) and a 1997 "Rare Plant Assessment" report for all GRI lands (not specific to the THP areas) last updated in 2001. Neither of these "scoping" tools provides a baseline assessment of rare plants relevant to existing conditions, and neither is a valid substitute for actual evidence-based survey information specific to the THP areas. These "scoping" compilations are not even critically reviewed or assessed, or interpreted in relation to likelihood for contemporary occurrence or THP impacts. The "Apple" and "Dogwood" THPs are likely to cause significant impacts to special-status species because of a lack of adequate, scientifically sound and reliable species-specific information about population sizes and distributions, habitat distribution and quality/suitability, and failure to analyze biologically meaningful impacts and mitigation. These conclusions are explained for selected rare plants, wildlife, and fish below.

**1.1. Rare plants impacts**

Despite the fact that Registered Professional Foresters have examined the THP areas over a time period sufficient for timber planning and layout of watercourse protections, there is no justification for the lack of any rare plant or general plant community survey or assessment, other than the inexplicable statement that "because of the time of year….rare plant surveys were not done" ("Apple" THP resubmitted cumulative impact analysis p. 145). This is unreasonable, especially given the known occurrence of special-status plant species, the potential for their growth and spread during the nearly 20 years since the last "rare plant assessment" specifically within the THP areas, which include floodplains and wetlands.

Specifically, the mesic to wetland areas of the flood prone (alluvial) areas of the THPs are likely to contain both populations of rare plants identified in the 1997 GRI Rare Plant Assessment, but also additional populations established during the period since then, which includes at least two wet periods (high rainfall) periods that facilitate colonization and establishment of some rare plants, including California bellflower (*Campanula californica*), California sedge (*Carex californica*), coast lily (*Lilium maritimum*), white rein-orchid (*Piperia candida*). In addition, previously undetected populations of marsh pea (*Lathyrus palustris*) may occur in mesic to wetland areas (seeps, springs, and peripheral moist areas).

These species would be conspicuous and reliably detectible only during bloom periods, and only by qualified and sufficiently experienced field botanists conducting surveys. In particular, sedge species require exceptionally skilled botanists for accurate detection and identification. The THPs lack this basic requirement for detection and assessment of rare plants specific to the THP areas, so it is not possible to conclude that potential significant impacts to rare plants are adequately assessed or mitigated. The THPs provide not even minimal information for impermissibly deferred mitigation proposed (pre-timber harvest surveys for rare plants): no methodology or sampling plan for rare plants, or qualifications for surveyers, is included in the THPs. Exclusive reliance on deferred surveys and mitigation, especially in the absence of any information on rare plant survey methodology, or criteria for

significance, or species-specific mitigation measures, prevents any meaningful public comment or expert analysis of the adequacy of mitigation.

Since avoidance and minimization of impacts to rare plants by adapting layout of timber harvest areas is not possible without advance knowledge of rare plant populations and habitats (especially herbicide use impacts), the THPs as currently proposed cannot properly mitigate potential significant impacts to rare plants.

Significant potential impacts of THPs would be likely to occur to rare plant populations due to direct and indirect effects of timber harvest operations:

- Direct impacts degrading or destroying undetected plant populations and their seed or bud banks in soil, deep burial of rare plant seed banks by vehicle and equipment tracks, soil disturbance and root or rhizome injury due to equipment and vehicle operation, tree felling, crushing by fallen timber and slash removal, skid trail construction or reactivation;
- Direct impacts of post-harvest herbicide applications to above-ground plant parts (seedlings, juveniles and adult plants)and below-ground seeds, buds, and other vegetative regenerative structures (especially imazapyr, a systemic herbicide that may persist in active form in soil and shallow groundwater);
- Indirect impacts of competition from native or non-native riparian/floodplain invasive plants currently invading the watershed, including *Ehrharta erecta, Lathyrus latifolius,* and *Cortaderia jubata*) due to release from light limitation (canopy gaps caused by timber selection cuts or clear-cuts) and soil disturbances;
- Indirect impacts of water stress and temperature stress, due to increased light penetration to the ground layer through canopy gaps caused by selection cuts or clear-cuts
- Inadequate buffer zones based solely on avoidance of direct impacts may significantly reduce individual rare plant population viability and lead to local extirpation or reproductive failure.

The THPs provide no spatially explicit data or maps on the distribution of seed sources of existing populations of invasive plant species that are poised to colonized disturbed timber harvest areas. The THPs provide no impact assessment of broadcast herbicide applications targeting non-native invasive species or "brush control" on native plant communities or rare plants. The THPs may cause significant degradation to riparian and floodplain plant communities, and rare plant populations, due to disturbances and indirect impacts of herbicide application. The THPs lack basic minimum data and mitigation measures to avoid or minimize these potential significant impacts.

## 1.2. Special-status wildlife species impacts

### California red-legged frog.

California red-legged frog (CRLF; *Rana draytonii*) distribution in relation to the THP areas is erroneously described because the THP areas were not surveyed in areas of suitable habitat, such as water holes, ponds, springs, seeps, backwater wetlands. CAL FIRE should defer to the expertise of the California Department of Fish and Wildlife(CDFW) and conduct adequate surveys for CRLF. The THPs erroneously claim that the nearest known reported populations occur 21 miles away in the Austin Creek watershed ("Dogwood" THP Sec 5 p. 163). In fact, at least 4 adult CRLF were detected this spring (2015) in the riparian zone of Salal Creek on The Sea Ranch (in channel pools that were potential breeding habitat during low-flow conditions) south of the THP area, with potential upland dispersal corridors to the lower (mouth) Gualala River riparian zones of the "Dogwood" THP. This occurrence of breeding age adults (incidental observations conducted by Sea Ranch rare plant surveyors) has been reported to Jeanne Chinn, CDFW.

Potential significant impacts to CRLF are not limited to breeding (aquatic) habitats, but are likely to include disturbances to upland foraging areas in the non-breeding (spring-summer-fall) season. CRLF forage in uplands at night and during periods of strong coastal fog, and shelter by day in moisture refuges in upland habitats (under logs, bark, mammal burrows, tree trunk or root cavities, etc.). THP operations may cause significant adverse impacts, including unauthorized "take" of CRLF, unless upland habitats as well as aquatic breeding habitats are surveyed and protected.

Nighttime flashlight surveys for CRLF following current U.S. Fish and Wildlife Service protocols must be conducted by a qualified biologist with specific CRLF experience. CRLF survey results must be reported and assessed in a supplemental biological existing conditions report attached to resubmitted "Apple" and "Dogwood" THPs. Without adequate and accurate baseline information on which to base impact assessment and mitigation measures, the THPs may cause significant impacts to listed CRLF or result in unauthorized "take" of this species.

### Western pond turtle

The THPs erroneously claim that no western pond turtles (*Emys marmorata marmorata* and synonyms; WPT) are known to occur in the THP areas. This is also clearly due to a lack of targeted surveys for WPT in the THP areas. I have personally observed juvenile and adult WPT (evidence of breeding populations) in various reaches of the Mainstem, South Fork, Wheatfield Fork, and tributaries including Buckeye Creek and Fuller Creek each year over the last 15 years. Some have been locally reported in the "Mendonoma Sightings" column of the local newspaper, The Independent Coast Observer, so there is no reason for the THPs to claim that they do not occur here. Western pond turtles are sensitive to disturbance and dive to deep water pools on approach, so detection requires careful survey methods;

incidental observation require many hours of repeat surveys. The THPs should be resubmitted with adequate survey data for WPT within the THP areas.

The THPs erroneously conclude that WLPZ (watercourse buffer zones) would protect WPT from impacts of timber harvest. This conclusion fails to address the movement of WPT into upland or floodplain areas where WPT avoid high energy channel conditions in winter. In addition, even during the dry season, WPT make upland movements (sometimes observed crossing roads) to bask, forage, or disperse. Since the THPs propose winter operations, potential timber operation impacts to WPT are not mitigated by WLPZs. WPT mitigation must assess both current WPT occurrences based on adequate surveys, and assessment of habitats in all seasons, considering WPT behavior and seasonal habitat use patterns. Without adequate and accurate baseline information on which to base impact assessment and mitigation measures, the THPs may cause significant impacts to WPT.

**Marbled Murrelet**

The THPs erroneously assert that no marbled murrelets (*Brachyramphus marmoratus*) or suitable habitat occur within the THP areas. This is inconsistent with previously submitted THP data GRI prepared for overlapping past THPs "Iris" "Kestrel" and "Willow", and omits any THP area-specific inventory of mature redwoods in the riparian and floodplain zones of the "Dogwood" THP, which include readily observable (from the Gualala River mainstem) tall redwoods with large diameter high limbs and irregular crown structure. The THP reports no recent surveys from the Gualala River by either CDFW, nonprofit conservation biology organizations, or knowledgeable local bird experts, to support its conclusion that marbled murrelets do not occur in the THP areas. Without diligent efforts to compile and review all reasonably available independent evidence about recent marbled murrelets and their habitat in the THP vicinity, and without adequate and accurate baseline survey information specific to the THP areas on which to base impact assessment and mitigation measures, the THPs may cause significant impacts to WPT, as well as potential unauthorized "take" of marbled murrelets. CAL FIRE should confer with both CDFW and USFWS regarding survey requirements for marbled murrelets, and conduct adequate scientifically sound baseline surveys of marbled murrelets and their suitable habitat within the THP areas and their vicinity. Otherwise, the THPs are likely to cause potential significant impacts to marbled murrelets, and without the benefit of diligent consultation and advice (and "take" authorization) from wildlife agencies that have jurisdiction over the conservation of this species.

**Northern Spotted Owl**

The THPs report at least 8 known or presumed recent occurrences of federally listed northern spotted owls (NSO; *Strix occidentalis caurina*) in the THP areas, and requests exceptions for standard mitigations to avoid disturbances to this species due to road use. The THPs propose only "owl circle" buffer zones around "activity centers" of NSO to protect NSO from significant impacts and potential unauthorized take. This mitigation is inadequate to minimize and avoid impacts (including unauthorized "take") to NSO because

it fails to address significant impairment of reproduction and survival caused by indirect impacts of forest habitat alteration that cause or contribute to significant competition, predation, and interbreeding impacts of invasive non-native barred owls. Barred owl spread is facilitated by interspersion of forest gaps around mature forest structure required by NSO, and NSO habitat integrity is degraded by forest gaps and disturbance "edge" effects. The THPs lack any ecological impact assessment of indirect or cumulative effects of timber harvest on NSO; the routine "owl circle" mitigation in relation to "activity centers" address only direct impacts and direct take of nest locations. No impact assessment or mitigation for significant indirect impacts (well supported in the current scientific conservation biology literature for NSO) is provided in the THPs. The THPs provide long-outdated (2008) "technical assistance" letters from USFWS for antecedent floodplain THPs

**Bald eagle**

The THPs erroneously report that there are no bald eagle nests on the Gualala River. Bald eagles have been observed and reported on the Gualala River mainstem, mouth, and Wheatfield Fork of the Gualala River for two years. I have personally observed mating "dives" of a bald eagle pair above the Wheatfield Fork of the Gualala River in 2015, and knowledgeable local bird experts have reports of recurrent dusk flights of an adult male to a likely nest tree in 2014. I have observed multiple low-elevation (presumably foraging) late afternoon/early evening flights of adult male bald eagles over the Wheatfield Fork in spring-summer 2014 and 2015. Suitable nest habitat of bald eagles does occur on mature redwoods along the mainstem, lower Wheatfield Fork, and lower South Fork. The THPs fail to provide any survey data, and have failed to diligently inquire about the status of bald eagles in the watershed from knowledgeable local experts (including published photograph-supported reports of bald eagles in the "Mendonoma Sightings" column of the local newspaper, Independent Coastal Observer). The THPs provide no habitat assessments for bald eagles in the THP areas or their vicinity. The THPs – especially "Dogwood" – may result in significant impacts to bald eagles from timber harvest disturbances (including water drafting vehicle entry to the river bed or riparian zone) that either deter nesting, disturb nesting, or disturb foraging activities of bald eagles.

**Sonoma tree vole**

The THPs provide inconsistent information on Sonoma tree vole (*Arborio pomo*) distribution, abundance, and potential impacts within the THP areas. On the one hand, the THPs report relatively widespread occurrence of Sonoma tree voles from incidental observation by GRI foresters. On the other hand, the "Apple" THP reports (cumulative impacts Section 4, p. 139-140) that "during plan layout, no tree vole nests were discovered", yet no surveys, survey methods, or dates of surveys are reported to support "discovery" or interpretation of absence of nests. Lack of "discovery" in the absence of surveys is no evidence of absence or lack of impacts. The THPs may cause significant impacts to tree voles (including nest trees) if they are present in the THP areas, but no methods for surveying, detecting, and avoiding occupied trees or nest trees are included in the THPs. The THPs should be revised to include Sonoma tree vole surveys and avoidance protocols.

### Fisher

The THPs report that no fishers have been detected in the THP areas. Fishers are extremely unlikely to be detected without targeted surveys and use motion-activated night video cameras.. Credible amateur wildlife reports of potential fisher sightings in the Gualala River watershed have been published in the "Mendonoma Sightings" column of the Independent Coast Observer. This species is proposed for listing, and warrants survey data to avoid potential impacts from THPs. The THPs cannot justify a conclusion of absence and no impacts for fishers without basic survey data. CAL FIRE should consult with CDFW to address survey protocols and methodology for fisher detection.

### Black bear

Black bears appear to move seasonally into the "Dogwood" THP area in fall, as indicated by annual appearance of frequent large bear scat composed of manzanita berries and peppernuts (*Arctostaphylos columbiana, Umbellularia californica*) along the river bed and adjacent riparian zone in October and November. THP activities in the food-rich floodplain and adjacent slopes in fall may disturb and displace bear foraging, and cause them to seek alternative food sources in human-inhabited areas of Sea Ranch and Gualala, contributing to or causing significant human-wildlife conflicts. CDFW's Statewide Black Bear Policy 2071, consistent with sections 1801, 4181 and 4181.1 of the Fish and Game Code, affirms the purpose to minimize bear/human conflicts.The THPs should include mitigation measures to time impacts from timber harvest operations to minimize bear foraging disturbances in fall.

## 1.3. Listed salmonids: steelhead and coho salmon impacts

Steelhead (*Oncorhychus mykiss*) occur in all reaches of the Gualala River and tributaries within and adjacent to the THP areas, and coho salmon (*Oncorhynchus kisutch*) are likely to occur on tributaries of the North Fork and Little North Fork. Coho also may occur in suitable cool refuge pool habitats (groundwater seep-influenced pools with stratified cooler pool bottom temperatures) in cooler coastal reaches of Rockpile and Buckeye Creeks, especially in cool summers. The GRWC stream and riparian data and NCWAP assessments cited profusely in the THPs to assess in-stream and riparian salmonid habitat are mostly outdated (mostly pre-2008), and are "stale" baseline for current drought conditions, incised pool morphology and temperatures, and riparian shade/cover indices. The THPs fail to describe current in-stream habitat conditions, current population conditions, recent population trends, and especially ephemeral floodplain foraging habitat for listed salmonid species. The THPs fail to assess significant impacts of timber harvest impacts in Anadromous Salmonid Protection Rules flood prone habitats. See comments on hydrology, floodplains and wetlands in section 2.0 of comments below for details.

## 2.0. Hydrology, Wetlands and floodplain impacts

## 2.1. Wetlands

Despite the presence of extensive seasonal and perennial wetlands in the floodplain redwood forest, the "Dogwood" THP provides no data, methodology, discussion, or analysis of the existing types, functions, or spatial distribution of wetlands under any definition or habitat classification. Timber operations, including equipment and vehicle track disturbances, skid roads, tractor trails, vegetation management, and slash deposition may all adversely affect wetland structure and function by:

(a) compacting soil,
(b) disturbing or destroying above-ground wetland vegetation shoot structure that supplies air to wetland plant roots and regenerative below-ground shoots during soil saturation or flooding;
(c) burying soil seed banks of wetlands plants too deep for emergence;
(d) application of systemic herbicides that destroy wetland soil seed banks or wetland plant populations;
(e) application of herbicide formulations not approved for use in wetland habitats that are not accurately identified and avoided;
(f) skid trail or haul road construction in wetlands that are not accurately identified and avoided, or otherwise mitigated.

"Dogwood" and "Apple" THPs provide no survey data, methodology, or maps of jurisdictional wetlands (under either federal or any state definition), or wetland habitat under any objective classification system. The "Dogwood" THP provides only map information about "wet areas", which are classifications under Forest Practice Rules of only *perennially* saturated wetlands (seeps or near-surface emergent groundwater), and do not account for the more widespread *seasonal* floodplain wetlands that are saturated or flooded only during portions of the winter-spring rainfall season. The THPs, however, do describe "flood prone" poorly drained topography and elevation gradients within the THP area (particularly "Dogwood") that are hydrogeomorphically conducive to wetlands, and indicate a high potential for them: "wide heavily vegetated areas with back-tilted topography exist between most of these skid trails and watercourses" ("Apple" Sec 3 p. 80, Item 27 a & f). The THPs refer to the standard rule for wetland avoidance (916.3(c)) requiring avoidance of road or tractor road construction or reconstruction in "marshes, wet meadows, and other wet areas" (e.g., Apple THP Sec 3. p. 80), but provides no baseline description, methodology, classification, or impact assessment for the variable types of *seasonal* wetlands in the redwood forest floodplain, including riparian floodplain gaps. It also fails to describe methodology and survey efforts for delineating "wet areas" based on wetland indicator vegetation surveys or maps, soil surveys, topographic surveys, direct observation of hydrology during the wet season, or indirect observation of soil or hydrology indicators during the dry season.

The "Apple" and "Dogwood" THPs provide only unexplained and apparently arbitrary map locations of "wet areas" without any description of their composition, structure, function, or hydrogeomorphic setting, or demarcation criteria between "wet areas" and either jurisdictional federal/state wetlands other wetland classification types. The THPs fail to

provide even minimal information on specific habitat requirements of wetland-dependent wildlife (such as seasonal or perennial breeding pools for special-status amphibians) or floodplain fish habitat (such as foraging areas for salmonids during backwater flooding events in seasonal wetland depressions).

Seasonal and perennial wetlands within the floodplain of the Gualala River include, but are not limited to, the following widespread types based on hydrogeomorphic setting, hydrology, and vegetation:

- Slough sedge seasonal marsh - Vegetation is dominated by *Carex obnupta*, often with abundant persistent leaf litter and relict organic flood debris deposits within backwater depressions (primarily backwater channels, relict distributary channels isolated by floodplain aggradation after formation). Slough sedge marshes in the floodplain are inundated during floodplain submergence (surface flooding) and post-flood drawdown periods. They may also be saturated for variable duration of weeks to months in winter-spring with or without stream flooding, by high groundwater and rainfall in poorly drained depressions. Slough sedge marshes occur in both forest gaps and predominantly shaded understory/ground layer positions during forest succession, sometimes in association with willows and alder (*Salix* spp, *Alnus rubra*)
- Panicled bulrush marsh – Vegetation is dominated by shade-tolerant S*cirpus microcarpus* in either monotypic stands or in association with *Woodwardia fibriata* or *Oenanthe sarmentosa*. Soil is saturated at or near the surface most of the growing season. These marshes form either in areas of topographic impeded drainage (impoundment) of small seeps, springs, or streams, or in zones of emergent groundwater zones on floodplain flats during the growing season.
- California blackberry, blackberry-horsetail, and blackberry-wormwood seasonal wetlands. Vegetation is dominated by *Rubus ursinus* in either nearly monotypic stands or in association with *Equisetum hyemale, E. telmateia*, or *Ambrosia douglasiana*, often in association with silty to silt-clay flood deposits in topographic depressions or backwater floodplain zones. Flooding or soil saturation is relatively shorter than slough sedge marsh, drawing down and draining a few weeks after most flood events.
- Willow-alder riparian woodland. Vegetation is dominated by willow species (*Salix lasiolepis, S. sitchensis*, or *S. lucida*; *S. exigua* in channel bars only)
- Baltic and soft rush wet meadow. Vegetation is dominated by *Juncus balticus, J. effusus, J. articulatus* in seasonally wet depressions of riparian gaps.
- Forb-dominated seasonal wetlands. Variable perennial seasonal wetland forb assemblages in seasonally saturated or briefly flooded forest gaps, including *Euthamia occidentalis, Ambrosia douglasiana, Helenium bigelovii*. Substrate is flood-deposited sandy silt or silt; topography is either flat, depressional or slightly convex ground with impeded surface drainage.

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In addition, the THP areas contain springs, "water holes" (previously excavated ponds), and seeps which are not described in terms of location, type, habitat functions, hydrology, number, size, or distribution.

The THP provides no information on the type, distribution or significant ecosystem functions of these wetlands, nor does it disclose that they exist in the THP area except as indeterminate "wet areas" with no attributes. No assessment of direct, indirect, or cumulative impacts to wetlands is presented in the "Dogwood" and "Apple" THPs. The THPs merely state that "wet areas" and watercourse buffer areas would be protected by WLPZ zones, but with no presentation of evidence or basis for that statement. Therefore, neither experts, agencies, nor the general public can meaningfully evaluate or comment on this belief-based conclusion about WLPZ protections reaching wetlands.

In the absence of any meaningful substantive or scientifically sound information about wetlands in the flood-prone areas of the THPs, neither the public nor agencies can provide meaningful comments on potentially significant wetland impacts, feasible mitigation measures, or alternatives that avoid or minimize impacts to wetlands. In the absence of any information on wetland survey methodology and qualifications of field technicians to properly identify wetlands (if indeed there was any methodology used at all, which is not at all evident in the THPs), the public and resource agencies are similarly prevented from knowing whether the THPs have adequately identified a reasonably high proportion of floodplain wetlands with significant ecosystem functions, or whether most of them were ignored or omitted. Similarly, neither the public nor agencies can meaningfully assess compliance of the THPs with Forest Practice Rules that depend on avoidance of incompatible activities in wetlands.

Because of the unique floodplain setting of the Dogwood THP, it is exceptionally important to include at least a reconnaissance-level preliminary survey of wetlands that are potentially subject to Section 404 of the Clean Water Act. This is needed in the unusual circumstances of a THP with 320 acres of timber harvest proposed in a floodplain that is subject to the Anadromous Salmonid Protection rules and other Forest Practice Act rules regulating impacts to wetlands, for which only limited exemptions from the Clean Water Act Section 404(f) are applicable to normal forestry activities (exempting regulation of fill discharges that do not convert wetlands to non-wetlands). Specifically, if fill discharges associated with any timber harvest operations have the effect of converting a federal jurisdictional wetland area to a non-wetland due to fill discharges, the 404(f) "recapture" provisions of the Clean Water Act apply, such that discharges would require a Section 404 permit from the U.S. Army Corps of Engineers. This may occur if skid roads or crossings or other fill discharges encroach in wetlands that are not accurately identified or mapped.

Normally, on THPs predominantly on steep uplands, wetlands are highly localized within or around narrow watercourses or seeps, and the risk of wetland fill is not high. But in a complex and extensive 320 timber harvest floodplain area with high potential for wetlands (both obvious ones and subtle ones difficult to identify without expert judgment and adequate data sampling), the likelihood for erroneous unauthorized fill discharges in

unmapped jurisdictional wetlands is high. Unauthorized fill in jurisdictional unmapped wetlands could result in violation of both federal and Forest Protection Act regulations protecting wetlands, and thus also significant unmitigated impacts to wetlands. An even lower threshold for accidental discharges of fill in wetlands exists for timber harvest operations in forested floodplain wetlands in the Coastal Zone, where State wetland criteria broader than federal ones apply (single parameter wetlands; either vegetation, hydrology or soil indicators sufficient).

The complete lack of adequate baseline information on the types, functions, and extent of wetlands in the floodplain also prevents an adequate comparison of alternatives from being evaluated by the public and resource agencies. Alternative configurations of THP floodplain "footprints" that avoid or minimize potentially significant impacts to wetlands require a reasonably accurate estimate of wetland types, functions and distribution, whether they are formally delineated or merely approximated based on actual current field data. The proposed alternatives analysis necessarily fails to evaluate alternatives that reduce or minimize impacts to floodplain wetlands because there is no meaningful information about them, and because they aren't discussed as a factor in alternatives, even though they are an outstanding inherent and significant landscape feature of the "Dogwood" THP located primarily in unique flood prone (floodplain) areas.

The THPs should be revised to include any reasonably accurate wetland classification and mapping documentation for the entire THP areas, including wetland types, significant ecosystem (ecological and hydrogeomorphic) functions. It would be prudent and advisable to include at least preliminary jurisdictional delineations of federal wetlands in order to avoid violations of the Clean Water Act, which would be a potential significant impact mitigated by adequate survey and enforceable avoidance measures.

**2.2. Floodplain sediment trap hydrogeomorphic functions**

The Dogwood and Apple THPs fail to assess potentially significant hydrological, geomorphic, and water quality impacts due to impairment of flood sediment trapping functions of the floodplain/flood prone areas. The significance of sediment trapping ecogeomorphic functions of flood-prone areas in coastal redwood forests is scientifically well-documented and supported; they are explicitly evaluated in CAL FIRE's own 2005 Riparian Protection Committee (Cafferata *et al.* 2005) report on "*Flood Prone Area Considerations in the Coast Redwood Zone*". The THPs do make explicit descriptive references to the existence of significant sediment trapping (sediment sink) functions of the floodplain in the THP area, but they fail to assess or analyze impacts of timber harvest activities on floodplain sediment trapping capacity and its recovery after timber harvest. During overbank flows when the floodplain is inundated, current velocities are slowed by friction (roughness) caused by floodplain vegetation structure, especially high density and high surface area of shoots in the ground layer vegetation and coarse woody debris. Transport of suspended sediment in the water column above the floodplain/flood prone area is significantly reduced by reduced overbank flow velocity and drag (friction) due to high vegetation roughness at the ground layer, due primarily to high plant shoot density and leaf

surface area facilitates fine sediment deposition. Fine sediment and bedload (sand and silt, clay) deposited and trapped (stabilized) on the floodplain is effectively removed from fluvial transport when flood flows decline and water levels drop; return water draining from the floodplain to the river or creek channels has lower suspended sediment and minimal or no significant bedload sediment. Nutrients are also trapped with sediment. Water quality is improved by floodplains that "treat" floodwaters by trapping fine seidment. The available pool of fine sediment in channel beds is thus also indirectly reduced by floodplain sediment trapping: less fine sediment available for subsequent remobilization and resuspension during high flows that do not flow overbank and submerge the floodplain. These ecogeomorphic functions of floodplains are described, with scientific literature cited, in CAL FIRE's *Flood Prone Area Considerations in the Coast Redwood Zone"* report (Cafferata *et al.* 2005; Table 1 and pp. 17 *& seq.*). To comply with Anadromous Salmonid Protection Rules (FPR Sec. 916.9), that report and more recent peer-reviewed scientific literature must be the basis for impact analysis of timber harvest in "Dogwood" THP, which covers 320 acres of flood prone redwood forest alluvial flats subject to ASP Rules.

The indirect effects of timber harvest operations on vegetation roughness in flood prone areas may be significant and adverse, but they are not disclosed or analyzed in the "Dogwood" (or "Apple") THP. Instead of appropriately analyzing potential impairment of the primary sediment sink (trapping, removal and sequestration) functions of the flood prone area, the THP arbitrarily focused on only relatively minor sediment source (release) functions from floodplain, which is a natural net sediment sink. The THPs analyze only "erosion control" were analyzed in context of erosion control ("Dogwood" THP pp. ), despite the acknowledgement of "unique potential impacts" of timber harvest operations in flood prone areas ("Dogwood" THP Sec. 3 p. 109). This myopic exclusive focus on flood prone area erosion control, and neglect of floodplain vegetation roughness and potential significant impacts on sediment sink floodplain functions, has no scientific basis. This bias is inconsistent with CAL FIRE's Riparian Protection Committee's recommendation that "The function of vegetative roughness will need to be identified and protected in the planning of timber harvesting operations on flood prone areas." (Cafferata *et al.* 2005:10). The THPs fail to do this, and the "Dogwood" THP merely states (without citation or evidence) that "experience in these [floodplain/riparian] zones that effects on hydraulic roughness have shown that generally hydraulic roughness is increased by operations" ("Dogwood" THP Sec. 2. p. 27). The THPs further obscure the function of floodplain vegetation roughness by inverting the geomorphic context of sediment transport in the watershed and focusing narrowly on erosion source control as though the THP area were a typical hillslope setting rather than primarily "a flood prone area adjacent to the mainstem, South Fork, Wheatfield Fork, Little Pepperwood Creek and Buckeye Creek…subject to Anadromous Salmonid Protection Rules ("Dogwood" THP Sec. 2, p. 22). Erosion potential (release of fine sediment sources) is has high magnitude and is widespread on slopes, but it is relatively confined within the floodplain to narrow zones of channel bank erosion, avulsion, or meander zones), while sediment sink processes are negligible on slopes, and have high magnitude and are ubiquitous on floodplains.

The "Dogwood" THP may cause significant short-term and extensive reduction in floodplain vegetation roughness. Reduction in roughness would be caused by vegetation clearing, crushing or removal during timber falling and harvesting, due to vehicle and equipment operation in and beyond skid roads, and slash removal for equipment and vehicle access. Subsequent treatment of canopy gap vegetation (scrub and herbaceous species) by herbicides may further inhibit regeneration of vegetation roughness. Coarse woody debris and slash do not provide comparable surface area or friction as dense ground-layer floodplain perennial and shrub vegetation (sedge meadows, blackberry and huckleberry thickets, etc.) that regenerates or persists and expands each year. Herbicide application may also cause long-term significant reduction in floodplain surface roughness and associated sediment trapping capacity.

The "Dogwood" and "Apple" THPs provide only marginal scattered references to floodplain sediment trapping when the river "occasionally foods its banks" and "sediment is washed down…often drops out of suspension in this area", but they provide no actual analysis of either baseline sediment trapping (area, rates, magnitudes, cumulative sediment storage during THP cumulative impact history period) or THP effects.

Indirect impacts of reduced floodplain roughness and reduced fine sediment trapping capacity may include significantly higher turbidity (suspended sediment) of longer duration in both floodplain and channel habitats. This may significantly adversely affect foraging efficiency by salmonids during flood events in both floodplain and channel or pool habitats. This potential significant impact was not assessed the "Dogwood" THP.

**2.4. Salmonid ephemeral floodplain habitat impacts**. The THPs also fail to analyze impacts on highly significant floodplain foraging events by listed salmonid species during large frequent to moderately frequent flood events. Ephemeral submerged floodplain habitat – distinct from persistent submerged backwater (alcove, meander cut-off or oxbow lake habitat and mainstem channel pool habitats – are highly productive foraging habitats for salmonids and disproportionately contribute to their growth in California streams (Somers *et al.* 2001, 2005; Jeffres *et al.* 2008). Floodplain foraging by salmonids during submergence events is a highly significant ecological process contributing to growth and high probability of survival to reproductive size and age. Seasonal wetlands within floodplains are significant features of this floodplain ecosystem function. This year (2015), the Salmonid Restoration Federation hosted an entire session of scientific presentations called "Beyond the Thin Blue Line: Floodplain Processes, Habitat, and Importance to Salmonids", chaired by Brian Cluer of NOAA Fisheries, Santa Rosa. http://www.calsalmon.org/conferences/33rd-annual-salmonid-restoration-conference/beyond-thin-blue-line-floodplain-processes
The session emphasized the importance of floodplains to salmonid recovery, beyond limited potential for salmonid recovery through channel habitat enhancement alone (in contrast to past habitat emphasis on channel/pool large woody debris).

The Dogwood THP asserts without supporting evidence (Sec. 2 p. 27) that it would not affect "critical flood prone habitat" such as abandoned meanders, ox-bow lakes, or other off-channel salmonid habitats, claiming any such habitat would be protected by WLPZs.

This statement reflects the outdated scientific perspective (pre-2001) that only these persistently submerged floodplain habitats are "critical" to salmonids; it completely neglects the integrity and productivity of seasonal and perennial floodplain wetlands and terrestrial riparian habitats during ephemeral submergence events. But the THP fails to provide any objective criteria or survey methodology or maps of off-channel habitats to support this claim, just as it fails to provide any delineation of seasonal wetlands in the floodplain (strong indicators of critical flood prone habitat for salmonids, often corresponding with subtle topographic depressions).

The scientific understanding of the importance of floodplain submergence, and salmonid foraging and growth in Pacific Coast (and specifically California) stream ecosystems has grown significantly since Cafferata *et al.* 2005 was published, and was in fact only emerging in the scientific literature around 2001-2005 (e.g., Somers et al. 2001, 2005) when the CAL FIRE Riparian Protection Committee report on flood prone area protection was prepared. The Anadromous Salmonid Protection Rules are based in part on this extremely important ecosystem function.

The proposed "Dogwood" THP is likely to cause significant short-term disturbance (lasting at least one and probably several years after disturbance during the 5 year THP period) of reduction in soil invertebrate productivity in forested floodplain areas subject to timber harvest operations (vehicle and equipment operations that expose mineral subsurface soils and disturb organic-rich surface soil and litter horizons), reducing ephemeral prey availability to salmonids during brief but critically important floodplain submergence events. Therefore, CAL FIRE should consult with NOAA Fisheries, including those who contributed substantially to original salmonid floodplain research and its applications, to properly update and scientifically assess potential impacts of the proposed unprecedented modern large-scale floodplain timber harvest on the lower Gualala River. The THP analysis of these potential significant impacts is not merely inadequate, it is essentially omitted entirely.

The Dogwood THP should correct these basic flaws in analysis of potential significant impacts to floodplain and their salmonid habitat functions by incorporating revisions including:

- Adequate scientific analysis of existing and post-logging flood prone area vegetation roughness, delineating and quantifying (estimates of) Manning's roughness coefficient (n) for all 320 acres of the Dogwood THP flood prone areas, and estimating n for post-logging conditions through the next expected timber harvest cycle. This analysis should assess n with and without herbicide suppression of ground layer vegetation.
- Providing objective criteria and survey methodology for off-channel salmonid habitats in flood prone area, and maps showing their distribution and quantity. This should include flood submergence foraging areas with high potential invertebrate productivity.
- Technical consultation with NOAA Fisheries regarding floodplain impacts to ephemeral floodplain salmonid habitat, including potential for degradation of habitat resulting in "take" of coho salmon and steelhead.

**2.5. Water drafting indirect impacts within Anadromous Salmonid Protection flood-prone areas**

The "Dogwood" THP proposes both water drafting (25,000 gpd April-Nov) and disturbances (logging operations, skid road construction/reconstruction, crossings) in flood prone areas that comprise nearly the entire THP area. These activities are effectively prohibited by Anadromous Salmonid Protection Rules of the FPRs (Sec. 916.9). The THPs provides no explanation for the flat statement that "it is not feasible" to avoid water drafting in flood prone areas to comply with ASP rules (*e.g.* "Dogwood" THP Sec 2 p. 27). This arbitrary statement is contradicted by the "Apple" THP, which states that GRI has used magnesium chloride (bittern hygroscopic salts) as dust suppression and "may do so again" ("Apple THP Sec 3 p. 77). The "Dogwood" THP fails to explain why feasible hygroscopic dust suppressants are not used as an alternative to water drafting prohibited in flood prone areas by ASP rules. Similarly, the "Apple" THP reports that Sea Ranch pumps water from wells during high flows and stores them for dry-season use, avoiding dry-season water drafting and its impacts. But the "Dogwood" THP provides no analysis of comparable feasible alternatives, such as storing water pumped during high flows in high volume geotextile "bladders" (reportedly in widespread use in cannabis growing operations of the North Coast). The omission of dust suppressant alternatives and dry-season pumping and storage discussion in the most relevant (nearly all flood prone area) "Dogwood" THP, despite its inclusion in the "Apple" THPs, is arbitrary, and it precludes meaningful comment by the public unless both THPs are compared with extraordinary scrutiny.

The feasibility of drafting 25,000 gpd and also meeting the proposed bypass flow mitigation requirements during extreme drought conditions (significantly impaired, deficient summer base flows) is not analyzed in the THP, and is not analyzed in the supporting hydrology study (O'Connor 2010). The O'Connor report assumed an estimated 8.4 to 14.9 cfs low baseflow from 2006-2009 conditions (including wet 2006 year inflating average baseflow, contrasting with <4 cfs recent summer low drought conditions), and 4000-20,000 "typical" pumping rates (not proposed 25,000 gpd maximum in THPs). These assumptions make the 2010 O'Connor report conclusions invalid and inapplicable to the THP assessment of direct, indirect, and cumulative impacts to water quality, flows, pool stability, and cumulative impacts. Similarly, the THPs provide no quantitative analysis of cumulative impacts of water drafting by other GRI-leased operations (gravel mining at Twin Bridges/Valley Crossing confluence of Wheatfield and South Forks) and North Gualala Water Company diversions during deficient flows (< 4 cfs) of critical drought years that currently exist (baseline conditions) and are likely to occur again, potentially in the 5 year THP period. These cumulative and indirect impacts of water drafting on summer flows of the river and its tributaries may have significant impacts on water quality (temperature, dissolved oxygen, algal production), pool stability (rapid drawdown and pool bed emergence before monitoring feedback to drafting occurs) and juvenile salmonid survivorship. In addition, I have personally observed anomalously rapid and localized summer drawdown of channel pools exceeding 1 ft/wk at two reaches of the Gualala River South Fork and Wheatfield Fork near subsurface gravel intakes and upslope spring-fed wells, apparently associated with elevated

pool temperatures, concentration of salmonids at high densities, and elevated exposure of salmonids to terrestrial and avian predation. Therefore, I conclude that proposed 25,000 gpd water drafting during the low flow season may cause or contribute to significant indirect impacts to listed salmonids, potentially resulting in "take" of listed salmonid species. CAL FIRE and the THP applicant GRI should confer with the North Coast Regional Water Quality Control Board and NOAA fisheries to analyze these potential significant impacts and feasibility of proposed mitigation during extreme drought conditions. The proposed water drafting does not comply with FPR Anadromous Salmonid Protection Rules requiring avoidance of water drafting in flood prone areas. This non-compliance and physical and biological consequences of non-compliance are significant unmitigated impacts of the "Dogwood" and "Apple" THPs.

The THP must re-assess direct, indirect, and cumulative potential significant impacts of proposed water drafting based on baseline conditions relevant to the time of THP public circulation and foreseeable THP 5 year period, using scientifically sound assumptions, estimates, and analytic methods, as well as an accurate scope of analysis.

**3.0. Archaeological and cultural resources**

Neither the "Apple" nor "Dogwood" THPs disclose the potential significant impacts of timber harvest operations on the integrity of two Southern Pomo prehistoric village site described locations within the THP areas that were published in 1908 along with approximate (relative) map locations (Barrett 1908). The prehistoric (abandoned before historical period) village sites of Kubahmoi and Kabētēyo (original phonetic spelling in Barrett 1908, not modern) were located "…near south bank Rockpile creek at its confluence with Gualala River" and "…near east bank Gualala River about a mile and a quarter upstream from confluence of Rock Pile Creek…", respectively. These village sites were associated with two named camps, and were likely associated with trails, resource-specific processing sites, lithic scatter deposits, related to harvest of river resources, including some that may still exist, like mature or old-growth pepperwood (*Umbellularia californica*) nut-bearing trees. The THPs are not exempt from CEQA requirements regarding archaeological and cultural resource though the certified CEQA program of FPR because CEQA provisions for archaeological and cultural resources are not covered by the FPRs. The THPs, therefore, must at least disclose enough information regarding potential impacts to prehistoric Pomo village sites to enable meaningful public comment, particularly from affected tribal members of either Southern Pomo, Kashaya Pomo, or Central (Point Arena/Manchester) Pomo descent who may have meaningful cultural connections to these villages.

Potential adverse significant impacts to village sites and related archaeological resources may include ground surface disturbances that degrade or destroy (significant alteration) stratigraphic relationships, soil organic matter and mineral relationships to artifacts (dating integrity), fossil plant materials, relationships among artifacts, and artifacts themselves, and the cultural and archeological integrity of the village sites.

The THPs should be recirculated with enough non-confidential information about prehistoric village sites (previously published and publicly accessible for over 100 years) and their significance, to enable the interested public and descendants of affected Pomo villages/tribelets to provide meaningful comments. In addition, CAL FIRE should consult with Sonoma State University Anthropology Studies Center and tribal historic preservation officers of all affected tribes regarding appropriate archaeological surveys, significance criteria, and protection measures (mitigation) for these village sites.

**4.0. Alternatives**

The alternatives analysis for the "Dogwood" THP fails to assess whether remaining significant adverse impacts would occur from timber harvest within 320 acres of flood prone area subject to FPR Anadromous Salmonid Protection rules, because the THP fails to identify or assess potential significant impacts to wetlands, ephemeral salmonid floodplain habitat, special-status plant, fish, and wildlife species, and two Pomo village sites, and the corresponding mitigation sufficient to reduce those impacts to less-than-significant levels. This places the burden of avoiding or minimizing significant impacts entirely on the alternatives analysis, especially given that even the applicant acknowledges "unique potential impacts that would not also be typical impacts of other locations" due to location in floodplain (alluvial) location ("Dogwood" THP Sec. 3 p. 109). But the "Dogwood" THP fails to provide any objective or rational explanation why additional alternatives or mitigation would not be feasible to protect the "unique" flood prone redwood forest protected in principle by Anadromous Salmonid Protection Rules. Instead, the alternatives analysis simply disregards potential significant impacts along its with non-compliance with Anadromous Protection Rules, dismissing them with arbitrary and unsupported claims that alternatives are not feasible, and affirmations that the landowner is simply not willing to consider avoidance of timber harvest that it consider entitled to and inevitable in flood prone areas:

> Since alluvial flats comprise a high percentage of the landowners [sic] holdings and are the landowners most productive timberlands*, at some point harvesting will occur on these flats*…The only way to avoid the impacts would be to never harvest any of the alluvial flats, which the landowner is *not willing* to do.
>
> ("Dogwood" THP Sec. 3 p. 109; italics added for emphasis.)

First, this is not merely a case of failing to meet the burden of the alternatives analysis pursuant to 14 C.C. R Sections 897(a) and 898; it is apparently a contemptuous defiance of those requirements. The assumption that timber harvest is inevitable is unreasonable and inconsistent with the Anadromous Salmonid Protection Rules of the FPA. The applicant's unwillingness to avoid impacts are not reasonable and have no bearing on feasibility criteria for alternatives analysis. This evasion of the burden of an alternatives analysis is invalid and unacceptable in a THP, let alone CEQA-equivalent standards.

Second, the alternatives analysis fails to consider a "reduced project alternative" that minimizes ("substantially lessens") flood prone area timber harvest and impacts. One

reasonable reduced project alternative would entail reduced consolidated timber harvest on only the most landward, interior reaches of the floodplain/flood prone area, and avoidance of all seasonal and perennial wetlands. This is a facial reasonable alternative: it may be economically feasible while balancing public interest in compliance with ASP Rule compliance (and exceptions based on actual evidence and analysis rather than whim or will) with private landowner interest. It was not included in a reasonable range of alternatives, however. The THP considers only "the only way to avoid these impacts", and neglects entirely reasonable alternatives that reduce ("substantially lessen") these unique floodplain impacts.

Third, the alternatives analysis does not even justify with economic or environmental analysis the assertion that off-site alternatives on non-alluvial, non-flood prone lands would have similar impacts. But the alternatives consider only other alternative THP locations on "this type of holding" (other productive alluvial/flood prone area) rather than on other types of "holdings" (uplands) that would actually avoid "unique" impacts to flood prone areas, but provide equivalent timber volume. But the alternatives analysis evades this basic upland alternative analysis by unreasonably presuming that an alternative must also be in alluvial flats:

> The key question is analyzing alternative locations is whether any of the significant effects of the project would be avoided or substantially lessened by putting the project in another location…By harvesting elsewhere any potential impacts of this THP would not be avoided *altogether* but would be shifted to another location.
> ("Dogwood" THP Sec. 3 p. 109; italics added for emphasis.)

The alternatives analysis fails to analyze upland alternatives, and creates a straw-man alternative of equal significant impacts (evading both avoidance and minimzatino of impacts) by assuming that alternative sites would be in alluvial (flood prone) areas. This is an unreasonable assumption under FPR Anadromous Salmonid Protection rules *requiring* avoidance of flood prone areas, and it defeats the basic CEQA purpose of the alternative analysis.

The alternatives analysis is basically defective and fails to meet FPR and CEQA requirements; it is specifically inconsistent with ASP Rules and is generally prejudiced and unreasonably deferential to landowner interests and preferences over public interest factors. It must be wholly revised to include off-site upland alternatives and reduced project alternatives.

**5.0 Cumulative impacts**

The time-scale premise of the cumulative impacts analyses of the "Apple" and "Dogwood" THPs is the THP history within a 10 year period. This is an arbitrary cut-off for cumulative THP impacts in terms of duration (no objective justification is given for limiting THP analysis to 10 years, or its relationship to any timber harvest duration, past, present or future). It also fails to provide any actual evidence or analysis of cumulative impacts of other

physically related (sediment, water drafting, riparian vegetation disturbance) GRI projects within the same river reaches, such as gravel mining; the cumulative impacts discussion merely makes arbitrary conclusions that no significant cumulative impacts of gravel mining and timber harvest would occur, mostly by arguing (again without evidence or citation of scientifically sound analysis or literature) that gravel mining impacts are equivocal. The cumulative impacts analyses for both THPs fail to consider cumulative impacts of critical low-flow season water diversions from gravel mining, North Gualala Water Company, timber harvesting (both GRI and non-GRI THPs upstream, including MRC) within the THP period. The THPs also fail to consider cumulative impacts on low-flow conditions caused by upslope exploitation of baseflow supplies from springs and groundwater affected by unregulated wells in the watershed. These influences may cause significant cumulative impacts to low flow channel and pool water quality, pool stability (water levels) and flows, and associated salmonid and special-status wildlife species (foothill yellow legged frog, western pond turtle). The significance threshold for such impacts is also very low because of TMDLs (EPA Section 303 Clean Water Act listing) for the Gualala River's sediment and temperature impairments and FPR Anadromous Salmonid Habitat flood prone area protected status of the THP area and water drafting locations. The cumulative impacts discussion fails to provide any adequate evidence or analysis of cumulative significant impacts based on these factors and objective criteria.

**6.0 Conclusions**.

The "Apple" and "Dogwood" THPs contain significant errors of omission, biological fallacies, and inadequate or absent mitigation. These errors in THP analysis result in likely significant impacts to biological resources, including many special-status plant, wildlife, and fish species. The THPs lack basic biological survey data on which to base their conclusions of no effects or no significant impacts after mitigation. The "Dogwood" alternatives analysis provides only arbitrary, unreasonable arguments to reject consideration of feasible and reasonable alternatives that comply with the Anadromous Salmonid Protection Rules of the Forest Protection Act; as proposed, the "Dogwood" THP does not comply with the ASP Rules. The "Dogwood" THP fails to identify, analyze, avoid, or otherwise adequately mitigate potential significant impacts to flood prone areas protected under the ASP Rules. The proposed THP water drafting also fails to comply with ASP rules, and the THP conclusion that it would have "no effect" on river flows or special-status species is not supported by its own documentation; moreover, the reasons given for alternatives to water drafting are both unsound and incomplete.

The THPs should be withdrawn and resubmitted with necessary corrections, or the THPs should be denied.

Respectfully submitted,

Peter R. Baye, Ph.D.

Copies furnished:
Interested parties
NOAA Fisheries
California Department of Fish and Wildlife
Regional Water Quality Control Board – Region 1 (North Coast)

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ATTACHMENT

SUMMARY OF QUALIFICATIONS

Peter Baye has a Ph.D. from the Department of Plant Sciences, University of Western Ontario, London, Canada. His areas of scientific expertise include coastal ecology with emphasis on coastal plant and vegetation interactions with geomorphic processes, endangered species recovery planning, endangered species impact assessment and mitigation planning, wetland ecology, management and restoration, and ecology of coastal dunes, wetlands, beaches, lagoons, and streams. His regulatory expertise includes Clean Water Act, Endangered Species Act, NEPA and CEQA compliance (including EIR/S management and review) for federal and state agencies, both as a consultant for County, State, and Federal agencies, and as federal agency staff for USFWS and USACE. At the USACE San Francisco District, Peter was senior staff conducting complex environmental assessments for wetland impacts and mitigation, and for wetland restoration planning. At the USFWS Sacramento Field Office, Peter prepared and contributed to draft and final Endangered Species Recovery plans and Section 7 consultations. He also has served and currently serves on many scientific expert review and advisory panels for wetland, fluvial, and coastal habitat management and restoration plans for many organizations and agencies, including NOAA Fisheries, NOAA National Estuarine Research Reserve, USFWS, National Park Service, Sonoma Land Trust, Marin County, Sonoma County, California Coastal Commission, and the Aquatic Science Center/San Francisco Estuary Institute. He is the author of peer-reviewed scientific articles and academic book chapters on wetlands, and many single-author and multiple-author coastal habitat management, enhancement, and restoration plans over his 35 year professional career.