SECTION IV

Cumulative Impact Assessment

STATE OF CALIFORNIA BOARD OF FORESTRY
CUMULATIVE IMPACTS ASSESSMENT

(1) Do the assessment area(s) of resources that may be affected by the proposed project contain any past, present, or reasonably foreseeable probable future projects?

Yes X **No** ____

If the answer is yes, identify the project(s) and affected resource subject(s).

Past, present and future projects are described below within the specific assessment area discussions.

(2) Are there any continuing, significant adverse impacts from past land use activities that may add to the impacts of the proposed project?

Yes X **No** ____

If the answer is yes, identify the project(s) and affected resource subject(s).

Continuing significant adverse impacts from past land use activities are described below within the specific assessment area discussions.

(3) Will the proposed project as presented, in combination with past, present, and reasonable foreseeable probable future projects identified in items (1) and (2) above, have a reasonable potential to cause or add to significant cumulative impacts in any of the following resource subjects?

	Yes after mitigation (a)	No after mitigation (b)	No reasonably potential significant effects (c)
1. Watershed		X	
2. Soil Productivity		X	
3. Biological		X	
4. Recreation			X
5. Visual		X	
6. Traffic		X	
7. Greenhouse Gases (GHG)			X
8. Wildfire Risk and Hazard			X
9. Other (Trespass)		X	

a) Yes, means that potential significant adverse impacts are left after application of the forest practice rules and mitigations or alternatives proposed by the plan submitter.
b) No after mitigation means that any potential for the proposed timber operation to cause significant adverse impacts has been substantially reduced or avoided by mitigation measures or alternatives proposed in the THP and application of the forest practice rules.

c) No reasonable potential significant effects means that the operations proposed under the THP do not have a reasonable potential to join with the impacts of any other project to cause cumulative impacts.

CUMULATIVE IMPACTS ASSESSMENT

The cumulative impacts assessment is based on the methodology described in the Board of Forestry Technical Addendum #2, and allows for the analysis of the qualitative and quantitative observations arising during THP preparation. The RPF has incorporated into the plan, measures designed to mitigate potential adverse impacts to a level of insignificance. Mitigation measures are listed within specific items addressed in the plan. All mitigations listed in the plan are designed to substantially reduce or avoid reasonably potential significant adverse cumulative impacts. This analysis, along with mitigation measures in the THP and operational compliance with the THP and applicable Forest Practice Rules, supports the plan preparer's statement that the THP will not have a significant adverse impact on resources.

ASSESSMENT AREA DESCRIPTIONS

1. Watershed

The watershed assessment area (WAA) includes the following planning watershed(s):

Pocket Canyon is a CALWATER version 2.2 watershed (1114.110301) containing 4,232 acres. The proposed plan area encompasses 94 acres of the watershed which is approximately 2.2% of the planning watershed. The plan area and the planning watershed (which is the watershed assessment area (WAA) are portrayed on the Cumulative Impacts Assessment Area Map (CIAAM).

Hulbert Creek is a CALWATER version 2.2 watershed (1114.110302) containing 10,884 acres. The proposed plan area encompasses 70 acres of the watershed which is approximately 0.6% of the planning watershed. The plan area and the planning watershed (which is the watershed assessment area (WAA) are portrayed on the Cumulative Impacts Assessment Area Map (CIAAM).

Dutch Bill Creek is a CALWATER version 2.2 watershed (1114.110303) containing 12,624 acres. The proposed plan area encompasses 61 acres of the watershed which is approximately 0.5% of the planning watershed. The plan area and the planning watershed (which is the watershed assessment area (WAA) are both portrayed on the WAA and BAA map located in Section V of this THP.

Rationale:
This assessment area is consistent with the January 7, 1992 CDF recommended guidelines to RPFs which states: "The watershed assessment area for assessing cumulative watershed effects should be selected to include an area of manageable size (usually an order 3 or 4 watershed) relative to the THP that maximizes the opportunity to detect an impact".

2. Soil Productivity

The soil assessment areas are confined to the soils within the timber harvesting area.

Rationale:
Soils outside of this area are unlikely to be significantly impacted by operations. As a result, this best represents the area in which potential adverse impacts may be detected. Soils outside these areas should be left undamaged and untouched by this timber harvest.

3. Biological

The Biological Assessment area (BAA) comprises all the area within 0.7 miles of the plan boundary. The 3,150 acre BAA is portrayed on the WAA and BAA Map located in Section V of this THP.

Rationale:
Terrestrial plants and animals further away from the harvest area will be less affected by the disturbance than those within the plan area. Aquatic species downstream from the THP area may be affected by water temperatures and sedimentation moving downstream. In addition, this assessment area was chosen because it coincides with the survey area for the Northern Spotted Owl set forth in the Forest Practice Rules.

4. Recreational

The recreational resource assessment area includes the harvest area plus 300 feet surrounding the harvest area.

Rationale:
Technical Rule Addendum No. 2 Cumulative Impact Assessment.

5. Visual

Visual resource assessment area includes those areas within a three-mile radius of the harvest area from which significant numbers of the general public may view the proposed operation.

Rationale:
Technical Rule Addendum No. 2 Cumulative Impact Assessment.

6. Traffic

The traffic assessment area includes the first roads not part of the logging area on which logging traffic must travel and those roads commonly used by logging traffic.

Rationale:
The only roads that will be affected are those used by logging trucks and trucks hauling equipment to and from the operation. The roads include Mays Canyon Road and Neely Road (both county maintained roads), and California State Highway 116.

7. Greenhouse Gases (GHG):

The Climate Change Assessment Area is that area within the THP boundary and all roads located

outside the boundary that will be used as part of harvest operations on this THP.
Rationale:
While all carbon sequestration is limited to the plan area, this is true for most but not all emissions generated by the proposed project. Those emissions associated with the project but not created within the plan boundary, log delivery, and processing at the mill, are accounted for in the GHG Calculator.

8. Wildfire Risk Assessment:

The entire plan area and appurtenant roads are within a Very High Fire Severity Zone according to the Sonoma County Fire Hazard Severity Zone Map.

Rationale:
Modification to the vertical and horizontal distribution of forest fuels and the use of internal combustion tools or vehicles that can affect wildfire risk or hazard associated with the proposed timber operations is limited to the plan area. The assessment area outside the plan boundary is consistent with existing notification requirement distances. This allows for assessment of possible ignition sources and forest fuel loading not associated with the proposed project but could combine to produce a cumulative increase in wildfire risk and hazard.

9. Other: (Trespass)

The entire plan area has experienced trespass and illegal dumping for over 20 years. Trespassing and dumping are highly concentrated near county roads but is evident throughout the plan area.

Rationale:
The plan area is in close proximity to the downtown area of Guerneville, CA. This proximity to town has resulted in a large homeless community utilizing the area. The homeless encampments have raw sewage, fire pits, and excessive amounts of garbage.

10. Noise: The noise assessment area includes the area within 0.5 miles of the project boundary.

Rationale:
This is the greater of known distance for noise disturbance from timber operations for some listed wildlife species. For people, this distance should be equally acceptable.

1. WATERSHED ASSESSMENT AREA

Past, Present, and Future Activities

Past Activities:
The assessment area has a long history of human habitation. The main activities that have contributed to past adverse impacts of the Watershed Assessment Area are wildland burning, agriculture/grazing, rural subdivisions, road building, and timber harvesting. Logging practices occurring prior to the Forest Practice Act have impacted the entire Russian River watershed. Past logging practices consisted primarily of splash dam logging in the late 1800's, intensive railroad logging occurred in the 1920's in conjunction with downhill ground lead cable operations. Both practices contributed sediment into stream channels. Additional activities include power line maintenance, LWD removal, trespass and illegal crop cultivation.

Wildland Burning:
Early landowners appear to have burned the slopes periodically following the initial logging in an attempt to enhance livestock carrying capacity. The wildland burning, which occurred from before the turn of the century until the early 1950s, had a definite negative impact on the beneficial uses of water across the assessment area. Annual burning was conducted to increase the amount of grazing habitat and improve the quality of the grazing habitat. Burning during this period was also used in conjunction with clear cutting in the watershed assessment area. This burning reduced protective ground cover exposing large areas of soil to increased erosion potential. Conifer shade canopy along the watercourses of the assessment area must have been reduced as a result of repeated burning, thus leading to higher summer water temperatures. Reduced canopy levels across the timbered portions of the assessment area would have resulted in reduced water use by vegetation and a potential for increased peak flows.

The practice of broadcast control burning is still practiced within the watershed to a certain degree to control fuel loads and vegetative cover and for site preparation activities. Fires are usually set in early winter when burning conditions are suitable for low intensity-controlled burns. Wildland burning, however, is not conducted on the same scale as it was in the past and is not used to increase grazing habitat.

Agriculture/Grazing:
The watershed assessment area has a long history of agricultural use. Farming and livestock grazing were dominant uses in the past and continue today. Homesteads existed where permanent water, natural open areas and level ground allowed for subsistence farming. Commercial sheep grazing was the dominant land use on the project area and throughout much of the WAA until the 1960's. Predation by coyotes and other predators have made this an uneconomic land use. Past grazing by livestock resulted in the destruction of streamside vegetation and minor gully erosion along trails. These impacts will likely be limited as the amount of grazing has been diminished. Presently the agriculture activity near Guerneville, CA, is dominated by vineyard management.

Rural subdivisions:
The human population levels of the area have fluctuated in the past. Currently there are many residences located throughout the watershed mainly located on rural land and part of larger non-industrial landowners. Whenever there is human activity, there is potential for adverse effects on the environment. Human population growth affects all resources, either directly or indirectly, and increased pressure upon rural settings is a manifestation of those impacts. Accelerated erosion can occur from access roads and home sites. Chemical and biological pollutants can enter waterways

from septic systems, gardens and roads. The increasing human population reduces the inventory of productive soils and disrupts wildlife. It reduces wildland recreational opportunities and disrupts the visual resources. The county/state controls almost all land use activities with regulations designed to prevent significant adverse impacts.

Road Building:
Road building is associated with all of the other past land uses discussed here. The sedimentation of watercourses is perhaps the greatest past and continuing impact within the watershed and a major contributing factor to that would be the construction and use of forest and ranch roads. Several sources including the Handbook for Forest and Ranch Roads (Weaver, Weppner and Hagans, 2015) and the Klamath Resource Information System (KRIS) indicate that road failures can contribute both fine and course sediment to streams, and accumulated road failures in large storm events can have catastrophic effects, such as filling in pools and reducing habitat complexity. Studies cited within KRIS show that roads can contribute 50 to 80% of the sediment that enters streams and the amount of sediment delivered from forests with roads can be more than 300 times greater than from undisturbed forest land. Roads on ranch lands and those leading to rural and suburban parcels also contribute to sediment problems in a watershed. Surface erosion from roads can produce chronic sources of fine sediment, which can diminish salmon and steelhead spawning success. Roads constructed next to streams are chronic contributors of fine sediment, particularly if they are used in winter months. Winter logging on seasonal road exacerbates this problem because the truck wheels pump fines from within the roadbed to the surface. Fine sediment from roads that enters streams fills interstitial spaces in gravel streambeds, reducing survival of salmon and steelhead eggs and aquatic insects.

Road construction in the past was not regulated as it is now and resources such as the Handbook for Forest and Ranch Roads were not available to private landowners. State and county roads next to watercourses are there because of historic uses associated with livestock watering needs and gentle gradients. Roads for timber harvest were constructed within and next to streams and were commonly used during wet winter periods. The roads altered the drainage patterns of the watershed assessment area and proper watercourse crossings were not installed. Recognition of road and erosion problems in the Russian River basin has led to several road improvement and erosion control projects in recent years. There are however many small landowners that continue to use road systems during wet periods and who conduct little or no upgrades to their road systems.

Timber Harvesting:
Before the implementation of the Forest Practice Act of 1973, historic logging activities did not take into consideration erosion, mass wasting or the watercourse protection issues that forest harvesting focuses on today. Early timber harvesting and the manufacturing of split products across the assessment area caused significant increases in the watershed effects described below and the beneficial uses of water were significantly adversely affected by these activities. Roads and skid trails were constructed either directly in or adjacent to watercourses resulting in sedimentation of the watercourses and reduction of shade canopy. Large increases in large woody debris and increased sediment inputs resulted in the storage of large amounts of sediment. As the woody debris begins to decay, stored sediment is moving through the watershed. Furthermore, lack of adequate erosion control on skid trails, roads and watercourse crossings resulted in the deposition of large amounts of sediment and organic debris into the watercourse channels. Overall impacts from past timber management however, appear to have been beneficial. The lands remain forested with various levels of regeneration dependent upon location. Incidental adverse impacts to watershed resources are more likely associated with road maintenance or primary log transport using watercourses rather than harvesting per se.

More recently, timber harvesting operations have been conducted under the Z'berg Nejedly Forest Practices Act of 1973 and the rules of the Board of Forestry. Other agencies such as the Department of Fish and Wildlife and Water Quality are also a part of the review process for proposed timber operations throughout the State of California. The education of timber operators and the development of new technologies have led to the significant improvement in road building, timber harvesting, and erosion control. These practices have led to continuing improvements in protecting environmental resources. Some improvements in the practice of forest management are in the following:

- The protection of watercourses using buffer zones protect beneficial uses of water and wildlife that depend on moisture and clean running water. These buffer strips maintain cool stream temperature and provide biomass to those organisms that feed on plant materials that are an essential part of the food chain within aquatic communities.

- Harvesting methods include skyline cable yarding that keep tractors off steep slopes and prevent logs from skidding on topsoil, which increases the potential for soil loss and/or erosion. This helps protect watershed dynamics and sensitive geologic areas such as unstable soils and slopes.

- Wildlife monitoring and habitat identification is included in Timber Harvest Plans to help determine if federal or state listed endangered, threatened and/or species of special concern are located within the proposed harvest area. If such species exist mitigations are required to protect appropriate habitat types. Available resource inventories and databases are used to determine local habitat characteristics that help assess if the proposed harvest area is suitable habitat for any such listed species; (i.e., Stream Surveys from CDFW and USFWS, Higher Plants of California, California Native Plant Society, California Natural Diversity Database, USFWS Wildlife Habitat Relationship (WHR), etc.).

- A number of different harvesting prescriptions are used to create more diversity and watercourse protection that benefits stand dynamics and wildlife. Reforestation efforts are increasing to assure future inventory of harvest trees. Many small landowners and non-industrial timber lands are encouraged to increase that inventory of coniferous trees through such programs as the California Forest Improvement Program created by the Department of Forestry and Fire Protection.

- Erosion Control Plans requiring monitoring and maintenance have increased the quality of road maintenance and a reduction of discharge of sediments associated with road, landing and skid trail use.

These improvements have shown that a steady supply of forest products can be maintained while protecting forest resources.

A query of Calfire-GIS THP and NTMP/NTO data has indicated there have been several Timber Harvests (THPs and NTMPs with associated NTOs) within the assessment area during the past 10 years. See Past Projects Maps at the end of this section for an indication of silviculture, location within the watershed, and THP and NTMP number. All of the past THP projects on the ownership have been completed and meet stocking. Approximately 2% of the watershed assessment area has been operated within the last 10 years. The table below shows the 10-year harvest history within the WAA, separated out by THP/NTMP and silviculture.

Past and Present Timber Harvest Activity 2009 to 2019

THP: Silver Estates

CDFPWS Name: Hulbert Creek
CALWNUM: 1114.110302

THP Year	THP Number	Silviculture	Acres	PLS Description		
2010	1-10-117 SON	Selection	48	T8N	R10W	Sec. 19
2010	1-10-117 SON	Transition	29	T8N	R10W	Sec. 19

CDFPWS Name: Dutch Bill Creek
CALWNUM: 1114.110303

THP Year	THP Number	Silviculture	Acres	PLS Description		
2012	1-06NTMP-011 (NTO#1)	Transition	21	T7N	R10W	Sec. 5 & 8
2012	1-06NTMP-011 (NTO#1)	Group Selection	57	T7N	R10W	Sec. 7 & 8
2013	1-06NTMP-011 (NTO#2)	Group Selection	62	T7N	R10W	Sec 7, 8, & 17
2014	1-06NTMP-011 (NTO#3)	Group Selection	92	T7N	R10W	Sec. 8 & 17
2015	1-06NTMP-011 (NTO#4)	Group Selection	123	T7N	R10W	Sec. 7, 8, 16, 17, & 18
2016	1-06NTMP-011 (NTO#5)	Group Selection	135	T7N	R10W	Sec. 9 & 16
2017	1-06NTMP-011 (NTO#6)	Group Selection	113	T7N	R10W	Sec. 9 & 10
2018	1-06NTMP-011 (NTO#7)	Group Selection	269	T7N	R10W	Sec. 3, 4, 5, 8, 9, & 10
2018	1-06NTMP-011 (NTO#7)	Rehabilitation	46	T7N	R10W	Sec. 3, 4, 5, 8, 9, & 10
2017	1-17NTMP-006	Group Selection	195	T7N	R10W	Sec. 21 & 28

CDFPWS Name: Pocket Canyon
CALWNUM: 1114.110301

THP Year	THP Number	Silviculture	Acres	PLS Description		
2018	1-06NTMP-011 (NTO#7)	Group Selection	66	T7N	R10W	Sec. 3, 4, 5, & 10

*These acreages represent approximate plan acreages within the Watershed Assessment Area (WAA), and not total THP acreages. This information is supplied by CDF through their online database. The Ten Year Harvest History Map can be found at the end of Section IV of this THP.

Harvest documents have been filed on approximately 1,256 acres out of the 27,718-acre watershed assessment area within the past 10 years, or approximately 4.5% of the assessment area.

LWD Removal:
Stream clearance activities were initiated by the California Department of Fish and Game within the assessment area in the 1960's. Active removal of the logjams began in the late 1960s and continued into the 1980's. Current views of this activity are less favorable as it may be seen as resulting in a loss of large woody debris (LWD). Watershed resources would have been affected. In stream habitat was adversely affected and impacts continue presently.

Trespass:
Trespass leading to erosion control structure damage and failure may have the potential for adverse impacts. These trespasses continue despite gated access and private property postings. Off-road motorcycle access is particularly hard to limit and control. These trespasses have and will presumably continue to affect water quality, growing space, wildlife, and soil productivity. This particular property has an unusually high number of homeless encampments due to its proximity to the town of Guerneville, CA. These encampments are typically located adjacent to watercourses on relatively flat slopes. Both the Mays Canyon Road and Neely Road access gates are regularly

patrolled for trespassing. Excess garbage, illegal dumping, vandalism, and illegal campfires are common throughout the property, but heavily concentrated near county roads.

Illegal Crop Cultivation:
Illegal gardening activity has been found within the WAA in the past. There are likely more sites as they are rarely advertised and in fact typically placed off the beaten path. This act primarily occurs in close proximity to watercourses or wet areas. In some "garden" sites barrels containing concentrated fertilizers have been found located directly within watercourses. In the past, numerous rat traps have been found near abandoned gardens, as well as toxic substances used for rodent control. The potential effects of this act could be a reduction in the prey base of the Northern Spotted Owl and/or possible water contamination.

Present Activities:
There is no present timber harvesting activity. Road maintenance associated with county roads and state highways within the watershed assessment area are ongoing activities that contribute cumulative impacts to the watersheds. The plan area does include two spray fields utilized by the Sonoma County Water District to dispose of secondary treated municipal wastewater. Areas within the THP have been used as spray irrigation fields for Sonoma County since the 1970's.

Future Activities:
As described above, the main activities that have been conducted within the Watershed Assessment Area are road building, timber harvesting, vineyard construction and vineyard management, and to a lesser extent wildland burning, agriculture, rural subdivisions, trespass, and illegal crop cultivation. It is anticipated that these activities will continue into the future. Timber harvesting within the WAA is expected to occur over the next 5-year period on the land owned by the Burch Family. Harvesting systems will vary with the terrain. Silviculture will be vary based on current stand conditions, preferably systems which result in natural stand regeneration. THP acreage will vary depending on volumes per acre, but generally a viable plan on this ownership must average 2-3MMBF in order to cover road improvement, and forestry costs.

Road building is not expected to result in adverse impacts to the assessment area in the future as a majority of the assessment area is currently roaded and any new roads constructed will utilize proper planning, design and construction techniques. Road maintenance and repair will increase in the future as awareness of the impacts of roads are evaluated and landowners work to improve their roads.

The assessment area consists of both large private landowners, and small rural parcels. Typically, large private landowners manage timberlands or vineyards. These activities on the larger ownerships are expected to continue. These future activities will be conducted with the knowledge gained from past practices and will result in fewer adverse impacts and improved forest health and diversity.

Wildland burning is expected to be conducted in the future, to a certain degree, to control fuel loads and vegetative cover and for site preparation activities. The amount of burning conducted is expected to be minimal and should not result in any adverse impacts.

Livestock grazing and other agricultural uses are expected to continue at limited levels.

Large forested land holdings have been and will likely continue to be sub-divided. Rural residential development will continue to have impacts upon the management of large tracts of industrial and small private timberland.

Trespass and illegal marijuana crop cultivation will undoubtedly continue into the future without substantial changes to the current laws.

Spray irrigation by RRCSD is expected to continue into the future.

Beneficial Uses

The Pocket Canyon, Hulbert Creek, and Dutch Bill Creek planning watersheds drains into the Russian River, which drains into the Pacific Ocean. To retain that resource, the Burch family attempts to incorporate suitable mitigation measures where necessary to maintain stable, clear stream flows and cool water input . The beneficial uses of water within this watershed are:

- Municipal Water Supply*
- Agricultural Supply
- Industrial Service Supply
- Commercial and Sport Fishing
- Rec1 - Water Contact Recreation
- Rec2 - Non-Contact Recreation
- Cool Water Habitat
- Migration of Aquatic Organisms
- Wildlife Habitat
- Fish Migration – Anadromous
- Estuarine Habitat
- Aquaculture*

(*Potential beneficial use)

The beneficial uses of water within the WAA are detrimentally affected by increases in the following watershed effects:

- Sediment
- Water temperature
- Bacteria
- Dissolved oxygen content
- Organic debris
- Chemical contamination
- Peak flows.

The State Water Resources Control Board has listed over 300 water bodies within California as being water quality limited in accordance with the federal Clean Water Act section 303(d). Included in their listing is the Russian River. The Russian River is considered to be a Threatened and Impaired water body due to concerns of sedimentation and temperature. "Phased approach" TMDLs are being recommended for problems related to grazing, logging, road construction and maintenance, and other nonpoint source pollutants, where existing information may be inadequate to draw clear linkages between impacts and contributing factors. This phased approach allows the establishment of interim targets, implementation of needed controls and restoration actions, monitoring of water body response, and planning for TMDL revision in the future. The NCRWQCB lists the priority for TMDL development as High for sediment and temperature for the Russian River watershed. The TMDL Implementation Policy for Sediment Impaired

Receiving Waters in the North Coast Region was adopted by the North Coast Regional Water Quality Control Board in November 2004.

Sediment:
Sediment-induced cumulative watershed effects occur when earth materials transported by surface or mass wasting erosion enter a watercourse system at separate locations and are then combined at a downstream location to produce a change in water quality or channel condition. The Russian River is listed as impaired (303d list) for sediment. Increased sediment is primarily responsible for pool filling and gravel embeddedness resulting in a decrease in available habitat for spawning and rearing salmonids. Increased sediment also can contribute to increased temperature due to pool filling.

Within the project area logging conducted in the 1950s and 60s placed an enormous amount of sediment and large woody debris (LWD) within the watercourses. Much of the LWD was buried in the deposited sediment. The watercourses are now showing evidence of down cutting through the sediment and the buried LWD is emerging. Where the watercourses have cut through the sediment, over steepened banks exist. The sediment in the over steepened banks is being slowly released into the streams during high flow events.

A Certified Engineering Geologist (Timothy C Best) was retained to evaluate existing geologic and geomorphic features and to provide guidance with respect to the issue of slope stability and potential impacts related to the proposed timber harvesting operations. His recommendations are included in Section II and his report can be found in Section V.

The project has been designed to avoid initiating soil loss by minimizing the overall extent of bare mineral soil, employing erosion control techniques that focus upon dispersing water rather than concentrating it, directing flows away from at-risk areas and by maintaining an adequate buffer away from watercourses. Elements of the project erosion control plan are likely to minimize risk of sediment delivery. Watershed resources within the plan area are expected to be protected from sediment effects by current forest practice regulations, and by the proposed mitigation measures within the plan including the erosion control plan. The following beneficial measures will be incorporated into the plan to mitigate possible adverse effects:

Item #14 describes the silvicultural systems to be used to help mitigate sediment effects on watershed resources. The use of unevenaged silviculture will retain a high level of overstory and understory cover along WLPZ corridors and in upland areas adjacent to tributary streams and on steep slopes and landslide features. Expected high levels of post-harvest vegetative cover throughout the plan area will help to reduce the potential for deleterious amounts of sediment entering into watercourses in the form of excessive surface runoff and rain drop impact.

Item #16 describes the yarding methods to be employed during harvest operations. Use of cable yarding systems on steep slopes around watercourses will help limit the mobilization of sediment by limiting ground disturbance thanks to the full or partial suspension of logs.

Item #18 includes soil stabilization measures for logging roads, tractor roads, and WLPZs/ELZs/EEZs, with specific requirements for Anadromous Species Protection Special road use and maintenance provisions will be applied to wet weather conditions during the non-winter period; self-maintaining drainage features, such as rolling dips and out-sloping, will be used in appropriate places.

Item #23 includes numerous provisions that are proposed to minimize the mobilization of sediment

during the winter period.

Item #24/25 describes road treatments that will be implemented to reduce the potential for generation of sediment near watercourses. Required road rules have been applied to this plan and include specific requirements for Anadromous Species Protection. Road construction is proposed and offset by cable yarding areas previously logged by ground-based machines.

Item #38 addresses specific Active Erosion Sites / CEG Recommendations / Road Related Map Points / Watercourse Related Map Points that were identified during preparation of this THP. To summarize, the RPF believes the following will prevent sediment-induced cumulative watershed effects from management activities:

- Watercourse protection zones serve as filter strips around watercourses inhibiting sediment. Only light selection harvesting will occur within these zones.
- Road drainage will be improved.
- Watercourse crossings will be upgraded
- Root strength and transpiration provided by the healthy leave stand will contribute to slope stability.
- Steep slopes and sensitive areas that were once tractor logged will be cable yarded

Water Temperature:
The Russian River is listed as impaired (303d list) for water temperature. Water temperature can be the single most critical feature of habitat for salmonids and other aquatic organisms, and is relatively easy to monitor. California chinook salmon, coho salmon, steelhead trout and coastal cutthroat trout are all Pacific salmon species (genus Oncorhynchus), and all require cold water. Water temperature tolerance varies somewhat between species and also between life stages. Warm temperatures can reduce fecundity, decrease egg survival, retard growth of fry and smolts, reduce rearing densities, increase susceptibility to disease, decrease the ability of young salmon and trout to compete with other species for food and to avoid predation.

Two main factors affect water temperature: canopy cover and pool depth. California's Forest Practice Rules recognize the need to maintain riparian trees in order to provide direct shade and prevent elevation of water temperature. Sedimentation of streams may also contribute to elevated water temperatures. Sediment can fill pools and cause the width-to-depth ratio of a stream to increase, which can facilitate heat exchange.

The THP area contains Class I, II-L and II-S, III, and IV watercourses. Shade canopy along the Class I and II watercourses across the assessment area varies from as high as 100% to as low as 0%. Conifer retention standards within the WLPZs of Class I and II watercourses incorporated into this THP will ensure that adequate shade canopy is retained along these watercourses. All Class I WLPZ (0-100') for a confined channel watercourse, unevenaged adjacent, and have a core zone "No-Cut" from (0-30') and are SELECTION with 80% canopy retention from (30-100 or 150 feet depending on silviculture). As a result, all canopy will be retained within the Class I WLPZ core zone, and 80% canopy retained in the outer zone. Any trees felled for safety within the Class I WLPZ core zone shall be left in place and not yarded out of the WLPZ. A number of the Class II watercourses and all of the Class III streams on the plan area do not flow year-round, and are usually dry during the hottest months of the summer when the impacts from solar warmed water are most critical. Hardwoods shall not be harvested from within any WLPZ area unless incidental to conifer removal for safety reasons. Many of these hardwoods provide needed shade canopy during the summer months.

Cumulative road use within the WLPZ of the plan is minimal and overall is not a factor with thermal loading to the watercourses. WLPZ road use is limited to crossing approach, installation and removal.

As per 14 CCR 916.3(g), large woody debris and snags shall be recruited along Class I and Class II watercourses. To ensure a future supply of LWD and snags at least two living conifers per acre at least 16 inches diameter breast height and 50 feet tall within 50 feet of all Class I and Class II watercourses shall be retained.

Salvage logging will not occur within any WLPZ nor will salvaging of embedded LWD material within the stream channel or bank of any Class I or II watercourse or ELZ which is currently functioning to store or meter sediments or provides cover or habitat for fish or wildlife.

Organic Debris:
Organic debris in a watercourse can have either positive or negative effects depending on the size and stability of the material. Large woody debris is an important component of a healthy functioning watershed, while an excessive amount of small fine organic debris will have a negative impact.

The Department of Fish and Wildlife (DFW) engaged in stream clearance work for over 20 years. The amount of large wood which has been removed from the Russian River by stream clearance projects aimed at fish passage has not been quantified. According to Higgins (1997): "Numerous California Department of Fish and Game stream surveys in the 1960's and 1970's called for clearance of debris jams as well as riparian restoration. A great many stream clearance projects were carried out, while riparian recovery occurred mainly as a result of natural processes. Logjam removal was thought to benefit fish passage and continued until about 1985."

LWD provides in stream habitat for salmonid species as well as storage and metering of sediment within the stream itself. A lack of LWD in Class I waters has been identified as a limit on salmonid habitat function.

Increased amounts of organic debris as a result of proposed operations under this THP are not anticipated because of the following Forest Practice Rules and proposed management practices:

As per 14 CCR 916.3(b) Accidental depositions of soil or other debris in lakes or below the watercourse or lake transition line in waters classed I, II, and IV shall be removed immediately after the deposition or as approved by the Director.

As per 14 CCR 916.4(c)(3) Soil deposited during timber operations in a Class III watercourse other than at a temporary crossing shall be removed and debris deposited during timber operations shall be removed or stabilized before the conclusion of timber operations, or before October 15.

All temporary crossings of watercourses on the plan area will be removed as per 14 CCR 923..9(p), and any organic debris deposited in these watercourses will be removed or stabilized so as to prevent an increase in the organic debris content of these watercourses.

Non-commercial vegetation bordering and covering Class I, II and III watercourses and wet areas is to be retained except at crossings.

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Peak Flow Effects:
Increases in peak flow arising from land management projects generally are associated with rapid runoff resulting from decreased evapotranspiration due to vegetation removal. Peak flow has been shown to be directly associated with storm events rather than harvest levels. Studies on the Casper Creek Watershed in Jackson State Demonstration Forest failed to correlate higher peak flows with harvest levels. However, the duration of peak flows was correlated with harvest, as the percentage harvest of a watershed increased the timing and duration of peak flows also increased.

Adherence to Forest Practice Rules and provisions in the THP are designed to maximize tree retention near streams and subsequently the filtering capability of the forest near watercourses, while minimizing sediment deposition. Vegetation retention across the landscape shall reduce the possibility of extended peak flows as noted in the Jackson State study. Due to the level of selective harvesting in this watershed and the proposed THP there is not expected to be any measurable effect on peak flows associated with this harvest.

Watercourse Condition

In accordance with Section 303(d) of the Clean Water Act, the State of California periodically identifies waters where water quality standards are not being met. The Regional Water Board identified the Russian River as impaired due to elevated sedimentation and water temperature. It has been acknowledged that this proposed plan is occurring within a watershed with threatened or impaired values. The mitigation measures stated throughout the plan and specifically those stated in

Items 18 and 26 of Section II have been incorporated into the plan to address cumulative effects within the Watershed Assessment Area, Biological Assessment Area, and the other assessment areas.

Embeddedness and substrate
Excess fine sediment can cause gravels in the water body to become embedded (i.e., the fine sediment surrounds and packs-in against the gravels), which effectively cements them into the channel bottom. Embeddedness can prevent the spawning salmon from building their redds. The intrusion of fine sediment into gravel reduces intra-gravel flow of water by reducing permeability, which results in reduced rates of oxygen delivery to incubating embryos and removal of metabolic waste from the egg pocket. The volume of fine sediment in spawning substrates is thus an indirect measure of gravel conditions that affect survival to emergence, whereas permeability directly measures conditions affecting embryonic survival.

Embeddedness within the Russian River watershed and within and adjacent to the plan area is estimated as moderate to high . The dominant substrate in pool tailouts is gravel or small cobble.

Pools
Salmonids need a variety of habitat types such as pools, riffles and flatwaters to accommodate different life stage functions during their lifecycle. Pool habitats are required by most salmonids at one or more life stages. Provided that water quality is adequate, primary pools provide critical summer habitat for steelhead and coho salmon.

Pool habitats within the observed areas are comprised of mainly large woody debris from natural streamside processes. The Russian River Stream Habitat Metrics (casalmon.org) indicate a distribution of habitat as follows, 34.2% riffle, 53.6% flatwater, and 11.8% pools by channel length.

Mays Canyon Creek Stream Inventory Report shows habitat types for the reach of Mays Canyon Creek associated with the plan area as follows, 0.4% pools, 0.3% riffles, 0.2% culverts, 11.4% flatwater, 68.1% dry, and No-survey (marsh) 19.5% by channel length (Mays Canyon Creek Stream Inventory Report, 1998).

Stream Aggradation:
As described above, the Russian River and its tributaries have been identified in accordance with Section 303(d) of the Clean Water Act as impaired due to elevated sedimentation. As a result of this elevated sedimentation, or as an example of it, stream aggradation is evident throughout the watershed.

Spawning gravels are impacted by the delivery of fine and coarse sediment to the stream which causes aggradation, the burial of large woody debris and other structural elements, a loss of the stream's ability to effectively sort gravel, and a potential reduction in the dominant particle sizes.

A moderate to high level of aggradation has occurred within the streams adjacent to the project area. These streams generally have gentle gradients and are therefore more susceptible to aggradation. The streams adjacent to the plan that have higher gradients show less aggradation, as these streams are more capable of flushing the sediment downstream.

Bank cutting/Down cutting:
Bank cutting is indicated by areas of fresh, un-vegetated soil or alluvium exposed along the stream banks, usually above the low-flow channel and often with a vertical or undercut face. Severe bank cutting is often associated with channels that are down cutting, which can lead to over-steepened

banks. As described above, high levels of sedimentation within the watershed has lead to or is evidenced by stream aggradation. Also described above, is the fact that more recently, sedimentation levels have been decreasing and the watercourses are now flushing the sediment downstream and are down cutting through the stored sediment.

Throughout the watershed and the plan area there are areas where down cutting is evident Many watercourse banks are not well armored and composed of soft sandstone parent material. Channel deflections are a result of both landslide processes and undermined trees that have been recruited into the channel. Crossing replacement and repair proposed on THP roads where culvert cannot be installed to natural grade, will use rock at outlets keyed in to ensure downcutting does not occur. This plan does not propose any significant upslope operations to increase peak discharge or alter the amount of large woody debris to impact the natural flow of a channel.

Bank mass wasting:
The Russian River system and surrounding topography evolved in response to rapid geologic changes along the west coast of North America over the past 30 million years, and especially in the last five million years. The drainage networks evolved along with the changing landscape. The drainage network of the Russian River is bedrock controlled and records the major geologic changes that took place. The landscape continues to change, most notably by mass wasting. Mass wasting and erosion affect fluvial geomorphic conditions, which in turn affect aquatic habitat conditions.

The causes of mass wasting are varied. A large percentage of mass wasting is a result of natural geologic processes. Grazing cattle and sheep on unstable grasslands and timber harvesting on unstable soils can also result in mass wasting. CDFs studies of the implementation and effectiveness of the Forest Practice Rules indicate that mass wasting failures associated with current timber operations have been mostly related to roads. Roads produced the highest sediment delivery to watercourse channels when compared to other erosion processes (MSG 1999). The majority of the road related mass failures were associated with fill slope problems, indicating that proper road construction techniques are critical for protecting instream resources.

See the CEG's Report located in Section V for specific mass wasting locations, descriptions, and operational recommendations on the plan area for operations on unstable areas.

Scouring:
Scouring is described in the Forest Practice Rules as "Stream channels that have been stripped of gravel and finer bed materials by large flow events or debris torrents. Streamside vegetation has often been swept away, and the channel has a raw, eroded appearance." Large flow events are described below under the discussion of flooding. These flood events resulted in the scouring of some small portions of streams within the assessment area, however because of the significant amount of gravel and finer bed materials within the watercourses in the assessment area these materials remained in most areas. Very few channels in the assessment area exhibit a raw, eroded appearance and the level of scouring should be considered low.

Organic Debris:
Debris in the watercourse can have either a positive or negative impact depending on the amount and stability of the material. Some stable organic debris present in the watercourse helps to form pools and retard sediment transport and downcutting in small to medium sized streams with relatively steep gradients. Large accumulations of organic debris can block fish passage, block or divert streamflow, or could be released as a debris flow.

Large trees that fall into coastal streams play a dominant role in forming pools, metering sediment, trapping spawning gravels and creating a more complex stream environment. Redwoods are particularly valuable because a large tree may not decay for several hundred years (Kelly et al., 1995). Fir and spruce trees last for several decades while alder and hardwood species rot within a few years of being recruited into the stream (Cedarholm et al., 1997). In general, the larger the size of the woody debris the greater its stability in the stream channel. Heavier pieces require higher flows for mobilization and longer pieces are more likely to be caught by the stream bank and its vegetation. Reeves et al. (1993) found "that wood is a primary element influencing habitat diversity and complexity in streams. Consequences of decreased amounts of wood include loss of cover and structural complexity, decreased availability and abundance of habitat units, and reduced varieties of current velocities and other hydraulic features."

This plan as proposed and implemented should not reduce the amount of organic input to the Class I and II streams.

Please also see the discussion of organic debris effects above.

Streamside Vegetation:
Stream-side vegetation and near-stream vegetation provide shade or cover to the stream, which may have an impact on water temperature, and provides root systems that stabilize stream banks and floodplains and filter sediment from flood flows. Root systems of terrestrial vegetation provide a natural stabilizing factor of streamside banks in addition to providing terrestrial insect drop (i.e. fish food) and nutrients in the form of leaf litter and organic material. Leaf litter, organic material and their associated nutrients are known to be utilized as a food source by benthic macro-invertebrates, which in turn are a major food source of fish. Terrestrial vegetative bank protection is very substantial in the form of large conifers, hardwoods, sedges, grasses, ferns, and various berries in this watershed.

Peak Flows
The assessment area has a maritime climate with long duration, low intensity storms commonly occurring from October to April. Most storms are small with rates exceeding one centimeter per day with an average of about thirty days per year. Larger storms occasionally occur with rates exceeding five centimeters per day about two to four days per year.
Peak flows may be increased when subsurface flows are diverted by compacted soils on roads and tractor trails reducing the time required for water to reach streams. Peak flows are not expected to be increased as a result of this operation. This plan proposes to reduce peak flows as a result of operations with a combination of Forest Practice Rules, Best Management Practices and the following proposed management practices:

- Tractor operations limited to existing skid trails when feasible
- Exposure of significant areas of soil or reduction of large amounts of vegetation will not occur on large areas.
- Slash remaining from operations and or standing vegetation will remain on-site to lessen raindrop impact.
- Silviculture prescription with specific marking requirements will not result in large exposed areas
- Large areas of exposed ground will not occur due to low amounts of repetitive skid trail use and no prescribed burning.

- Existing, well established mainline roads used for repetitive hauling are concentrated on the ridges away from watercourses when feasible.
- Minimal use of WLPZ roads with mulching requirements as stated in Section II, Item 18.

Finding: This plan is not likely to adversely affect existing watershed conditions within the WAA due to the silvicultural systems employed where a significant amount of standing trees will remain with portions of the plan area, the soil erosion protection measures, adherence to the ASP rules, the design of the log skidding, landing and road system, and the seasonal restrictions on operations. Over time it will provide for enhanced diversity in forest structural development by concentrating growth on the larger trees, trees that will extend a shaded canopy over the watercourse to a greater extent and be in a more favorable position to contribute LWD to the watercourse channel.

2. SOIL PRODUCTIVITY ASSESSMENT AREA

The assessment area for the impact to soil is the proposed plan area. A skid trail system and road system will access the timber with limited soil disturbance and loss of potential soil productivity.

The logging roads and tractor road networks are generally in good condition. Modern cable logging will be utilized on portions of the THP area. Any slash deposited from operations will provide protection to surface areas from raindrop impact and will also act as a nutrient reservoir. Proper treatment of landing sites and roads according to the THP and Forest Practice Rules will provide the necessary protection of soil resources.

Past Activities:
The plan area has a long history of agricultural use by humans. Portions of the plan area were harvested before the Forest Practice Act. The last major harvests took place in the early 2000's using tractor and cable yarding methods. Since that time, the property has been used primarily for recreation and agricultural uses. The plan area also includes two spray fields utilized by the Sonoma County Water District to dispose of secondary treated municipal wastewater. Areas within the THP have been used as spray irrigation fields for Sonoma County since the 1970's.

Future Activities:
There are no known future projects planned within the Soil Productivity Assessment area within the next ten-year period. Road maintenance will be an ongoing future activity within the project area. Spray irrigation is expected to continue within the plan area.

Cumulative soil productivity impacts occur when the effects of two or more activities, from the same or different projects, combine to produce a significant decrease in soil biomass production potential. These impacts most often occur on-site within the project boundary, and the relative severity of productivity losses for a given level of impact generally increases as site quality declines. The primary factors influencing soil productivity that can be affected by timber operations include; **organic matter loss, surface soil loss, soil compaction,** and **growing space loss.**

Organic Matter Loss:
Significant losses of organic matter can result in long-term loss of soil productivity. Loss of organic matter will expose topsoil to erosion, which along with duff, litter layer and woody debris provides the source of nutrients for future forest growth. Organic matter loss can occur by displacement of surface organic materials during skidding, mechanical site preparation, and other land disturbing activities and from erosion, burning, or oxidation of exposed fine organic material. Soil productivity is affected by the loss of nutrients stored in organic matter, surface exposure that results in higher temperatures and increased evaporation during the dry season, and reductions in soil porosity from loss of soil organic matter. Because this THP proposes to remove forest products from the assessment area using logging methods that will disturb soil, moderate organic matter loss will occur.

Minimizing the amount of disturbed soil is the most effective method of limiting organic matter loss. Retention of trees on unstable areas and in riparian zones leaves large areas of the assessment area with canopy cover. This protects organic matter loss through inception of rainfall and over time ads to the organic matter layer. In coastal lands where this THP is proposed, organic layer loss is a short-term condition, as rapid plant growth following harvest leads to quick replenishment of the organic layer when displaced. This is particularly notable following controlled burning, where rapid vegetation growth is spurred by sunlight exposure and availability of fire-released nutrients previously stored in debris.

Finding: A temporary organic matter loss is expected to occur overall, while the proposed harvesting activities are expected to result in a temporary increase in organic matter at the soil surface. Replacement through regrowth is expected to prevent a significant or cumulative adverse effect. Measures contained in the THP that help reduce organic matter losses are as follows:

- Use of existing road as much as possible to minimize new road construction
- No ground based equipment yarding when soils are saturated
- Mechanical site preparation, if deemed necessary, will favor brush crushing methods that keep organic matter on-site while reducing erosion potential of the soil
- Downed woody debris will be retained post-harvest within the THP area
- Use of pre-existing tractor roads
- Cable yarding areas that were formerly tractor logged, thus reducing soil displacement

These measures will help ensure the long-term soil fertility, provide for soil moisture conservation and support soil microorganisms that are critical in the nutrient cycling and uptake process. Such measures will enable the area to continue to grow healthy, productive trees. No significant adverse impact to organic matter is expected to occur in relation to this project.

Surface Soil Loss:
Topsoil is the major storehouse of nutrients that provide current and future site fertility. Displacement or loss of topsoil can have an immediate and log-term negative effect on an area to grow trees and plants, which may not be readily measurable. Soil loss occurs from mechanical displacement (scalping) during road construction, harvesting, or site preparation and by surface erosion or mass wasting on harvest units. Removing the surface soil has a disproportionate effect on soil productivity because the upper layers of soil are the storehouse of organic matter and nutrients that have accumulated from decomposing plant materials and atmospheric sources. Loss of soil by surface erosion from harvesting units is generally small for timber operations conducted under current Forest Practice Rules, and mass wasting (above background rates) from timber operations is prevented by identifying and placing limits on operations in unstable areas.

Surface soil loss may occur as a result of road and landing construction, skid trail construction, displacement into piles or windrows or mass wasting, and burning. Road and landing construction constitutes a small percentage of the THP area and are, therefore, not likely to cause a significant reduction in soil productivity. Skid trial construction also affects only a small portion of the plan, and will cause a minimal impact to soil productivity. Displacement of surface soils during slash piling or windrowing affects only a portion of the topsoil, and is done on a very small percentage of the plan area. This activity will, therefore, cause a minimal impact to soil productivity.

Finding: Within the proposed THP areas, surface erosion due to harvesting activities is expected to be minimal. Proper road drainage and erosion control facilities will help mitigate the problem by lowering the erosion potential on associated roads. The THP proposes a minimal amount of new road construction. No ground-based yarding will occur during periods when soils are saturated. Further mitigation that will reduce the occurrence of surface erosion is as follows:
- Cable yarding within areas that were previously tractor logged
- Soil stabilization where required as outlined in Section II, Item #18
- Minimal new road construction
- The use of tractor yarding will be limited to existing, stable skid trails within the THP area

As described above, this low level of impact will help maintain the integrity of the organic matter and upper

few inches of soil. It will also protect soil fertility and moisture conservation and protect the microorganisms that are critical in nutrient cycling. No significant loss of surface soil is anticipated due to this project.

Soil Compaction:
Highly compacted soils inhibit plant growth for a variety of reasons, and can cause increased surface water runoff resulting in erosion. Soil compaction in timberlands is typically caused by heavy equipment running repeatedly over soils that are partially saturated. Heavy equipment operations will primarily be conducted, pursuant to the FPR's, during the dry summer season.

Finding: The exclusion of ground-based equipment usage during the winter period will significantly minimize the excessive compaction of saturated soils. Use of cable yarding operations within larger portions of the plan area shall reduce soil compaction. Limitations to tractor operations will also reduce soil compaction. By doing this, the level of soil compaction will be kept minimal and the general character of the soil will not be degraded. No significant adverse impacts related to soil compaction are expected to occur as a result of operations associated with this THP.

Growing Space Loss:
Potential losses to growing space would primarily result from new road, landing, skid trial construction, and/or mass wasting events. The roads to be construction include maximum width specifications which will reduce the amount of road construction and ensure that no unnecessary land be taken out of production.

Finding: Growing space will improve after implementation of the proposed project. There will most likely be a gain in growing space by non-use of skid trails located in the proposed cable operating area. These tractor roads used during the previous harvest entries have revegetated between harvest entries. As such, there will be a net gain of growing space associated with this plan.

The Caspar Creek watershed study provides an example of how practices related to growing space have improved over the past two to three decades. When the South Fork was logged selectively with crawler tractors from 1971 to 1973, approximately 15% of the watershed was compacted through the creation of roads, skid trails, and landings. When the North Fork was logged from 1985 through 1991, only about 3% of the basin was found to be compacted by creating new roads, skid trials, and landings. Since practices have continued to improve, this level of impact to growing space can be anticipated to continue at the 1985 through 1991 level or decline even further.

No significant adverse impacts related to growing space loss are expected to occur as a result of operations associated with this THP.

Soil productivity impacts tend to occur when operations are conducted without regard for minimizing effects on soil resources. This operation will limit effects by operating under the BMP's of the Forest Practice Rules to minimize organic matter, surface soil, soil compaction and growing space losses. Based on the above information, no significant adverse cumulative effect associated with soil productivity is anticipated with this plan.

3. BIOLOGICAL RESOURCES ASSESSMENT AREA

Additional Page
6-2-2020

The Biological Assessment area (BAA) comprises all areas within 0.7 miles of the THP boundaries. The 3,150 acre BAA is portrayed on the WAA and BAA Maps. A broad array of habitat is encountered across the biological assessment area. This assessment area as described is large enough to account for any effects that may be caused by this THP.

Past Projects:

Past projects within this assessment area are similar to those discussed within the watershed assessment section above. Past timber harvesting has had a role in the condition of the assessment area with 1 THP and 5 NTMP/NTOs operated in the watershed assessment area within the past 10 years. In terms of past timber harvesting within the Biological Assessment Area, of the 6 aforementioned THP/NTMP/NTOs, 1 NTMP (2 associated NTOs) fall within the BAA. The Bohemian Grove is a neighboring property with an active NTMP. The Bohemian grove actively harvest timber from their NTMP area. These harvests are light selection harvests that happen approximately every other year. Approximately 257 acres of the 3,150 acre BAA has seen timber harvest activity within the last 10 years, representing ~12% of the assessment area.

Past and Present Timber Harvest Activity 2009 to 2019

THP: Silver Estates

Biological Assessment Area Harvest History

THP Year	THP Number	Silviculture	Acres	PLS Description		
2012	1-06NTMP-011 (NTO#1)	Transition	20	T7N	R10W	Sec. 5 & 8
2012	1-06NTMP-011 (NTO#1)	Group Selection	12	T7N	R10W	Sec. 4, 5, 8, & 9
2013	1-06NTMP-011 (NTO#2)	Group Selection	14	T7N	R10W	Sec. 7 & 8
2014	1-06NTMP-011 (NTO#3)	Group Selection	18	T7N	R10W	Sec. 7 & 8
2018	1-06NTMP-011 (NTO#7)	Rehabilitation	23	T7N	R10W	Sec. 4 & 5
2018	1-06NTMP-011 (NTO#7)	Group Selection	170	T7N	R10W	Sec. 4, 5, 8, & 9

Present Activities:

There is no present timber harvesting activity that the RPF is aware of. Recreational, agricultural, and rural residential activities are continuing, contributing cumulative effects to the BAA. Ongoing road maintenance associated with county and state highways will have minor cumulative effects.

Future Activities:

Timber harvesting and recreating has been the primary historic activity within the BAA and is expected to continue. Grazing activities will continue within the assessment area but probably at a lesser rate than what occurred in the past. Increased levels of rural residential and agricultural development are expected to occur in the assessment area in the future.

Biological Resources:

The biological resources are the plants, vertebrate, and invertebrate species that inhabit the Biological Assessment Area during all or part of the year. Species of concern are those identified as known Rare, Threatened or Endangered listed (US & CA) species and Sensitive Species (BOF). The Natural Diversity Data Base (NDDB) of the California Department of Fish and Wildlife (DFW), California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California, the California Wildlife Habitat Relationships System (WHR) and various wildlife biologists were consulted for occurrences of special plants, animals and natural communities on the biological assessment area. While the BAA is comprised of the area within 1.3 miles of the THP, nine adjacent USGS quadrangles were assessed for plant and animal occurrences. The nine quadrangles include:

Fort Ross, Cazadero, Guerneville, Duncans Mills, Camp Meeker, Sebastopol, Bodega Head, Valley Ford, and Two Rock.

The following is a description of Sensitive, Rare, Threatened and Endangered species which have acceptable habitat within the Biological Assessment area and which may occur within the nine adjacent quadrangles described above.

Birds

Northern Spotted Owl (*Strix occidentalis caurina*): (Status: Federal Threatened, CDF Sensitive Species)
Uses mature forest with permanent water and suitable nesting trees or snags. Prefer narrow, steep canyons with north-facing slopes. Prey mostly on small mammals. Nests in trees, snag cavities, or broken tops of large trees. Abandoned raven or raptor nests are also utilized. It typically inhabits dense, old growth, multi-layered mixed conifer, redwood and Douglas-fir forests in narrow, steep-sided canyons with north-facing slopes. A water source in close proximity to the nest site and roost site are believed to be required. The primary prey of the spotted owl is the wood rat, although flying squirrels, mice, voles and rabbits are also taken. Small birds, bats and arthropods are also consumed. Hunting is usually done by swooping onto prey from a perch or pouncing on prey in vegetation or on the ground. Excess food may be cached. Mature, multi-layered forests are thought to be required for breeding. Breeding occurs from early March through June with peak activity in April and May. A pair may use the same breeding site for 5 to 10 years, although they may not breed every year. The spotted owl is very sensitive to habitat destruction and fragmentation. The barred owl is becoming a significant threat by taking over habitat and displacing the spotted owl.

A query of the NSO database revealed 1 activity center within 0.7 miles of the plan boundary (SON0076). In accordance with 14 CCR 919.9, the THP and adjacent areas shall be surveyed for the presence of the NSO prior to operations. A letter of technical assistance from the U.S. Fish and Wildlife Service shall be provided prior to the start of operations. NSO protection measures are described in Section II, Item #32 with supporting documents in Section V.

The proposed "Silver Estates THP" operations are not likely to cause any significant impacts to the assessment areas. The overall NSO habitat quality is high, consisting of large diameter mixed conifer-hardwood habitat. The quantity is somewhat limited by the extensive amount of residential area within the assessment area.

The proposed silviculture methods are not expected to change the overall structure or composition of the existing NSO habitat enough to result in the loss or degradation of the available habitat. Within the NSO Territory assessment area, a sufficient amount of functional habitat currently exists and will remain upon the completion of the proposed operations.

The 'NSO Habitat & Operational Protection Measures' have been provided to protect the NSO from any potential impacts that may result from timber harvest operations. Timber operations are not proposed within 1,000 feet of the 1 known Activity Center, SON0076. No operations are expected within the Limited Operating Period for SON0076.

Provided current protocol surveys are completed and the 'NSO Habitat & Operational Protection Measures' are implemented, the proposed operations of the "Silver Estates THP" are not likely to cause any significant cumulative impacts to the northern spotted owl.

Marbled Murrelet (*Brachyramphus maramoratus*): (Status: Federal Threatened, State

Endangered, Board of Forestry Sensitive Species)
The Marbled Murrelet ranges from the Aleutian Archipelago and the eastern Bering Sea in Alaska to Monterey Bay in California. Off the California coast, Marbled Murrelets are concentrated in two areas at sea that correspond to the three largest remaining blocks of older, coastal forest. These forest blocks are separated by areas of little or no habitat, which correspond to locations at sea where few Marbled Murrelets are found. A 300-mile gap occurs in the southern portion of the Marbled Murrelet's breeding range, between Humboldt and Del Norte Counties in the north and San Mateo and Santa Cruz Counties in the south. Marbled Murrelets are diving seabirds that feed on a wide variety of small fish and invertebrates in near-shore marine waters (generally within one mile of the shore). They are generally opportunistic feeders and can exhibit major changes in prey consumption in response to changes in the marine environment. Nesting birds carry one prey item to the nest at a time to feed their young. Marbled Murrelets produce one egg per nest. Nests are not built, but rather the egg is placed in a small depression or cup in moss or other debris on the limb. Nests are typically in mature, old growth Douglas-fir and redwood trees. Habitat nesting variables include number of platforms (>7"diameter) per acre, number of trees with platforms, moss depth, percentage of moss on limb, percentage of vertical and horizontal cover over the platform, position on slope, flight accessibility, and distance to coast.

The project area is located approximately 7 air miles from the coast in an area with warm and dry conditions on the southern end of the redwood timber belt of the north coast. Meyer and Miller (2002) found murrelets generally occupied low-elevation inland sites with relatively low fragmentation of old-growth forest patches that were close to the coast and productive marine environments (bays, river mouths). Nearly all occupied areas occurred in the fog-induced vegetation zone.

Nesting habitat suitable for this species is not present within the harvest area. The RPF observed some individual trees which displayed suitable platforms but are isolated and lack cover-canopy due to the past harvests which have occurred on the plan area. Subsequently, they were not considered suitable murrelet nesting habitat due to artificial exposure to wind and solar radiation.

Habitat for this species is present just outside the BAA in portions of the late seral stands of the Bohemian Grove and the Northwood Golf Course. Bohemian Grove is located approximately 0.4 air miles south of the plan area along The Russian River and up Smith Creek. The Northwood Golf Course is located approximately 0.1 miles south of the plan area.

No murrelets or signs of murrelet presence were observed during plan preparation. Any observations of the murrelet during harvesting operations will be reported to CDF&W and operations within the immediate area will stop until further notice from CDF&W. Following operations all existing potential suitable habitat will remain within the assessment area.

Northern Goshawk (*Accipiter gentilis*): (Status: Board of Forestry Sensitive Species and Department of Fish and Game Species of Special Concern.)
The goshawk preys mainly upon other bird species such as band tailed pigeons, quail, jays, woodpeckers, flickers, robins, etc. and occasionally preys upon rabbits, squirrels, and chipmunks. The goshawk is a pursuit predator that does most of its hunting in mature forests. Forest understories hamper goshawk hunting success by lessening the goshawk's ability to visually scan for prey, restricting flight access during prey pursuit, and providing cover for prey to escape. Goshawk nesting habitat is also usually in well-developed forest with a sparse understory. Nest trees are usually greater than 12 inches in diameter and nest are generally built below the canopy in the fork of a large branch.

The Northern Goshawk could potentially utilize the habitat within and surrounding the project area and should following operations; however no Northern Goshawks were detected during plan preparation or during wildlife surveys. If a nest tree is discovered during operations it will be protected as per 14 CCR 919.2 and the Department of Fish and Wildlife will be consulted. The preferred habitat of this species (densely forested habitats with openings in close proximity) will remain on the plan area and within the BAA following operations; therefore the proposed project is not expected have an adverse impact on this species.

Cooper's Hawk *(Accipiter cooperii)*: (Status: California Species of Special Concern)
Preferred habitat consists of wooded areas that occur in patches within close proximity to water. Dense stands with moderate crown depths are utilized for nesting. Nesting usually occurs in second-growth conifer stands near streams. Hunting consists of explosive flights from perches or harrier-style low, gliding flight, using trees and terrain for concealment. Feed mostly on small birds, mammals, reptiles and amphibians. Cover is utilized to approach and attack prey. Breeding occurs March through August with peak activity in May, June and July. Incubation lasts between 35 and 65 days. Annual fledging success is (about) 2 young per pair. Widely distributed breeding species. Nests in live trees with good cover on a stick platform nest, lined with bark.

No Cooper's hawks or sign of Cooper's hawks were found during fieldwork on this plan. If a nest tree is discovered during operations it will be protected as per 14 CCR 919.2 and the Department of Fish and Wildlife will be consulted. The preferred habitat of this species (wooded areas that occur in patches within close proximity to water) will remain on the plan area and within the BAA following operations, therefore the proposed project is not expected have an adverse impact to this species.

Sharp-shinned hawk (*Accipiter striatus*): (Status: California Species of Special Concern) Forested habitats with openings in close proximity are the preferred nesting and cover environment. Dense, even-aged, single-layered stands of timber provide the ideal nesting habitat. A water source is usually within 300 feet of the nest. Birds are the primary prey of the sharp-shinned hawk, mostly birds smaller than jays. Small mammals, reptiles, insects and amphibians are also consumed. Hunting consists of sudden flight from perch sites, although the low, sweeping flight of the harrier is also utilized. Openings at the edges of woodlands, hedgerows, brushy pastures and shorelines are preferred hunting habitats. Nests are usually built in dense, pole and small-tree stands of conifers that are cool, moist and well shaded. Nests are typically built in dense foliage against the trunk or in the crotch of a large branch. The sharp-shinned hawk nest is the most inconspicuous of all *Accipiter* nests. The breeding period is April through August with peak activity in late May and June. The incubation period is approximately 34 days with the young fledged at 60 days. This species is an important predator of small birds. It is the least common breeding *Accipiter* in California.

The sharp-shinned hawk could potentially utilize the habitat within and surrounding the project area and should following operations; however, no sharp-shinned hawks were detected during plan preparation or during wildlife surveys. If a nest tree is discovered during operations it will be protected as per 14 CCR 919.2 and the Department of Fish and Wildlife will be consulted. The preferred habitat of this species (densely forested habitats with openings in close proximity) will remain on the plan area and within the BAA following operations; therefore, the proposed project is not expected have an adverse impact on this species.

Osprey (*Pandion haliaetus*): (Status: CDF Sensitive Species, California Species of Special Concern)
Uses large snags and open trees near large bodies of water for feeding, cover and nesting. Prey mostly on fish and nests on a platform of sticks at top of snags. The osprey inhabits wooded habitats

that have large bodies of fish-bearing waters and abundant snags and open trees. They are found in ponderosa pine through mixed conifer forests. Suitable waterbodies include rivers, lakes, bays, estuaries and surf zones. Fish is the principle prey of osprey, with lesser amounts of mammals, birds, reptiles, amphibians and invertebrates. Prey is caught from flight, hovering or swooping from perches. Platform-stick nests are built at the top of large snags, dead-topped trees, on cliffs or on human-made platforms. Ospreys have been observed nesting 250 feet above the ground. Nests are typically located within $^1/_3$-mile of water, although nests 1 mile from water are occasionally observed. Breeding is initiated around March and continues through September. Colonial nesting in this species is common. Breeding success has increased since the early 1970s.

Ospreys have been known to inhabit and nest in portions of the Russian River. The Russian River provides suitable habitat for the osprey. Two known osprey nests have been identified in previous harvest plans just outside the plan along the northern boundary. Ospreys were/were not observed in the nest during plan layout. Both osprey nest trees are more than 300 feet outside of the plan boundary and will be protected in accordance with CCR 913.3. In addition, no harvesting is proposed within the Core Zone of the Russian River and will result in the retention of suitable habitat and nesting structures for this species should it exist. In addition, large snags and dead-topped trees suitable for nesting habitat for this species will be retained throughout the plan area. The silvicultures selected for this THP will not significantly impact the habitat or territories of the osprey. If an occupied nest tree is discovered during operations it will be protected as per 14 CCR 919.3 and the Department of Fish and Wildlife will be consulted.

Bald eagle (*Haliaeetus leucocephalus*): (Status: Federal Delisted, California Endangered, CDF Sensitive Species)
Uses large, old growth trees or snags, in remote, mixed stands near large bodies of water. Prey mostly on fish. Nest of sticks, often uses largest tree in stand, with some shading. Require large bodies of water or free-flowing rivers with suitable snags and other perches. Found in a variety of habitats that have permanent water sources. Nests are built in tall trees, typically 50 to 200 feet above the ground. Large, stoutly-branched trees, snags, or broken-topped trees provide suitable cover. This species will also perch on large rocks. Bald eagles consume a variety of fish, small mammals and water birds. Hunting typically involves swooping onto prey from a perch or from soaring flight. Carrion is also consumed. Nesting typically involves stands with 40% or less canopy. Platform stick nests are built just below tree crown. A variety of tree species are used. Peak breeding activity occurs March through June, although the breeding season extends from February through July. The incubation period is approximately 35 days.

The Bald eagle could potentially utilize the habitat within and surrounding the project area and should following operations; however, no Bald eagles were detected during plan preparation or during wildlife surveys. If a nest tree is discovered during operations it will be protected as per 14 CCR 919.2 and the Department of Fish and Wildlife will be consulted. The preferred habitat of this species (densely forested habitats with openings in close proximity) will remain on the plan area and within the BAA following operations; therefore, the proposed project is not expected have an adverse impact on this species.

Golden Eagle (*Aquila chrysaetos*): (Status: CDF Sensitive Species, California Species of Special Concern)
The golden eagle typically inhabits rolling foothills, mountain areas, sage-juniper flats, cliffs, rock outcrops and deserts. Open terrain for hunting is a necessity with such conditions being provided by grasslands, deserts, savannahs and early-successional forests. Cliffs and large trees are required for

nesting. Major food sources include lagomorphs (rabbits and hares) and rodents, as well as lesser amounts of mammals, birds, reptiles and carrion. The Golden eagle has also been known to take calves and lambs. Typical hunting methodology consists of high elevation soaring (100 to 300 feet) or low, sweeping gliding. Less common approaches include locating prey from a perch or pirating from other predators. The breeding season is late January through August with peak activity occurring between March and July. Eggs are laid early February to mid-May. The incubation period is approximately 44 days of a 65- to 70-day nesting period. Nests may be abandoned if disturbed by humans during early incubation.

Suitable habitat for the golden eagle exists within the plan area and elsewhere in the Biological Assessment Area. No golden eagles were detected during preparation of this plan and during wildlife surveys. If an occupied nest tree is discovered during operations it will be protected as per 14 CCR 919.3 and the Department of Fish and Wildlife will be consulted. The proposed project is not expected to have an adverse impact on this species.

Peregrine Falcon (*Falco peregrinus*): (Status: Federal – Delisted in 1999, California – Candidate for Delisting, CDF Sensitive Species)
Uses bodies of water in open areas with cliffs and canyons nearby for cover and nesting. Prey mostly on birds (in flight). Nest is a scrape on depression or ledge in open area. Man-made structures are often used; abandoned raptor nests and tree cavities occasionally used. Typical habitat for the peregrine falcon includes bodies of water in open areas with cliffs and canyons nearby. A variety of vegetative communities that possess the necessary water sources provide suitable habitat for this species. The peregrine breeds near wetlands, lakes, rivers or other water sources on high cliffs banks, dunes and mounds. The breeding season extends from March to late August. The incubation period is approximately 32 days.

No peregrine falcon were observed during preparation of this plan. No large rock outcroppings or tall buildings occur within the plan area. If an occupied nest tree is discovered during operations it will be protected as per 14 CCR 919.3 and the Department of Fish and Wildlife will be consulted. The plan area could provide foraging habitat; however, no nesting habitat is known within the plan area. The proposed project is not expected to have an adverse impact on this species.

Great Blue Heron (*Ardea herodias*): (Status: CDF Sensitive Species)
Feeds on small fish and frogs in shallow waters and prefers secluded groves of tall trees near shallow water feeding areas for colonial nesting. The heron is common in shallow estuary systems as well as fresh and saline emergent wetlands and are less common along riverine systems, rocky coastlines, croplands, and mountainous areas. Inhabits shallow estuaries and fresh and saline emergent wetlands near forested habitats. This species will also utilize riverine environments as well as croplands, pastures, and mountains above foothills. Diet consists of fish, rodents, amphibians, snakes, lizards, insects, crustaceans and occasionally small birds. A majority of the diet--75%--consists of fish. Most fish consumed by herons are species not typically consumed by humans. Hunting involves standing motionless or slowly moving and quickly striking and grasping their prey. Nesting usually occurs in groups (rookeries) in the tops of tall trees or snags. The tallest trees are usually the preferred nesting sites. Heron rarely nest elsewhere than in their preferred habitat. Rookeries should be protected from human disturbance as nest abandonment is a typical result of disturbance. As a rule, herons are most active around dawn and dusk. Eggs are laid in late-February and March. The incubation period lasts about 28 days. Young herons are capable of flight by 7 weeks of age but may remain at the nest until week 11.

No great blue herons were observed during THP field preparation activities. If an occupied nest tree

or rookery is discovered during operations it will be protected as per 14 CCR 919.3 and the Department of Fish and Wildlife will be consulted. The WLPZ protection measures will result in the retention of suitable habitat and nesting structures for this species should it exist. Some habitat exists within the Biological Assessment Area. The proposed project is not expected to have an adverse impact on this species.

Great egret (*Casmerodius albus*): (Status: CDF Sensitive Species)
Requires groves of trees suitable for nesting and roosting, relatively isolated from human activities, near aquatic foraging areas. Prey on small fish, aquatic insects, crabs, frogs, etc. Prefer to forage in shallow, relatively still waters of estuaries, lakes, slow moving watercourses, salt ponds, or mud flats. Colonial nesters that build groups of platform nests in large trees or snags, usually near a feeding area. Great egrets are highly dependent upon wetland habitats and riparian areas. The great egret requires forested areas for nesting and roosting and aquatic habitat for foraging. Night roosting and nesting occurs in trees; day roosting occurs in feeding habitat. Typical feeding habitats include fresh and saline emergent wetlands, the edges of estuaries, lakes and slow-moving rivers, mudflats and salt ponds and irrigated croplands and pastures. The egret's diet consists of small mammals, fish, crustaceans, insects, amphibians, snakes, and snails. The method of hunting is similar to the great blue heron--standing motionless or stalking slowing then rapidly striking their prey is customary. Nesting typically occurs away from human disturbance. March through July is the primary nesting period. Nests are built of sticks and stems of marsh plants in tall trees. The incubation period is approximately 26 days. The young are thought to fly after 5 to 6 weeks. Egret and great blue heron often nest together. Egrets are susceptible to human disturbance during nesting and nest abandonment is often the result of human activity in nesting areas.

No Great egrets were observed during THP field preparation activities or wildlife surveys. If an occupied nest tree or rookery is discovered during operations it will be protected as per 14 CCR 919.3 and the Department of Fish and Wildlife will be consulted. The WLPZ protection measures will result in the retention of suitable habitat and nesting structures for this species should it exist. Some habitat exists within the Biological Assessment Area. The proposed project is not expected to have an adverse impact on this species.

Purple Martin (Progne subis): (Status: CDF&W Special Concern)
This species exists within coastal Mendocino County. The purple martin is a colonial cavity nester, often nesting in large, old trees and snags with available cavities. Purple martins feed by hawking insects on long, gliding flights above the ground and occasionally forage on the ground for ants and other insects.

Habitat exists for this species within the BAA and plan. None of these birds were observed during recent plan field activities.

By retaining a majority of snags (i.e. with no safety issues) throughout the THP area and by retaining additional wildlife trees, recruitment for future habitat will be provided. As such this and future operations should not have any significant adverse impacts on the species.

Vaux's Swift (*Chaetura vauxi*): (Status: CDF&W Special Concern)
This species is a small, insect eating, secondary cavity nesting, neo-tropical migratory bird. Vaux's swifts rest and nest in large fire scarred trees or snags with internal hollows. This species may face territorial competition from woodpeckers, flickers, and possibly purple martins with respect to claiming cavities in the snags present in the area.

Habitat exists for this species within the BAA and plan. None of these birds were observed during recent plan field activities or wildlife surveys.

By retaining a majority of snags (i.e. with no safety issues) throughout the THP area and by retaining additional wildlife trees, recruitment for future habitat will be provided. As such this and future operations should not have any significant adverse impacts on the species.

Bank swallow (*Riparia riparia)*: Status: (CDF&W Threatened)

Throughout much of its western North American breeding range, the Bank swallow nests in erodible soils on vertical or near-vertical banks and bluffs in lowland areas dominated by rivers, streams, lakes, and oceans. In eastern North America, however, many colonies are found in sand and gravel quarries. The size and longevity of colony sites depend greatly on erosion to maintain nesting-habitat suitability. The ephemeral nature of the nesting banks results in relatively low levels of nest-site fidelity, since there is little evolutionary benefit to maintaining long-term ties to specific colony sites.

One occurrence was found within the CNDDB search of the nine USGS quadrangles surrounding the THP area. The one occurrence was in the Duncan Mills Quad in 1960. Potential habitat does exist within the BAA and the plan along the banks of the Russian River. However, none of these birds were observed during recent plan field activities or wildlife surveys.

By retaining all of the trees within the Class I Core Zone (0-30'), and the majority of the trees within the outer zone (30-100'), habitat for this species should be undisturbed by proposed operations.

Tricolored blackbird (*Agelaius tricolor*): (Status: CDF&W Threatened)

The Tricolored Blackbird is North America's most colonial land bird. Found almost exclusively in California, its breeding colonies can teem with up to 25,000 birds, sometimes all settled into a single 10-acre field or wetland to raise their young.

Tricolored blackbirds are grain-eating birds. They also consume a wide variety of plants and insects, and respond opportunistically to the most abundant, readily available food source. They forage in agricultural areas, particularly where livestock are present, and grass is short.

Three occurrences were found within the CNDDB search of the nine USGS quadrangles surrounding the THP area. The first recoreded occurrence was in the Sebastopol quad in 1976. The second occurrence was located in the Valley Ford quad in 1977. The third recorded occurnce was in the Tomales quad in 2011. Potential habitat does exist within the BAA and the plan area. However, none of these birds were observed during recent plan field activities or wildlife surveys.

No tricolored blackbirds or sign of tricolored blackbirds were found during fieldwork on this plan. If a nest is discovered during operations it will be protected as per 14 CCR 919.2 and the Department of Fish and Wildlife will be consulted. The preferred habitat of this species will remain within the BAA following operations; therefore, the proposed project is not expected have an adverse impact to this species.

Western snowy plover (*Charadrinus alexandrines nivosus*): (Status: Federal Threatened)

The western snowy plover is a threatened small shorebird, approximately the size of a sparrow.

During the breeding season, March through September, plovers can be seen nesting along the shores, peninsulas, offshore islands, bays, estuaries, and rivers of the United States' Pacific Coast.

Snowy plovers have natural predators such as falcons, owls, raccoons, and coyotes. There are also predators that humans have introduced or whose populations they have helped to increase, including crows and ravens, red fox, and domestic dogs. Humans can be thought of as predators too, because people drive vehicles, ride bikes, fly kites, and bring their dogs to beaches where the western snowy plover lives and breeds. All of these activities can frighten or harm plovers during their breeding season.

Two occurrences were found within the CNDDB search of the nine USGS quadrangles surrounding the THP area. Both recorded occurrences were in the Bodega Head quad in 1978. Potential habitat does exist within the BAA and the plan area. However, none of these birds were observed during recent plan field activities or wildlife surveys.

No western snowy plovers or sign of western snowy plovers were found during fieldwork on this plan. If a nest is discovered during operations it will be protected as per 14 CCR 919.2 and the Department of Fish and Wildlife will be consulted. The preferred habitat of this species is located within Class I WLPZ Core Zone and will remain undisturbed following operations, therefore the proposed project is not expected have an adverse impact to this species.

Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*): (Status: Federal Threatened, CDF&W Endangered)

The western yellow-billed cuckoo is a medium-sized bird of about 30 cm (about 12 inches) in length and weighing about 60 g (about 2 ounces). Caterpillars and katydids are what cuckoos like to eat most, but they'll catch tree frogs, cicadas, and grasshoppers to use as fast food for their young.

Western yellow-bill cuckoos use a variety of riparian habitats. Cottonwood and willow trees are an important foraging habitat in areas where the species has been studied in California. Western yellow-billed cuckoos appear to require large blocks of riparian habitat for nesting. Along the Sacramento River in California, nesting yellow-billed cuckoos occupied home ranges which included 25 acres (10 hectares) or more of riparian habitat. Another study on the same river found riparian patches with yellow-billed cuckoo pairs to average 99 acres (40 hectares). Home ranges in the South Fork of the Kern River in California averaged about 42 acres (17 hectares).

Two occurrences were found within the CNDDB search of the nine USGS quadrangles surrounding the THP area. The first recorded occurrences were in the Cotati quad in 1972. The second recorded occurrence was in the Valley Ford quad in 1996. Potential habitat does exist within the BAA and the plan area. As, none of these birds were observed during recent plan field activities or wildlife surveys.

No western yellow-billed cuckoo or sign of western yellow-billed cuckoo were found during fieldwork on this plan. If a nest is discovered during operations it will be protected as per 14 CCR 919.2 and the Department of Fish and Wildlife will be consulted. The preferred habitat of this species is located within Class I WLPZ Core Zone and will remain undisturbed following operations, therefore the proposed project is not expected have an adverse impact to this species.

General Mitigation for Occupied Nests:

Should an occupied nest site of a listed bird species be discovered during the timber operations, the timber operator will protect the nest tree, screening trees, and replacement trees, and will apply the provisions of 14 CCR 919.2(d), and will immediately notify the Department of Fish and Wildlife, the Department of Forestry, and the landowner or his agent. Appropriate mitigations will be devised through consultation with the agencies and the landowner and representative. A minor amendment will then be filed reflecting such additional protection as is agreed between the operator and the Director after consultation with the Department of Fish and Wildlife. The specific protection measures to be implemented will be based on the establishment of buffer zones, compliance with year-round restrictions, and the established critical periods foreach species.

Mammals

Pacific Fisher (*Martes pennanti*): (Candidate Species for listing as Federally Endangered, CDF&W Special Concern)
The THP is located within the Historic Fisher Range and where Fisher are rare or absent (Ouick Reference: Range of Martes *pennant,* The Pacific fisher in California, Coastal California Map, CDF&FP, August 2009).

The Fisher is a large member of the weasel family occurring in Canada and the U.S. including portions of the Pacific Northwest into northern California. Historical distribution included coastal northwestern California down to Sonoma County, east to the Klamath Mountains and Cascade Range, and south through the entire Sierra Nevada. Historical distribution may have included coastal Mendocino County: however, extreme trapping pressure and timber harvesting may have extirpated populations from this region by the Joseph Grinnell began to map the fisher's range in north western California.

Fishers are considered rare or absent in the coastal redwood forest of Sonoma County, and are based on limited anecdotal sightings occurring in this region. These unsubstantiated sightings should be viewed with caution as they are inherently unreliable. According to range maps produced by Bill Zelinski and Keith Slauson, foremost experts on fisher in California, the fisher's range based on verifiable records includes eastern Mendocino County but excludes the coastal region. Substantial survey efforts in coastal Mendocino County supports this observation as track plate surveys and camera surveys have failed to provide physical evidence of fisher in coastal redwood forests. Meso-carnivore track plate surveys conducted by Georgia-Pacific on company lands in the 1990s and by Campbell Group on Redwood Forest Foundation from 2009-2010 failed to detect fisher. Camera surveys conducted in 2003 on Jackson State Demonstration Forest lands also resulted in no fisher detections. The most comprehensive and systematic meso-carnivore surveys conducted to date are on Mendocino Redwood Company ownership wherein surveys conducted from 2004 to present have failed to detect fisher. During the preparation of this THP no fishers were observed.

The Fisher is known to inhabit intermediate to large-tree stages of coniferous forests and deciduous-riparian habitats with a high percent canopy closure. Suitable habitat for fishers consists of large areas of mature, dense forest stands with specific habitat elements including snags, den trees, large woody debris, conifers greater than 32 inches, and hardwoods greater than 16 inches. WHR maps indicate that fishers are known to inhabit the North Coastal Range, with sightings in Mendocino County primarily in the mid to northeast mixed conifer forests.

Overall, habitat for fisher within the plan area is low and the BAA contains only scattered small areas of potential suitable habitat. However, throughout the plan area habitat elements such as large trees,

snags and downed woody debris will be maintained, and in some cases increased. Large woody debris will be increased as a result of this proposed harvest. As such, the proposed plan will not result in a significant adverse impact to potential fisher habitat within the Biological Assessment Area. Section II Item 32 contains protection measures for Pacific Fisher to avoid take.

Humboldt Marten (*Martes americana humboldtensis*): (Status: CDF&W Special Concern, Candidate to be listed as Federally Endangered)
This THP is not located within the Current Range of Humboldt marten but is within the Historic Range of this species (Current and Historic Range of the Humboldt Marten in California, Map, CDF&FP, January 19, 2012).

The marten is endemic to coastal forests of northwestern California with a historical range described as "narrow northwest humid coast strip, chiefly within the redwood belt" from the Oregon border to northern Sonoma County (Slauson 2003). Recent studies on habitat use by Humboldt marten show they primarily occupy old growth coniferous forests with a well-developed understory shrub layer of salal, evergreen huckleberry, rhododendron, and huckleberry oak. A few locations were characterized by serpentine soils or ridgetops with low tree cover, but with distinct layer of dense shrubs. They utilize resting and denning structures such as cavities in live, dead or downed trees, rock piles, and subnivean habitats at higher elevations in the winter. Most of the areas where marten was detected appeared to be less suitable for potential predators such as the gray fox and Pacific fisher. Tend to travel along ridge tops, and rarely move across large areas devoid of canopy cover. Small clearings, meadows, and riparian areas provide foraging habitats, particularly during snow-free periods.

A field study by Zielinski and Slauson (2007) in Mendocino National Forest (MNF) attempted to document the marten but located none. However, a few CNDDB occurrences document marten in the MNF. Two wildlife surveys for carnivore presence have occurred on Jackson Demonstration State Forest (JDSF), Mendocino County. In 1992, Humboldt State University professor David Kitchen and his student field crew placed 50 smoked track-plate stations throughout JDSF. In 2003, CDGW Environmental Scientist; T. Nelson, placed baited photo stations in the James Creek area (eastern side of JDSF). Neither study was able to document the marten. A Mendocino Redwood Company (Mendocino & Sonoma Counties) property wide systematic survey effort of for mesocarnivores from 2003-2008 did not detect any Humboldt marten. Marten or sign of marten have not been observed on the plan area or within the BAA.

The special habitat elements required by marten (snags, LWD, cavities for denning sites) will not be impacted during operations, therefore the proposed harvest plan will not result in a significant adverse impact to marten within the Biological Assessment Area.

Grey Wolf (*Canis lupus*): (Status: Federally Endangered, California Endangered)
On June 4th, 2014 the gray wolf became listed as endangered under CESA. Although unlikely to occur, the THP area and BAA contains suitable habitat for Gray Wolves. Protection measures are included in Section II of this plan. The proposed project is not expected to have an adverse cumulative impact on this species.

Red Tree Vole (*Phenacomys longicaudus*) (Status: CDF&W Species of Special Concern)
Red tree voles are distributed along the North Coast from Sonoma County to Oregon border. They tend to occur in mature Douglas-fir, redwood, and Montane hardwood-conifer habitats in fog belt. Red tree vole feed on needles of Douglas-fir and grand fir. Needles and twigs gathered at night may be consumed or brought to nest. Needle resin ducts are removed with the remaining needle eaten and

the discarded resin ducts used to line nest cup. Males occur mostly in fir needle tree nests, or less often, in shallow burrows at base of tree beneath the litter. Females spend most of their lives in trees constructing large, domed nursery nests of Douglas-fir needles 6-150 feet above ground. Medium to large nests are generally females and small nests more likely males. Nests may be occupied by succeeding generations, increasing in size. Nests may be situated on whorls of limbs against trunk or at outer limits of branches. In young second-growth Douglas-fir, the broken tops of trees frequently are used. Older nursery nests may encircle the entire tree. Water is obtained mostly from food but individuals lick dew and rain off needles near nests. Red tree voles are preyed upon by spotted owls, saw-whet owls, steller's jays, and raccoons. Severe winter storms may also affect local populations adversely.

Habitat potential within the project area and the BAA is high. No RTV nests have been observed in the plan area. Timber will be individually marked; thus, each tree can be examined for wildlife nest occurrence. If a tree is found to contain an active nest it will be retained, along with associated screen trees, where feasible. A variety of sizes of Douglas-fir trees will be retained. Given these management strategies, sufficient protection will be afforded to prevent potential adverse impacts on this species.

Sonoma Tree Vole (*Arborimus pomo*): (Status: CDFW Species of Special Concern)
The Sonoma tree vole is an arboreal, small rodent restricted to coastal forests in the humid fog belt in northwestern California. Their range extends from Sonoma County to De Norte County. The Sonoma tree vole relies on a diet of soft tissue of Douglas-fir needles and buds, as well as coniferous bark. Old growth forests provide optimal habitat components.

Sixteen occurrences were found within the CNDDB search of the nine USGS quadrangles surrounding the THP area, however no occurrences are located within the BAA . While suitable habitat is present within the THP and the BAA, no Sonoma tree vole nests were observed within the THP area during field inspections. Trees exhibiting any nests, regardless of species, shall be maintained. The proposed project is not expected to have an adverse cumulative impact on this species.

Townsend's Big Eared Bat (*Corynorhinus townsendii)(COTO)*: (CDF&W Special Concern)

Range, Distribution and Abundance
The Townsend's big-eared bat ranges from southern British Columbia, south through the Pacific Northwest and California, and extending eastward through the intermountain region to east of the Rocky Mountains and south into the Mexican mainland. Its geographical range is all of California except the highest elevations of the Sierra Nevada. The largest populations observed occur in the Southern Cascades, Sierra Nevada Foothills and Mono/Southwestern Great Basin ecoregions. The Sierra Nevada population has seen the most declines. Townsend's big-eared bat, in the North Coast ecoregions, may be less abundant than before the removal of most old-growth conifer forests that provided roosting structures in basal hollows. Its habit of roosting on open surfaces makes it readily detectable, and it is often the species most frequently observed in caves and abandoned mines throughout its range.

Life History
Reproduction. Townsend's big-eared bat is a colonial species with maternity colonies forming between March and June (based on local climate and latitude). Colony size ranges from a few dozen to several hundred. Mating generally takes place in both migratory sites and hibernacula between September or October and February. Females are generally reproductive in their first

year, whereas males do not reach sexual maturity until their second year. Gestation length varies with climatic conditions, but generally lasts from 56 to 100 days. A single pup is born between May and July. Young bats are capable of flight at 2.5 to 3 weeks of age and are fully weaned at 6 weeks. Nursery colonies start to disperse in August about the time the young are weaned and break up altogether in September and October. Expected annual survival at about 50% for young, and about 80% for adults. Expected lifetime could range from 16-21 years.

Migration/Hibernation/Roost Sites. Townsend's big-eared bat is a relatively sedentary species with no long-distance migrations reported. The longest movement known for this species in California is 20 miles. There is some evidence of local migration, perhaps along an elevational gradient.

Hibernation roost sites are generally caves or mines, although animals are occasionally found in buildings. In the north coast of California, they may occur in large basal hollows in the range of 1 yard by 3-5 yards wide. Winter roosting is typically composed of mixed-sexed groups from a single individual to several hundred or several thousand, however, behavior varies with latitude and temperature, larger groups where temperatures are low and smaller groups where temperatures are high. Individuals roost on walls or ceilings, often near entrances. If undisturbed, individuals will frequently roost less than 3 m (10 ft) off the ground and have been found in air pockets under boulders on cave floors. The period of hibernation is shorter at lower elevations and latitudes.

Feeding

Townsend's big-eared bat feeds principally on small moths but may eat beetles and a variety of soft-bodied insects. Captures prey by echolocation, or by gleaning from foliage. Usually feeds within riparian habitat or wooded habitats and usually avoids open grazed meadows. Flight is slow and maneuverable and is capable of hovering.

Threats to Townsend's big-eared bat

Townsend's big-eared bat is highly sensitive to disturbance from the sight and sound of human activity in or near roosting locations. Human disturbance of roost sites has been documented to cause temporary or permanent abandonment of roost sites, however, in some instances the species can become habituated to reoccurring and predictable human activity. Caves and mines, where the greatest populations exist, are under threat due to disturbance by high recreational use and closure from liability. Many caves or mine shafts with habitat are frequented by cavers and disturbance during hibernation or reproductive stages easily causes bats to abandon their roost. Cave and mines that may be a liability to the owner or are on public land are frequently closed off completely without concern for bats. Mine entrances have a tendency to slump closed over time and are particularly vulnerable to collapse during heavy rains. Abandoned buildings in urban areas have been known to inhabit concentrations of Townsend's big-eared bat and are under threat of rehabilitation. Large trees with sufficient basal hollows to create habitat for bats have been removed from the forest over the last 150 years. Remnant trees occur in some forest habitat but are usually in a fragmented stands and provide less than ideal habitat. Much of the dam-building, reconstruction, and license renewal in California occur at the same elevations in the foothills of the Sierra Nevada, Klamath and Trinity mountains optimal for Townsend's big-eared bat roost sites. The historical practice of collecting bat specimens for scientific purposes has likely had a large impact on bat species sensitive to disturbance. Studies aimed at understanding the disease White Nose Syndrome as a method for more scientific work on Townsend's big-eared bat could impact the species.

Available Habitat and Mitigation

There are no known mines or caves within the plan area and no abandoned buildings. According to the 9 quad CNDDB search , there are 5 recorded occurrences within the search area. Three recorded occurrences are located within the Bodega Head USGS quadrangle from 1946 to 2014. Two recorded occurrences are located within the Guerneville USGS quadrangle in 1949.

Townsend's big eared bats were not observed during plan layout. Habitat for this species exists within the BAA and within the plan area. Plan area habitat is probably in the form of basal hollows in large redwood trees. There are no abandoned buildings in the plan area. Within the BAA there may be abandoned buildings in addition to basal hollows. The plan does have mitigations in Item 32 (b) to protect special habitat elements that would be beneficial for Townsend's big-eared bat.

Pallid Bat ***(Antrozous pallidus)*****:** (Status: CDF&W Special Concern)
The pallid bat is a common, widely distributed species throughout California. Pallid bats generally occur in dry, rocky habitat but are occasionally found in forested areas. Pallid bats generally roost in caves, crevices, mines, cliffs, and occasionally buildings and tree hollows. Unlike most other local bat species, pallid bats will forage on the ground as well as in flight. This species forages in open areas and prey include insects and occasionally very small vertebrates.

No Pallid bats were discovered during plan layout. Habitat for this species exists within the BAA and within the plan area. Large trees with specific habitat elements exist and will be retained across the plan area. No significant impacts are expected.

Fish

Coho salmon ***(Oncorhynchus kisutch)*** is listed as endangered under the Federal and State Endangered Species Act. The plan area is located in the Central California Coast ESU for Coho salmon. Coho salmon are riffle spawners that typically utilize smaller streams and gravel. Coho Salmon are anadromous salmonids that require access to stream migration, cold, clean, well oxygenated water and prefer the cover of overhanging vegetation, undercut banks, submerged vegetation, rocks, and logs and deep water. Coho typically initiate upstream migration between late October and mid-February. Coho, as a rule, spawn in smaller tributaries than Chinook salmon. Preferred temperatures to Coho are as follows: Spawning migration 4.0 – 14.0°C (40.0 – 58.0°F), Rearing 7.2 – 16.7°C (45.0 – 62.0°F). Redds are laid in gravel that range in size from 1.3 – 10.2 cm in diameter; intergravel mortality occurs when fine sediments exceed 13% of the substrate composition. Embryos hatch after 8 to 12 weeks of incubation. Coho migrate to the ocean at age one and return to fresh water to spawn after 2 to 3 years. Coho are known to exist in the Russian River.

Protective measures for the Coho salmon and other aquatic wildlife species have been incorporated into the silvicultural methods (see Item #14), soil stabilization measures (Item #18), watercourse protection measures (Item #26), and other provisions in this THP and others within the assessment area. Given the standards and practices in place now, no significant adverse impacts are expected.

Steelhead ***(Oncorhynchus mykiss irideus)*** is listed as threatened under the Endangered Species Act. The proposed timber harvest plan is located within the Northern California DPS for Steelhead. Summer steelhead ascend spawning watercourses in the spring, and hold in deep pools until the fall, when they spawn. Winter Steelhead enter river systems during fall and winter when water levels are sufficient to permit upstream migration. The effects of timber harvesting concerning this species are elevated water temperatures and sedimentation of spawning gravels. Steelhead mortality at the

different life stages are closely affiliated with water temperatures. Preferred temperatures for different stages are as follows: Spawning migration 3.9 - 9.4° C(39 – 49°F), Egg development 10.0° C(56°F), Rearing 10.0 – 13.0° C(50 - 56°F). Steelhead prefer to spawn in gravels 0.6 – 10.2 cm in diameter, with eggs developing in approximately 31 days. When fine sediments exceed 13% of the substrate composition, intergravel mortality can occur. Juvenile steelhead spend 1 to 3 years in freshwater habitats before migrating to the ocean. They typically spend 2 years in the ocean before spawning. Although summer and winter steelhead use the same spawning gravels, they are genetically distinct and do not interbreed. Steelhead can utilize smaller tributaries and smaller sized gravels (2-3 in. in diameter) for spawning. Steelhead are known to exist in the Russian River.

Measures that are proposed for the protection of coho, should also be considered adequate for the protection of steelhead. Protections provided by WLPZs, ELZs, and water drafting mitigations insures no cumulative impacts due to timber operations within the plan area. Given the mitigations in the plan (including no harvest operations within the core zone of Class I WLPZs), the Forest Practice Rules, and our standards and practices, no significant impacts are expected.

Chinook (*Oncorhynchus tshawytscha*) is listed as threatened under the Endangered Species Act. The proposed timber harvest plan is located within the California Coastal ESU for Chinook. Sustained water temperatures greater than 80 degrees Fahrenheit are fatal for adult salmon, which will migrate into the headwaters of smaller Class I waters to spawn when water is sufficient and debris dams do not prevent access. Chinook salmon are riffle spawners and typically construct redds near the head of riffles in gravel 6 inches or less in diameter. Ideal temperatures for spawning occur between 41-58 degrees Fahrenheit. Chinook salmon prefer to spawn in the main stem of rivers or larger tributaries but will come further up watercourses depending on the stream flow in any given year. Chinook are known to exist in the Russian River.

Measures that are proposed for the protection of coho and steelhead should also be considered adequate for the protection of chinook. Protections provided by WLPZs, ELZs, and water drafting mitigations insures no cumulative impacts due to timber operations within the plan area. Given the mitigations in the plan (including limited harvest operations within Class I WLPZs), the Forest Practice Rules, and our standards and practices, no significant impacts are expected.

Longfin smelt (*Spirinchus thaleichthys*): (Status: Federal candidate, CDF&W threatened)

Longfin Smelt is a small fish in the family Osmeridae found along the Pacific coast of the United States from Alaska to California. In California, Longfin Smelt is historically found in the San Francisco Estuary and the Sacramento/San Joaquin Delta (Bay-Delta), Humboldt Bay, and the estuaries of the Eel River and Klamath River— uses a variety of habitats from nearshore waters, to estuaries and lower portions of freshwater streams. Longfin Smelt are euryhaline, meaning they can tolerate a wide range of salinity from completely fresh to marine. Longfin Smelt is also anadromous, depending on fresh and marine waters for spawning and rearing.

Loss of estuarine wetland and slough habitat may be an ongoing issue for the species. Longfin Smelt use these highly productive areas as adults before migrating up rivers to spawn, and as juveniles to rear and feed prior to entering the ocean.

The nine quad CNDDB search revealed two recorded occurrences, the first in 1989 in the Duncans Mills quadrangle. The second occurrence was in 2007 in the Valley Ford quadrangle. No longfin smelt occurrences are recorded within the BAA, and furthermore, no individuals were observed during field preparation activities. Suitable habitat does exist within the Biological Assessment Area.

Habitat for longfin smelt will be well protected with standard WLPZs. If present, no impact from the proposed timber management activities on the longfin smelt is anticipated.

General Mitigation for Fish:

Impacts to all fish species that occur or have habitat located within the assessment area will be minimal. The watercourse protection measures as listed throughout the plan provides for canopy retention, LWD recruitment and sedimentation prevention. There will be no timber harvesting operations within Class I WLPZs core zones. In addition, an Erosion Control Plan has been prepared, which will further ensure sedimentation of the watercourses is minimized and that the beneficial uses of water are not adversely impacted by the proposed operations.

Amphibians

Foothill Yellow-legged frog (*Rana boylii*): (Status: CDF&W Special Concern, State Candidate for Threatened Listing, BLM sensitive)

The Foothill Yellow-legged frog inhabits small permanent streams with rocky substrates. The species uses permanent pools of streams, ponds, and marshes with extensive shoreline vegetative cover. These habitats include valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral and wet meadow. Feed on aquatic and terrestrial insects and invertebrates, as well as fish, tadpoles, and smaller frogs. Insects are the primary food source of adult frogs, especially adult insects. Both aquatic and terrestrial insects are consumed. Tadpoles graze on algae and diatoms. This species of ranid is rarely found far from permanent water, even on rainy nights. Tadpoles require water for three to four months during maturation. Home range is limited to about 33 feet, in the farthest direction. Breeding and egg laying usually commences at the end of spring flooding--typically between mid-March and May. Eggs are deposited in permanent pools attached to emergent vegetation. Egg clusters average 200-300 individuals. Tadpoles hatch in about 5 days. Tadpoles transform in three to four months. Garter snakes, fish and bullfrogs are the primary predators of this frog.

Foothill yellow-legged frogs have not been detected within the BAA, however a total of 41 occurences have been recorded within the nine quad CNDDB search. No known detections have been made within the plan area, however suitable habitat does exist. Habitat for yellow-legged frogs will be well protected with WLPZs. If present, no impact from the proposed timber management activities on the yellow-legged frog is anticipated.

California tiger salamander (*Ambystoma californiense*): (Status: Federal Threatened, CDF&W Threatened)

The California tiger salamanders around Sonoma County and Santa Barbara are endangered, which means they are in danger of extinction throughout all or a significant portion of its range. This is a large, stocky salamander, with a broad, rounded snout. Its small eyes, with black irises, protrude from its head.

Adults mostly eat insects. Larvae eat things like algae, mosquito larvae, tadpoles and insects. The species is restricted to grasslands and low foothills with pools or ponds that are necessary for

breeding. Natural breeding areas, mostly vernal pools (a seasonal body of standing water), are being destroyed. Ranch stock ponds that are allowed to go dry help take the place of vernal pools for breeding.

The nine quad CNDDB search revealed 31 recorded occurrences from 1989 to 2017 in the Sebastopol, Santa Rosa, and Two Rock quadrangles. No California tiger salamander occurrences are recorded within the BAA, and furthermore, no individuals were observed during field preparation activities. Suitable habitat does exist within the Biological Assessment Area. Habitat for California tiger salamander will be well protected with standard WLPZs. If present, no impact from the proposed timber management activities on the California tiger salamander is anticipated.

Southern torrent salamander *(Rhyacotriton variegatus)*: (Status: Federal Special Concern, CDF&W Special Concern)

The range map in the Wildlife Habitat Relationship System indicates that the southern torrent salamander is a potential year-round resident within the Biological Assessment Area. Torrent salamanders occur in small streams, springs and seeps in mixed conifer-hardwood forests with a closed canopy. Ideal habitat conditions exist in small, cold perennial streams with water filtering through moss-covered gravel. Preferred water temperatures range between 8 and 12^{0C}. Large streams are avoided. Surface flow is not critical as long as there is perennial subsurface flow. The torrent salamander can live deep in the gravel as long as the interstitial pores remain free of silt. In harvested areas this species tends to occur in steeper gradient streams (10% or more) where the faster flowing water flushes sediment through and out of the pores. In un-harvested forests, lower gradient streams are used where silt is not a problem. The torrent salamander has an aquatic larval and semi-aquatic adult phase. The aquatic larval stage lasts 3 to $3^1/_2$ years while the semi-aquatic adult stage spans a period of 1 to $2^1/_2$. An adult is fully mature in 4 to $5^1/_2$ years. The reproduction cycle of this salamander is not well understood. It is believed that egg laying occurs in late spring and early summer. Eggs are laid singly in cracks in the rock or between gravel where cold water continually flows. The principle prey of the torrent salamander are small aquatic and semi-aquatic invertebrates, notably insects and other anthropods. Adult salamanders forage both in water and along stream margins, whereas larvae feed exclusively in the water.

The nine quad CNDDB search revealed no recorded occurrences within the search area. No southern torrent salamander occurrences are recorded within the BAA, and furthermore, no individuals were observed during field preparation activities. Suitable habitat does exist within the Biological Assessment Area. Habitat for southern torrent salamander and it will be well protected with WLPZs. If present, no impact from the proposed timber management activities on the southern torrent salamander is anticipated.

California Red-Legged Frog (*Rana aurora*): (Status: Federally Threatened, CDFW Species of Special Concern)
The California red-legged frog is a pond breeding frog usually associated with ponds, wetlands, and other lentic aquatic habitat and adjacent terrestrial areas. The California red-legged frog is a subspecies of the red-legged frog and its current distribution includes isolated localities in the Sierra Nevada, northern coast and northern traverse ranches. It is common in the San Francisco Bay area as well as along the central coast. The breeding season for the California red-legged frog is between November and April.

CNDDB scoping indicated 26 occurrences of California red-legged frog within nine adjacent

quads to the THP boundary. The occurrences are from 1991 to 2017 in the Valley Ford, Duncans Mills, Coati, Bodega Head, Two Rock, and Cazadero quadrangles. There were no recorded occurrences within the BAA. Protections provided by WLPZs, ELZs, and water drafting mitigations insures no cumulative impacts due to timber operations within the plan area. Given the mitigations in the plan, the Forest Practice Rules, and our standards and practices, no significant adverse impacts are expected.

California giant salamander (*Dicamptodon ensatus*): (Status: CDF&W Special Concern)
The California giant salamander's distribution ranges from extreme southern Mendocino County south to Sonoma, Napa, Marin, and Santa Cruz counties. Found in coast redwood, Douglas-fir/tanoak, and true oak woodland. Co-occurs and hybridizes with the coastal giant salamander (*Dicamptodon tenebrosus)* in a narrow hybrid zone which extends south of Manchester, CA to just south of Point Arena, CA. The exact boundaries to this hybrid zone still remain ill-defined on both a north-south and east-west gradient. More systematics and population genetic work is needed utilizing contemporary molecular methods to delineate the range of this species.

Terrestrial forms of the California giant salamander are found on land under the forest canopy, underneath rocks, logs, other coarse and large woody debris, and in subterranean burrows. Most terrestrial individuals are found in moist areas near watercourses. During rainy periods, adults may be very active and move overland to forage. Larvae are found in cool, clear streams with rocky substrates. Larvae are generally abundant in streams with cool water temperatures (< 18 °C), low levels of siltation and substrate embeddedness. Larvae utilize rocks, woody debris, and detritus as cover in streams. Small larvae may be found several inches beneath the stream bottom in gravel to avoid predation by larger conspecific larvae and other predators. Larvae have been observed in heavily silted small streams using the silt as camouflage. They may be more tolerant of warmer water temperature conditions and the presence of silt compared to other co-occurring headwater amphibian species (i.e. *Ascaphus* and *Rhyacotriton*).

Very little specific life-history information has been reported for this species but is thought to be similar to the coastal giant salamander (*D. tenebrosus*). Adult and neotenic forms breed in small and medium-sized streams with rocky substrates during the early spring when high flows recede. Seventy to 100 eggs are individually attached on the underside of rocks or woody debris in slow moving portions of streams. Females may guard and defend nests until larvae hatch and disperse. Complete metamorphosis of larvae may take several summers, and different age classes are regularly seen in streams where they are abundant. Neotenic forms (reproductive adults with larval characteristics) may occur in perennial bodies of water. Larvae feed on a variety of aquatic inverterbrates, though prey selection changes with body size and metamorphosis, and may include fish, smaller conspecific larvae, amphibians. Adults regularly feed on banana slugs (*Ariolimax columbianus*) and other small vertebrate prey such as rodents.

While no individuals have been observed within the THP area, the nine quad CNDDB searchindicates 34 occurrences, 1 of which, falls within the BAA, recorded in 1998. Protections from WLPZ measures for Class I and Class II watercourses as well as for seeps and springs should mitigate any negative impacts to California giant salamander populations. If present, no impact from the proposed timber management activities on the California giant salamader is anticipated.

Red-bellied newt (*Taricha rivularis*): (Status: CDF&W Special Concern)
The red-bellied newt is distributed from southern Humboldt, western Lake, Mendocino, and northern Sonoma counties. It is one four species in the genus *Taricha* residing in California and

has the smallest range.

This species breeds in flowing sections of small to mid-sized streams with rocky/cobble substrates in oak woodland, Douglas-fir/tanoak, and coast redwood forests. Adults utilize terrestrial habitats such as burrows, loose rock formations, fallen trees, course woody debris, and remnant logging debris for cover and foraging during the dry season (May-October).

Emergence of terrestrial adults begin after the onset of the wet season in November and December. This species is a long-distance migrant and may travel several miles overland to natal streams for breeding. Breeding occurs from February to May, with March and April representing the peak months when large numbers of adults congregate in streams to mate. Multiple adult males can be seen amplexing with females in "mating balls" to stimulate breeding. The male will deposit a spermatophore (sperm packet) on a small rock, then the female picks it up with her vent. Oviposition generally occurs on the underside of rocks in the fast-flowing section of streams, or on submerged roots along the stream bank. Egg masses consist of 6-16 eggs and form single flattened clusters one-egg layer thick. Developmental rates are a function of stream temperature, and the period from hatching to metamorphosis ranges from 4-6 months. Following breeding, adults migrate from streams to terrestrial habitats. Red-bellied newts are thought to be long lived. Twitty (1966) noted that many recaptured newts marked as reproductive adults were at least 17 years old. Others have suggested they may live 20-30 years, but this has yet to be verified. Newts forage on a variety of aquatic and terrestrial invertebrate prey, small fish, and larval amphibians.

Class I and Class II (WLPZ) measures apply to all occupied watersheds reduce sedimentation and maintain cool water temperatures conducive for breeding adults, oviposition, and larval rearing. Additional considerations should be given to seeps, springs, and even ponds immediately adjacent to occupied watercourses as these habitats have been demonstrated to be important both for foraging and refugia during the dry season. Adult newts, in general, are more tolerant of warmer terrestrial environments and water temperatures compared to headwater stream amphibian species (e.g. *Ascaphus, Rhyacotriton,* and *Dicamptodon).* Several publications have suggested that industrial logging has had an impact on *T. rivularis* due to much of its range owned by privately held companies (Reilly et al. 2014). Interestingly, many watersheds on industrial forestlands not only were intensively harvest over the past 100 years, they still have large breeding populations of *T. rivularis*. In general, most logging activities are scheduled during the dry season, which may further mitigate direct mortalities along active roadsides when newts are less likely to be migrating overland in large numbers. Additional voluntary measures, such as wet season restrictions, drift fences, migration culverts, and new road design may further reduce mortalities; however, the feasibility of these measures has yet to be explored.

The nine quad CNDDB search indicated 11 occurrences of the red-bellied newt, one of which is located within the BAA. This occurrence was recorded in 1934 within 1.3 miles of the THP boundary. Protections from WLPZ measures for Class I and II watercourses as well as for seeps and springs should mitigate any negative impacts to red-bellied newt populations. If present, no impact from the proposed timber management activities on the red-bellied newt is anticipated.

General Mitigation for Amphibians:

Impacts to all amphibian species that occur or have habitat located within the assessment area will be minimal. The watercourse protection measures as listed throughout the plan provides for canopy retention, protection for springs, protection for wet areas, LWD recruitment and sedimentation prevention. In addition, an Erosion Control Plan has been prepared, which will further ensure sedimentation of the watercourses is minimized and that the beneficial uses of water are not adversely

impacted by the proposed operations.

Reptiles

western pond turtle (*emys marmorata marmorata*): (Status: CDF&W Special Concern).

The western pond turtle is found in ponds, lakes, or permanent pools of streams below 6,000 ft in elevation. Basking sites are partially submerged logs, rocks or mud banks and normally associated with permanent or nearly permanent water. Nesting may occur adjacent to or in openings of forest habitat. Nests are generally located on south, southwest or southeast facing exposures. Three to 11 eggs are laid between March and August. Eggs are deposited in soil with relatively high humidity and containing significant amounts of clay or silt. Surrounding vegetation tends to be short grasses or forbs. The incubation period is approximately 75 days. Sexual maturity is thought to take 8 years. This turtle is omnivorous, feeding on aquatic plant material (pond lilies), aquatic insects, and a variety of aquatic invertebrates, frogs and fish. The Northwestern pond turtle is the only abundant native turtle in California.

No northwestern pond turtles were observed during field preparation activities. Habitat potential is high within the plan area and BAA, particularly along the Russian River. The watercourse protection measures stated in the plan are sufficient to protect the habitat for this species. No negative impacts to this species as a result of timber harvesting activities are expected to occur.

CNDDB scoping for this species indicated 37 occurrences within the 9-quad search. However, no recorded occurences are located within the BAA or the THP area. The THP proposes to maintain habitat structure suitable for western pond turtles with standard WLPZ protections, therefore no significant adverse impacts are expected.

Insects

Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*): (Status: Federal endangered, CDF&W unlisted)

Myrtle's silverspot is a medium sized butterfly in the brush foot family (Nymphalidae). Wingspan is approximately 5.6 cm (2.2 inches). The upper surfaces of the wings are golden brown with numerous black spots and lines. The undersides are brown, orange-brown and tan with black lines and distinctive silver and black spots. Larvae are dark-colored with many sharp branching spines on their backs.

Adults feed on nectar from flowers, including gumplant (Grindelia rubicaulis), yellow sand verbena (Abronia latifolia), mints (Monardella spp.), bull thistle (Cirsium vulgare) and seaside daisy (Erigeron glaucus). Adult butterflies are typically found in areas that are sheltered from the wind, below 250 m (820 feet) elevation, and within 3 miles of the coast.

CNDDB scoping for this species indicated 3 occurrences within the 9-quad search. 2 occurences were recorded in the Valley Ford quadrangle in 1992 and 2003. One occurrence was recorded in the Duncans Mills quadrangle in 1991. The THP proposes to maintain trees with habitat structure suitable for Myrtle's silverspot butterfly overwintering populations, therefore no significant adverse impacts are expected.

western bumble bee (*Bombus occidentalis*): (Status: CDF&W Candidate Endangered)

Bombus occidentalis used to be the most common bumble bee species in the Pacific Northwest, but in the mid-1990s it became one of the rarest. The reason or reasons for the species decline remain unsolved, but one possibility points to a fungal pathogen known as *Nosema bombi.*

Prior to 1998, the western bumble bee was both common and widespread throughout the western United States and western Canada. The U.S. states included in the former range of this species are: northern California, Oregon, Washington, Alaska, Idaho, Montana, western Nebraska, western North Dakota, western South Dakota, Wyoming, Utah, Colorado, northern Arizona, and New Mexico. Since 1998, this bumble bee has undergone a drastic decline throughout some areas of its former range. While viable populations still exist in Alaska and east of the Cascades in the Canadian and U.S. Rocky Mountains, the once common populations of central California, Oregon, Washington and southern British Columbia have largely disappeared. We are trying to find out how widespread this pattern is; unfortunately, most of this bee's historic range has never been systematically sampled.

CNDDB scoping for this species indicated 5 occurrences within the 9-quad search. Four occurrences were recorded in the Duncans Mills quadrangle from 1953 to 1979. One occurrence was recorded in the Duncans Mills quadrangle in 1991. The THP proposes to maintain habitat structure suitable for western bumble bee, therefore no significant adverse impacts are expected.

Other

California Freshwater Shrimp (Syncaris pacifica): (Status: Endangered)

California Freshwater shrimp are detritus feeders. They eat small decaying particles brought downstream to their pools. They brush up the food with tufts at the ends of their claws and lift it to their mouths. They are one of nature's garbage collectors.

California freshwater shrimp have evolved to survive a broad range of stream and water temperature conditions characteristic of small, perennial coastal streams. They have been found only in low-elevation less than 116 m (less than 380 feet) and low-gradient (generally less than 1 percent) streams. Excellent habitat conditions include streams of 30 to 91 cm (12 to 36) inches in depth with exposed live roots of trees such as alder and willow along undercut banks greater than 15 cm (6 inches). The banks have overhanging woody debris or stream vegetation and vines such as stinging nettles, grasses, vine maple and mint. Such areas may provide refuges from swift currents as well as some protection from high sediment concentrations associated with high stream flows. During the winter, the shrimp is found in undercut banks with exposed fine root systems or dense, overhanging vegetation.

CNDDB scoping for this species indicated 3 occurrences in the Valley Ford quadrangle in 2006, 2008, and 2011. The THP proposes to maintain canopy retention with Class I WLPZ along with a no harvest Core Zone, therefore no significant adverse impacts are expected.

Table 1. Rare Plants with Known Regional Occurrences or Distribution from CNDDB and CRPR Electronic Inventory

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
Plants				
pink sand-verbena *Abronia umbellata var. breviflora*	Rank 1B.1	Coastal dunes. Elevation ranges from 0-35 feet. Blooms Jun-Oct.	**No Potential.** This species is known to occur in coastal mesic habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Blasdale's bent grass *Agrostis blasdalei*	Rank 1B.2	Coastal bluff scrub, coastal dunes, coastal prairie. Elevation ranges from 0 to 490 feet. Blooms May-Jul.	**No Potential.** This species is known to occur in coastal mesic habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Franciscan onion *Allium peninsulare var. franciscanum*	Rank 1B.2	Cismontane woodland, Valley and foothill grassland/ clay, volcanic, often serpentinite. Elevation ranges from 170-1000 feet. Blooms (Apr) May-Jun.	**No Potential.** This species is known to occur in cismontane woodland and grassland habitat with volcanic or serpentine soil. The Study Area is comprised of North Coast coniferous forest without volcanic or serpentine soil and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

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SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
Sonoma alopecurus *Alopecurus aequalis var. sonomensis*	Rank 1B.1	Marshes and swamps (freshwater), Riparian scrub. 15- 1200 feet. Blooms May-Jul.	**Moderate Potential.** The Study Area does contain freshwater springs and riparian habitat and may provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
Napa false indigo *Amorpha californica var. napensis*	Rank 1B.2	Broadleafed upland forest (openings), Chaparral, Cismontane woodland Elevation ranges from 390-6560 feet. Blooms Apr-Jul.	**No Potential.** This species is known to occur in broadleaved upland forest, chaparral and cismontane woodland. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
bent-flowered fiddleneck *Amsinckia lunaris*	Rank 1B.2	Coastal bluff scrub, cismontane woodland, valley and foothill grassland. Elevation ranges from 10 to 1640 feet. Blooms Mar-Jun.	**No Potential.** This species is known to occur in coastal, cismontane woodland and grassland habitats. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
coast rockcress *Arabis blepharophylla*	Rank 4.3	Broadleafed upland forest, coastal bluff scrub, coastal scrub, coastal prairie. Elevation ranges from 9 to 3300 feet. Blooms Feb-May.	**No Potential.** This species is known to occur in broadleaved upland forest and coastal habitats. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Baker's manzanita *Arctostaphylos bakeri spp. bakeri*	CR Rank 1B.1	Broadleafed upland forest, chaparral, often serpentinite soils. Elevation ranges from 225-900 feet. Blooms Feb-Apr.	**No Potential.** This species is known to occur in broadleafed upland forest and chaparral habitat with serpentine soil. The Study Area is comprised of North Coast coniferous forest without serpentine soil and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
The Cedars manzanita *Arctostaphylos bakeri spp. sublaevis*	CR Rank 1B.2	Closed-cone coniferous forest, chaparral, often serpentinite seeps. Elevation ranges from 555-2280 feet. Blooms Feb, Apr, May	**No Potential.** This species is known to occur in closed-cone coniferous forest and chaparral habitat in serpentine seeps. The Study Area is comprised of North Coast coniferous forest without serpentine seeps and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Vine Hill manzanita *Arctostaphylos densiflora*	CE Rank 1B.1	Chaparral (acid marine sand). Elevation ranges from 150-360 feet. Blooms Feb- Apr.	**No Potential.** This species is known to occur in chaparral habitat in acid marine soil. The Study Area is comprised of North Coast coniferous forest without acid marine soil and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Howell's manzanita *Arctostaphylos hispidula*	Rank 4.2	Chaparral (serpentinite or sandstone). Elevation ranges from 360-3750 feet. Blooms Mar-Apr.	**No Potential.** This species is known to occur in chaparral habitat. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Rincon Ridge manzanita *Arctostaphylos stanfordiana ssp. decumbens*	Rank 1B.1	Chaparral (rhyolitic), Cismontane woodland. Elevation ranges from 245 to 1215 feet. Blooms Feb-Apr (May).	**No Potential.** This species is known to occur in chaparral and cismontane woodland habitat. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
Raiche's manzanita *Arctostaphylos raichei*	Rank 1B.1	Chaparral, lower montane coniferous forest (openings), rocky, often serpentinite soil. Elevations range from 1350-3105 feet. Blooms Feb-Apr.	**No Potential.** This species is known to occur in chaparral and lower montane coniferous forest habitat. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
serpentine milkweed *Asclepias solanoana*	Rank 4.2	Chaparral, Cismontane woodland, Lower montane coniferous forest/serpentinite. Elevation ranges from 750 to 6100 feet. Blooms May-Jul (Aug).	**No Potential.** This species is known to occur in chaparral, cismontane woodland and lower montane coniferous forest habitat. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Sonoma sunshine *Blemnosperma bakeri*	FE CE Rank 1B.1	Valley and foothill grassland (mesic), vernal pools. Elevation ranges from 30-330 feet. Blooms Mar-May.	**No Potential.** This species is known to occur in vernal pools and mesic grassland habitat. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
narrow-anthered brodiaea *Brodiaea leptandra*	Rank 1B.2	Broadleafed upland forest, Chaparral, Cismontane woodland, Lower montane coniferous forest, Valley and foothill grassland / volcanic. Elevation ranges from 360-3000 feet. Blooms May-Jul.	**No Potential.** This species is known to occur in chaparral, woodland, broadleafed upland forest, lower montane coniferous forest and grassland habitat with volcanic soils. The Study Area is comprised of North Coast coniferous forest without volcanic soils and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

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SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
Bolander's reed grass *Calamagrostis bolanderi*	Rank 4.2	Bogs and fens, Broadleafed upland forest, Closed-cone coniferous forest, Coastal scrub, Meadows and seeps (mesic), Marshes and swamps (freshwater), North Coast coniferous forest/mesic. Elevation ranges from 0-1495 feet. Blooms May-Aug.	**High Potential.** This species is known to occur in wet areas within forested habitats. The Study Area is comprised of North Coast coniferous forest with springs and watercourses and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
Thurber's reed grass *Calamagrostis crassiglumis*	Rank 2B.1	Coastal scrub (mesic), Marshes and swamps (freshwater). Elevations range from 30-345 feet. Blooms May-Aug.	**Moderate Potential.** This species is known to occur in coastal and freshwater marshes and swamp habitats. The Study Area is comprised of North Coast coniferous forest with springs and watercourses and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
serpentine reed grass *Calamagrostis ophitidis*	Rank 4.3	Chaparral (open, often north-facing slopes), Lower montane coniferous forest, Meadows and seeps, Valley and foothill grassland/ serpentinite, rocky. Elevation ranges from 295-3495 feet. Blooms Apr-Jul.	**No Potential.** This species is known to occur in chaparral, lower montane coniferous forest and grassland habitat with serpentinite soils. The Study Area is comprised of North Coast coniferous forest without serpentinite soils and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
The Cedar's fairy-lantern *Calochortus raichei*	Rank 1B.2	Closed-cone coniferous forest, chaparral (serpentinite soil). Elevation ranges from 600-1470 feet. Blooms May-Aug.	**No Potential.** This species is known to occur in chaparral and closed-cone coniferous forest habitat with serpentinite soils. The Study Area is comprised of North Coast coniferous forest without serpentinite soils and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

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SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
pink star-tulip *Calochortus uniflorus*	Rank 4.2	Coastal prairie, coastal scrub, meadows and seeps, North Coast coniferous forest. Elevation ranges from 30-3610 feet. Blooms Apr-Jun.	**High Potential.** This species is known to occur in coastal and North Coast coniferous forest habitats. The Study Area is comprised of North Coast coniferous forest and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
Mt. Saint Helena morning-glory *Calystegia collina ssp. oxyphylla*	Rank 4.2	Chaparral, Lower montane coniferous forest, Valley and foothill grassland/ serpentinite. Elevations range from 915-3315 feet. Blooms Apr-Jun.	**No Potential.** This species is known to occur in chaparral, lower montane coniferous forest and grassland habitat with serpentinite soils. The Study Area is comprised of North Coast coniferous forest without serpentinite soils and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
coastal bluff morning-glory *Calystegia purpurata ssp. saxicola*	Rank 1B.2	Coastal bluff scrub, Coastal dunes Coastal scrub, North Coast coniferous forest. Elevations range from 0-345 feet. Bloom (Mar) Apr-Sep.	**High Potential.** This species is known to occur in coastal and forest habitats. The Study Area is comprised of North Coast coniferous forest and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
swamp harebell *Campanula californica*	Rank 1B.2	North Coast coniferous forest, Marshes and swamps (freshwater), Bogs and fens, Closed-cone coniferous forest, Coastal prairie, Meadows and seeps/mesic. Elevation ranges from 0-1330 feet. Blooms Jun-Oct.	**High Potential.** This species is known to occur in wet areas within forested habitats. The Study Area is comprised of North Coast coniferous forest with springs and watercourses and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
bristly sedge *Carex comosa*	Rank 2B.1	Valley and foothill grasslands, Coastal prairie, Marshes and swamps (margins). Elevation ranges from 0-1875 feet. Bloom May-Sep.	**Moderate Potential.** This species is known to occur in mesic habitats. The Study Area does contain freshwater wet areas that may provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
johnny-nip *Castilleja ambigua var. ambigua*	Rank 4.2	Coastal bluff scrub, Coastal prairie, Coastal scrub, Marshes and swamps, Valley and foothill grassland, Vernal pools margins. Elevation ranges from 0-1425 feet. Bloom Apr-Aug.	**Moderate Potential.** This species is known to occur in coastal and mesic habitats. The Study Area is comprised of North Coast coniferous forest with freshwater wet areas and may provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
Monterey Coast paintbrush *Castilleja latifolia*	Rank 4.3	Closed-cone coniferous forest, Cismontane woodland (openings), Coastal dunes, Coastal scrub/sandy. Elevation ranges from 0-555 feet. Bloom Feb-Sep.	**No Potential.** This species is known to occur in coastal, closed-cone coniferous forest and cismontane woodland habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Pitkin Marsh paintbrush *Castilleja ulignosa*	CE Rank 1A	Marshes and swamps (freshwater). Blooms Jun-Jul.	**Moderate Potential.** This species is known to occur in freshwater wet areas. The Study Area is comprised of North Coast coniferous forest with freshwater wet areas and may provide suitable habitat for this species .	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.

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SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
Rincon Ridge ceanothus *Ceanothus confusus*	Rank 1B.1	Closed-cone coniferous forest, Chaparral, Cismontane woodland/ volcanic or serpentinite. Elevation ranges from 245-3495 feet. Blooms Feb-Jun.	**No Potential.** This species is known to occur in chaparral, cismontane woodland and closed-cone coniferous forest habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Vine Hill ceanothus *Ceanothus foliosus var. vineatus*	Rank 1B.1	Chaparral. Elevations ranges from 120-915 feet. Blooms Mar-May.	**No Potential.** This species is known to occur in chaparral habitat not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
glory brush *Ceanothus gloriosus var. exaltatus*	Rank 4.3	Chaparral. Elevations range from 95-2000 feet. Bloom Mar-Jun (Aug).	**No Potential.** This species is known to occur in chaparral habitat. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Point Reyes ceanothus *Ceanothus gloriosus var. gloriosus*	Rank 4.3	Coastal bluff scrub, Closed-cone coniferous forest, Coastal dunes, Coastal scrub/sandy. Elevation ranges from 15-1705 feet. Bloom Mar-May.	**No Potential.** This species is known to occur in mesic coastal and closed-cone coniferous forest habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

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SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
holly-leaved ceanothus *Ceanothus purpureus*	Rank 1B.2	Chaparral, Cismontane woodland/volcanic, rocky. Elevation ranges from 390-2100 feet. Bloom Feb-Jun.	**No Potential.** This species is known to occur in chaparral and woodland habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
pappose tarplant *Centromadia parryi ssp. parryi*	Rank 1B.2	Chaparral, Coastal prairie, Meadows and seeps, Marshes and swamps (coastal salt), Valley and foothill grassland (vernally mesic)/ often alkaline. Elevation ranges from 0-1380 feet. Blooms May-Nov.	**No Potential.** This species is known to occur in chaparral, coastal, vernally mesic grasslands, and coastal salt marsh and swamp habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
dwarf soaproot *Chlorogalum pomeridianum var. minus*	Rank 1B.2	Chaparral (serpentinite). Elevation ranges from 915-3000 feet. Blooms May-Aug.	**No Potential.** This species is known to occur in chaparral habitat not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Point Reyes bird's beak *Chloropyron maritimum*	Rank 1B.2	Marshes and swamps (coastal salt). Elevation ranges from 0-30 feet. Blooms Jun-Oct.	**No Potential.** This species is known to occur in coastal salt marsh and swamp habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

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SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
San Francisco Bay spineflower *Chorizanthe cuspidata var. cuspidata*	Rank 1B.2	Coastal bluff scrub, coastal dunes, coastal prairie, coastal scrub; sandy. Elevation ranges from 9-645 feet. Blooms Apr-Jul (Aug).	**No Potential.** This species is known to occur in coastal habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
woolly-headed spineflower *Chorizanthe cuspidata var. villosa*	Rank 1B.2	Coastal dunes, coastal prairie, coastal scrub; sandy. Elevation ranges from 9-180 feet. Blooms May-Jul (Aug).	**No Potential.** This species is known to occur in coastal habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Sonoma spineflower *Chorizanthe valida*	FE CE Rank 1B.1	Coastal prairie (sandy). Elevation ranges from 30-915 feet. Blooms Jun-Aug.	**No Potential.** This species is known to occur in coastal prairie habitat not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Franciscan thistle *Circium andrewsii*	Rank 1B.2	Broadleafed upland forest, coastal bluff scrub, coastal prairie, coastal scrub (mesic, sometime serpentinite). Elevation ranges from 0-450 feet. Blooms Mar-Jul.	**No Potential.** This species is known to occur in coastal and broadleaf upland forest habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
Vine Hill clarkia *Clarkia imbricata*	FE CE Rank 1B.1	Chaparral, valley and foothill grassland (acidic sandy loam). Elevation ranges from 150-225 feet. Blooms Jun-Aug.	**No Potential.** This species is known to occur in chaparral and grassland habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
serpentine collomia *Collomia diversifolia*	Rank 4.3	Chaparral, Cismontane woodland/ serpentinite, rocky or gravelly. Elevation ranges from 655-1970 feet. Blooms May-Jun.	**No Potential.** This species is known to occur in coastal habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
serpentine bid's -beak *Cordylanthus tenuis ssp. bruneus*	Rank 4.3	Closed-cone coniferous forest, chaparral, cismontane woodland, usually serpentinite. Elevation ranges from 915- 2745 feet. Bloom Jul-Aug.	**No Potential.** This species is known to occur in chaparral, cismontane and closed-cone forest habitats with a strong affinity to serpentine soils not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Pennell's bird's-beak *Cordylanthus tenuis ssp. capillaris*	FE CR Rank 1B.2	Closed-cone coniferous forest, chaparral (serpentinite). Elevation ranges from 135-915 feet. Blooms Jun-Sep.	**No Potential.** This species is known to occur in chaparral and closed-cone forest habitats with a strong affinity to serpentine soils not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

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SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
Peruvian dodder *Cuscuta obtusiflora var. glanulosa*	Rank 2B.2	Marshes and swamps (freshwater). Elevation ranges from 45-840 feet. Blooms Jul-Oct.	**Moderate Potential.** This species is known to occur in freshwater wet areas. The Study Area is comprised of North Coast coniferous forest with freshwater wet areas and may provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
Mendocino dodder *Cuscuta pacifica var. papillate*	Rank 1B.2	Coastal dunes (interdune depressions). Elevation ranges from 0-165 feet. Bloom (Jun) Jul-Oct.	**No Potential.** This species is known to occur in coastal habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
California lady's-slipper *Cypripedium californicum*	Rank 4.2	Lower montane coniferous forest, bogs and fens, in perennial seepages on serpentine substrate and in gravel along creek margins, often in wetlands within yellow pine forest, freshwater wetland and wetland-riparian communities. Elevation ranges from 99 to 9023 feet. Blooms Apr-Aug (Sep).	**No Potential.** This species is known to occur in wetlands within yellow pine forests. The Study Area is comprised of North Coast coniferous forest without yellow pine trees and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
mountain lady's-slipper *Cypripedium montanum*	Rank 4.2	Lower montane coniferous forest, broadleaved upland forest, cismontane woodland, North Coast coniferous forest, often on dry, undisturbed slopes. Elevation ranges from 607 to 7300 feet. The blooming period is from Mar-Aug.	**High Potential.** This species is known to occur in forested habitats. The Study Area is comprised of North Coast coniferous forest and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
Baker's larkspur *Delphinium bakeri*	FE CE Rank 1B.1	Broadleafed upland forest, coastal scrub, valley and foothill grassland (decomposed shale, often mesic. Elevation ranges from 240-915 feet. Bloom Mar-May.	**No Potential.** This species is known to occur in broadleafed upland forest, coastal and grassland habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
golden larkspur *Delphinium luteum*	FE CR Rank 1B.1	Chaparral, coastal prairie, coastal scrub (rocky). Elevation ranges from 0-300 feet. Blooms Mar-May.	**No Potential.** This species is known to occur in coastal and chaparral habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
western leatherwood *Dirca occidentalis*	Rank 1B.2	Broadleafed upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, North Coast coniferous forest, riparian forest, riparian woodland. Elevation ranges from 75-1275 feet. Blooms Jan-Mar (Apr).	**High Potential.** This species is known to occur in chaparral, woodland and forested habitats. The Study Area is comprised of North Coast coniferous forest and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
dwarf downingia *Downingia pusilla*	Rank 2B.2	Valley and foothill grassland (mesic), Vernal pools. Elevation ranges from 0-1460 feet. Blooms Mar-May.	**No Potential.** This species is known to occur in vernal pool and grassland habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

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SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
small spikerush *Eleocharis parvula*	Rank 4.3	Marshes and swamps (coastal salt marsh). Elevation ranges from 3-9060 feet. Blooms (Apr) Jun-Aug (Sep).	**No Potential.** This species is known to occur in coastal salt marsh and swamp habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
California bottle-brush grass *Elymus californicus*	Rank 4.3	Broadleafed upland forest, cismontane woodland, North Coast coniferous forest, riparian woodland. Elevation ranges from 45-1410 feet. Blooms May-Aug (Nov).	**High Potential.** This species is known to occur in woodland and forested habitats. The Study Area is comprised of North Coast coniferous forest and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
streamside daisy *Erigeron biolettii*	Rank 3	Broadleafed upland forest, Cismontane woodland, North Coast coniferous forest/ rocky, mesic. Elevation ranges from 95-3610 feet. Blooms Jun-Oct.	**High Potential.** This species is known to occur in woodland and forested habitats. The Study Area is comprised of North Coast coniferous forest and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
Greene's narrow-leaved daisy *Erigeron greenei*	Rank 1B.2	Chaparral (serpentinite or volcanic). Elevation ranges from 260-3295 feet. Blooms May-Sep.	**No Potential.** This species is known to occur in chaparral habitat with serpentinite or volcanic soils not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
serpentine daisy *Erigeron serpentinus*	Rank 1B.3	Chaparral (serpentinite, seeps). Elevation ranges from 180-2010 feet. Blooms May-Aug.	**No Potential.** This species is known to occur in chaparral habitat with serpentinite soil not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
The Cedars buckwheat *Eriogonum cedrorum*	Rank 1B.3	Closed-cone coniferous forest (serpentinite). Elevation ranges from 1095-1650 feet. Blooms Jun-Sep.	**No Potential.** This species is known to occur in closed-cone coniferous forest habitat with serpentinite soil not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
ternate buckwheat *Eriogonum ternatum*	Rank 4.3	Lower montane coniferous forest (serpentinite). Elevation ranges from 915-6675 feet. Blooms Jun-Aug.	**No Potential.** This species is known to occur in lower montane coniferous forest habitat with serpentinite soil not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
slender cottongrass *Eriophorum gracile*	Rank 4.3	Bogs and fens, meadows and seeps, upper montane coniferous forest (acidic). Elevation ranges from 5840-8700 feet. Blooms May-Sep.	**No Potential.** This species is known to occur in upper montane coniferous forest, bogs, fens and seep habitat with acidic soil not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
bluff wallflower *Erysimum concinnum*	Rank 1B.2	Coastal bluff scrub, Coastal dunes, Coastal prairie. Elevation ranges from 0-605 feet. Bloom Feb-Jul.	**No Potential.** This species is known to occur in coastal habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
San Francisco wallflower *Erysimum fraciscanum*	Rank 4.2	Chaparral, coastal dunes, coastal scrub, valley and foothill grassland (often serpentinite or granitic, sometimes roadsides). Elevation ranges from 0-1650 feet. Blooms Mar-Jun.	**No Potential.** This species is known to occur in coastal, chaparral and grassland habitats in serpentinite soil not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
coast fawn lily *Erythronium revolutum*	Rank 2B.2	Bogs and fens broadleafed upland forest, North Coast coniferous forest/ mesic, streambanks. Elevations ranges from 0-4800 feet. Bloom Mar- Jul (Aug).	**High Potential.** This species is known to occur in wet areas within forested habitats. The Study Area is comprised of North Coast coniferous forest with springs and watercourses and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
bare monkeyflower *Erythranthe nudata*	Rank 4.3	Chaparral, Cismontane woodland/ serpentinite seeps. Elevation ranges from 600-1200 feet. Bloom May-Jun.	**No Potential.** This species is known to occur in chaparral and woodland habitats in serpentinite soil not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
Minute pocket moss *Fissidens pauperculus*	Rank 1B.2	North Coast coniferous forest (damp coastal soil). Elevation ranges from 30-3072 feet.	**High Potential.** This species is known to occur in North Coast coniferous forest habitats. The Study Area is comprised of North Coast coniferous forest and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
fragrant fritillary *Fritillaria liliacea*	Rank 1B.2	Cismontane woodland, coastal prairie, coastal scrub, valley and foothill grassland/ often serpentinite. Elevation ranges from 5-1345 feet. Blooms Feb-Apr.	**No Potential.** This species is known to occur in coastal, woodland and grassland habitats, often in serpentinite soil not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
blue coast gilia *Gilia capitate ssp. chamissonis*	Rank 1B.1	Coastal dunes, coastal scrub. Elevation ranges from 6-600 feet. Blooms Apr-Jul.	**No Potential.** This species is known to occur in coastal habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Pacific gilia *Gilia capitata ssp. pacifica*	Rank 1B.2	Coastal bluff scrub, Chaparral (openings), Coastal prairie, Valley and foothill grassland. Elevation ranges from 15-5465 feet. Bloom Apr-Aug.	**No Potential.** This species is known to occur in coastal and grassland habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

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SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
woolly-headed gilia *Gilia capitate ssp. tomentosa*	Rank 1B.1	Coastal bluff scrub, valley and foothill grassland (serpentinite, rocky, outcrops).	**No Potential.** This species is known to occur in coastal and grassland habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
dark-eyed gilia *Gilia millefoliata*	Rank 1B.2	Coastal dunes. Elevation ranges from 5-100 feet. Bloom Apr-Jul.	**No Potential.** This species is known to occur in coastal dunes not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
congested-headed hayfield tarplant *Hemizonia congesta ssp. congesta*	Rank 1B.2	Valley and foothill grassland/ sometimes roadsides. Elevation ranges from 65-1835 feet. Bloom Apr-Nov.	**No Potential.** This species is known to occur in grassland not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Hogwallow starfish *Hesperevax caulescens*	Rank 4.2	Valley and foothill grassland (mesic, clay), vernal pools (shallow). Elevations 0-1515 feet. Blooms Mar-Jun.	**No Potential.** This species is known to occur in vernal pools and grassland habitat not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
short-leaved evax *Hesperevax sparsiflora var. brevifolia*	Rank 1B.2	Coastal bluff scrub (sandy), Coastal dunes, Coastal prairie. Elevation ranges from 0-705 feet. Bloom Mar-Jun.	**No Potential.** This species is known to occur in coastal habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
pygmy cypress *Hesperocyparis pygmaea*	Rank 1B.2	Closed-cone coniferous forest (usually podzol-like soil). Elevation ranges from 95-1970 feet.	**No Potential.** This species is known to occur in a closed-cone coniferous forest habitat with podzol-like soil not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Point Reyes horkelia *Horkelia marinensis*	Rank 1B.2	Coastal dunes, Coastal prairie, Coastal scrub/ sandy. Elevation ranges from 15-2475 feet. Bloom May-Sep.	**No Potential.** This species is known to occur in coastal habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Thin-lobed horkelia *Horkelia tenuiloba*	Rank 1B.2	Broadleafed upland forest, chaparral, valley and foothill grassland (mesic openings, sandy). Elevation ranges from 150-1500 feet.	**No Potential.** This species is known to occur in chaparral, broadleafed upland forest and grassland habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

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SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
harlequin lotus *Hosackia gracilis*	Rank 4.2	Broadleafed upland forest, Coastal bluff scrub, Closed-cone coniferous forest, Cismontane woodland, Coastal prairie, Coastal scrub, Meadows and seeps, Marshes and swamps, North Coast coniferous forest, Valley and foothill grassland/wetlands, roadsides. Elevations range from 0-2295 feet. Bloom Mar-Jul.	**High Potential.** This species is known to occur on roads and wet areas within forested and grassland habitats. The Study Area is comprised of North Coast coniferous forest with springs and watercourses and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
coast iris *Iris longipetala*	Rank 4.2	Coastal prairie, Lower montane coniferous forest, Meadows and seeps (mesic). Elevation ranges from 0-1800 feet. Bloom Mar-May.	**Moderate Potential.** This species is known to occur in mesic coastal, meadows and seeps and forested habitats. The Study Area is comprised of North Coast coniferous forest with springs and watercourses and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
Northern California black walnut *Juglans hindsii*	Rank 1B.1	Riparian forest, Riparian woodland. Elevation ranges from 0-1445 feet. Blooms Apr-May.	**Moderate Potential.** This species is known to occur in riparian forest and woodland habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest with riparian forest along the Russian River and may provide suitable habitat for this species.	**Present**. This species is located within the riparian area of the Russian River and within the Core Zone, which is a no-cut zone. Therefore, no northern CA black walnut shall be removed or damaged from trees outside the no cut zone being removed. No further recommendations for this species.
Small groundcone *Kopsiopsis hookeri*	Rank 2B.3	North Coast coniferous forest. Elevation ranges from 270-2555 feet. Blooms Apr-Aug.	**High Potential.** This species is known to occur within North Coast coniferous forest. The Study Area is comprised of North Coast coniferous forest with springs and watercourses and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.

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SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
Burke's goldfields *Lasthenia burkei*	CE FE Rank 1B.1	Closed-cone coniferous forest (openings), Coastal scrub, Meadows and seeps, Marshes and swamps. Elevation ranges from 195-1705 feet. Bloom Apr-Oct.	**Moderate Potential.** This species is known to occur in wet areas, coastal and closed-cone coniferous forest habitats. The Study Area is comprised of North Coast coniferous forest with springs and watercourses and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
Baker's goldfields *Lasthenia californica ssp. bakeri*	Rank 1B.2	Closed-cone coniferous forest (openings), coastal scrub, meadows and seeps, marshes and swamps. Elevation ranges from 180-1560 feet. Blooms Apr-Oct.	**Moderate Potential.** This species is known to occur in wet areas, coastal and closed-cone coniferous forest habitats. The Study Area is comprised of North Coast coniferous forest with springs and watercourses and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
perennial goldfields *Lasthenia californica ssp. macrantha*	Rank 1B.2	Coastal bluff scrub, Coastal dunes, Coastal scrub. Elevation ranges from 15-1705 feet. Bloom Jan-Nov.	**No Potential.** This species is known to occur in coastal habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Contra Costa goldfields *Lasthenia conjugens*	FE Rank 1B.1	Cismontane woodland, Playas (alkaline), Valley and foothill grassland, Vernal pools/ mesic. Elevation ranges from 0-1540 feet. Blooms Mar-Jun.	**No Potential.** This species is known to occur in woodland, grassland and vernal pool habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
legenere *Legenere limosa*	Rank 1B.1	Vernal pools. Elevation ranges from 3-2640 feet. Blooms Apr-Jun.	**No Potential.** This species is known to occur in vernal pool habitat not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
bristly leptosiphon *Leptosiphon acicularis*	Rank 4.2	Chaparral, Cismontane woodland, Coastal prairie, Valley and foothill grassland. Elevations range from 180-4920 feet. Bloom Apr-Jul.	**No Potential.** This species is known to occur in woodland, grassland, coastal and chaparral habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
large-flowered leptosiphon *Leptosiphon grandiflorus*	Rank 4.2	Coastal bluff scrub, closed-cone coniferous forest, cismontane woodland, coastal dunes, coastal prairie, coastal scrub, valley and foothill grassland. Elevation ranges from 15-3660 feet. Blooms Apr-Aug.	**No Potential.** This species is known to occur in woodland, grassland, coastal and closed-cone coniferous forest habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Jepson's leptosiphon *Leptosiphon jepsonii*	Rank 1B.2	Chaparral, Valley and foothill grassland, Cismontane woodland/ usually volcanic. Elevation ranges from 325-1640. Bloom Mar-May.	**No Potential.** This species is known to occur in woodland, grassland and chaparral habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
Rose leptosiphon *Leptosiphon rosaceus*	Rank 1B.1	Coastal bluff scrub. Elevation ranges from 0-300 feet. Blooms Apr-Jul.	**No Potential.** This species is known to occur in coastal bluff scrub habitat not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Crystal Springs lessingia Lessingia arachnoidea	Rank 1B.2	Cismontane woodland, coastal scrub, valley and foothill grassland (serpentinite, often roadsides). Elevation ranges from 180-600 feet. Blooms Jul-Oct.	**No Potential.** This species is known to occur in woodland and grassland habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
woolly-headed lessingia *Lessingia hololeuca*	Rank 3	Broadleafed upland forest, Coastal scrub, Lower montane coniferous forest, Valley and foothill grassland/ clay, serpentinite. Elevation ranges from 45-1000 feet. Blooms Jun-Oct.	**No Potential.** This species is known to occur in broadleafed upland forest, lower montane coniferous forest, grassland and coastal habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Pitkin Marsh lily *Lilium pardalinum ssp. pitkinense*	FE CE Rank 1B.1	Cismontane woodland, meadows and seeps, marshes and swamps (freshwater)/ mesic, sandy. Elevation ranges from 105-195 feet. Blooms Jun-Jul.	**Unlikely.** This species is known to occur in woodland and mesic habitats in sandy soil not found within the Study Area. The Study Area is comprised of North Coast coniferous forest with wet areas; however, does not have sandy soil and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
Sebastopol meadowfoam *Limnanthes vinculans*	CE FE Rank 1B.1	Meadows and seeps, Valley and foothill grassland, Vernal pools/ vernally mesic. Elevation ranges from 45-1000 feet. Blooms Apr-May.	**Unlikely.** This species is known to occur in grassland and mesic habitats that are vernally mesic not found within the Study Area. The Study Area is comprised of North Coast coniferous forest with wet areas; however, does not have vernally mesic areas and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Tidestrom's lupine *Lupinus tidestromii*	FE CE Rank 1B.1	Coastal dunes. Elevation ranges from 0-300 feet. Blooms Apr-Jun.	**No Potential.** This species is known to occur in coastal dune habitat not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
marsh microseris *Microseris paludosa*	Rank 1B.2	Closed-cone coniferous forest, cismontane woodland, coastal scrub, valley and foothill grassland. Elevation ranges from 15-1065 feet.	**No Potential.** This species is known to occur in closed-cone coniferous forest, woodland, grassland and coastal habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
green monardella *Monardella viridis*	Rank 4.3	Broadleafed upland forest, Chaparral, Cismontane woodland. Elevation ranges from 325-3315 feet. Blooms Jun-Sep.	**No Potential.** This species is known to occur in broadleafed upland forest, chaparral and woodland habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
Baker's navarretia *Navarretia leucocephala ssp. bakeri*	Rank 1B.1	Cismontane woodland, meadows and seeps, vernal pools and swales, valley and foothill grassland, lower montane coniferous forest/ adobe or alkaline soils. Elevation ranges from 10 to 5512 feet. The blooming period is from Apr-Jul.	**No Potential.** The Study Area does not contain adobe or alkaline soils, vernal pools, grassland or cismontane woodland and does not provide suitable habitat for this species	**Not Present.** No further recommendations for this species.
many-flowered navarretia *Navarretia leucocephala ssp. plieantha*	CE FE Rank 1B.1	Vernal pools (volcanic ash flow). Elevation ranges from 90-2850 feet. Bloom May-Jun.	**No Potential.** This species is known to occur in vernal pools. The Study Area is comprised of North Coast coniferous forest without vernal pools and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Gairdner's yampah *Perideridia gairdneri ssp. gairdneri*	Rank 4.2	Broadleafed upland forest, chaparral, coastal prairie, valley and foothill grassland, vernal pools/ vernally mesic. Elevation ranges from 0-1830 feet. Blooms Jun-Oct.	**No Potential.** This species is known to occur in vernally mesic habitats. The Study Area is comprised of North Coast coniferous forest without vernally mesic areas and does not provide suitable habitat for this species.	**Not Present**. No further recommendations for this species.
white-flowered rein orchid *Piperia candida*	Rank 1B.2	Broadleafed upland forest, Lower montane coniferous forest, North Coast coniferous forest/ sometimes serpentinite. Elevation ranges from 95-4300 feet. Bloom (Mar) May-Sep.	**High Potential.** This species is known to occur in forested habitats. The Study Area is comprised of North Coast coniferous forest and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
narrow-petaled rein orchid *Piperia leptopetala*	Rank 4.3	Cismontane woodland, lower montane coniferous forest, upper montane coniferous forest. Elevation ranges from 1140-6675 feet. Blooms May-Jul.	**No Potential.** This species is known to occur in upper and lower montane coniferous forest and woodland habitats. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
North Coast semaphore grass *Pleuropogon hooverianus*	CT Rank 1B.1	North Coast coniferous forest, broadleafed upland forest, meadows and seeps/ open areas, mesic. Elevation ranges from 30-2013 feet. Blooms Apr-Jun.	**High Potential.** This species is known to occur in wet areas within forested and grassland habitats. The Study Area is comprised of North Coast coniferous forest with springs and watercourses and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
Oregon polemonium *Polemonium carneum*	Rank 2B.2	Coastal prairie, coastal scrub, lower montane coniferous forest. Elevation ranges from 0-5490 feet. Blooms Apr-Sep.	**No Potential.** This species is known to occur in coastal and lower montane coniferous forest habitats. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Marin knotweed *Polygonum marinense*	Rank 3.1	Marshes and swamps (coastal salt or brackish). Elevation ranges from 0-30 feet. Blooms (Apr) May-Aug (Oct).	**Unlikely.** This species is known to occur in coastal salt or brackish marsh and swamp habitat not found within the Study Area. The Study Area is comprised of North Coast coniferous forest with wet areas; however, is not influenced by coastal salt and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Cunningham Marsh cinquefoil *Potentilla uliginosa*	Rank 1A.	Marshes and swamps (freshwater, permanent oligotrophic wetlands). Elevation ranges from 90-120 feet. Blooms May-Aug.	**Unlikely.** This species is known to occur in permanent marsh and swamp habitat not found within the Study Area. The Study Area is comprised of North Coast coniferous forest with wet areas; however, are not permanent and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
Lobb's aquatic buttercup *Ranunculus lobbii*	Rank 4.2	Cismontane woodland, North Coast coniferous forest, Valley and foothill grassland, Vernal pools/mesic. Elevation ranges from 45-1540 feet. Bloom Feb-May.	**High Potential.** This species is known to occur in wet areas within forested and grassland habitats. The Study Area is comprised of North Coast coniferous forest with springs and watercourses and does provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
white beaked-rush *Rhynchospora alba*	Rank 2B.2	Bogs and fens, Meadows and seeps, Marshes and swamps (freshwater). Elevation ranges from 195-6695 feet. Bloom Jun-Aug.	**Moderate Potential.** This species is known to occur in mesic habitats. The Study Area is comprised of North Coast coniferous forest with wet areas and may provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
California beaked-rush *Rhynchospora californica*	Rank 1B.1	Bogs and fens, lower montane coniferous forest, meadows and seeps (seeps), marshes and swamps (freshwater). Elevation ranges from 135-3030 feet. Blooms May-Jul.	**Moderate Potential.** This species is known to occur in mesic habitats. The Study Area is comprised of North Coast coniferous forest with wet areas and may provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
brownish beaked-rush *Rhynchospora capitellata*	Rank 2B.2	Lower montane coniferous forest, meadows and seeps, marshes and swamps, upper montane coniferous forest. 135-6000 feet. Blooms Jul-Aug.	**Moderate Potential.** This species is known to occur in mesic habitats. The Study Area is comprised of North Coast coniferous forest with wet areas and may provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
round-headed beaked-rush *Rhynchospora globularis*	Rank 2B.1	Marshes and swamps (freshwater). Elevation ranges from 135-180 feet. Blooms Jul-Aug.	**Moderate Potential.** This species is known to occur in mesic habitats. The Study Area is comprised of North Coast coniferous forest with wet areas and may provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
Point Reyes checkerbloom *Sidalcea calycosa ssp. rhizomata*	Rank 1B.2	Marshes and swamps (freshwater, near coast). Elevation ranges from 9-225 feet. Blooms Apr-Sep.	**Unlikely.** This species is known to occur in marsh and swamp habitat near the coast. The Study Area is comprised of North Coast coniferous forest with wet areas; however, is not located near the coast and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Marin checkerbloom *Sidalcea hickmanii ssp. viridis*	Rank 1B.1	Chaparral (serpentinite). Elevation ranges from 150-1290 feet. Blooms May-Jun.	**No Potential.** This species is known to occur in serpentinite chaparral habitat. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
purple-stemmed checkerbloom *Sidalcea malviflora ssp. purpurea*	Rank 3.2	Broadleafed upland forest, Coastal prairie. Elevation ranges from 45-280 feet. Bloom May-Jun.	**No Potential.** This species is known to occur in coastal and broadleafed upland forest habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Scouler's catchfly *Silene scouleri ssp. scouleri*	Rank 2B.2	Coastal bluff scrub, coastal prairie, valley and foothill grassland. Elevation ranges from 0-1800 feet. Blooms (Mar-May) Jun-Aug (Sep).	**No Potential.** This species is known to occur in coastal and grassland habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
bearded jewelflower *Streptanthus barbiger*	Rank 4.2	Chaparral (serpentinite). Elevation ranges from 450-3210 feet. Blooms May-Jul.	**No Potential.** This species is known to occur in serpentinite chaparral habitat. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Hoffman's bristly jewelflower *Streptanthus glandulosus ssp. hoffmani*	Rank 1B.3	Chaparral, cismontane woodland, valley and foothill grassland (often serpentinite). Elevation ranges from 360-1425 feet.	**No Potential.** This species is known to occur in serpentinite chaparral, woodland and grassland habitats. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Three Peaks jewelflower *Streptanthus morrisonii ssp. elatus*	Rank 1B.2	Chaparral (serpentinite). Elevation ranges from 295-2675 feet. Bloom Jun-Sep.	**No Potential.** This species is known to occur in serpentinite chaparral habitat. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Dorr's Cabin jewelflower *Streptanthus morrisonii ssp. hirtiflorus*	Rank 1B.1	Closed-cone coniferous forest, chaparral (serpentinite). Elevation ranges from 555-2460 feet. Blooms Jun.	**No Potential.** This species is known to occur in serpentinite chaparral and closed-cone coniferous forest habitats. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Morrion's jewelflower *Streptanthus morrisonii ssp. morrisonii*	Rank 1B.2	Chaparral (serpentinite). Elevation ranges from 360-1755 feet. Bloom Jun-Sep.	**No Potential.** This species is known to occur in serpentinite chaparral habitat. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

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SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
whiteworm lichen *Thamnolia vermicularis*	Rank 2B.1	Chaparral, valley and foothill grassland/ on rocks derived from sandstone.	**No Potential.** This species is known to occur in grassland and chaparral habitats. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
two-fork clover *Trifolium amoenum*	Rank 1B.1 FE	Coastal bluff scrub, Valley and foothill grassland (sometimes serpentinite). Elevation ranges from 15-1360 feet. Blooms Apr-Jun.	**No Potential.** This species is known to occur in serpentinite coastal and grassland habitats. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Santa Cruz clover *Trifolium buckwestiorum*	Rank 1B.1	Coastal prairie, broadleaved upland forest, cismontane woodland, often found in moist grasslands along gravelly margins. Elevation ranges from 99 to 2641 feet. Blooms Apr-Oct.	**Unlikely.** This species is known to occur in coastal, cismontane woodland and broadleaved upland forest habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
saline clover *Trifolium hydrophilum*	Rank 1B.2	Marshes and swamps, Valley and foothill grassland (mesic, alkaline), Vernal pools. Elevation ranges from 0-985 feet. Blooms Apr-Jun.	**Moderate Potential.** This species is known to occur in mesic habitats. The Study Area is comprised of North Coast coniferous forest with wet areas and may provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.

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SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN THE PROJECT AREA	RECOMMENDATIONS
San Francisco owl's clover *Triphysaria floribunda*	Rank 1B.2	Coastal prairie, coastal scrub, valley and foothill grassland/ usually serpentinite. Elevation ranges from 30-480 feet. Blooms Apr-Jun.	**Unlikely.** This species is known to occur in coastal, grassland habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
coastal triquetrella *Triquetrella californica*	Rank 1B.2	Coastal bluff scrub, Coastal scrub. Elevation ranges from 30-330 feet.	**No Potential.** This species is known to occur in coastal habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.
Methuselah's beard lichen *Usnea longissima*	Rank 4.2	Broadleafed upland forest, North Coast coniferous forest on tree branches; usually on old growth hardwoods and conifers. Elevations range from 160-4790 feet.	**High Potential.** This species is known to occur in forested habitats. The Study Area is comprised of North Coast coniferous forest and may provide suitable habitat for this species.	**Not Observed.** This species was not observed during the botanical surveys. No further recommendations for this species.
oval-leaved viburnum *Viburnum ellipticum*	Rank 2B.3	Chaparral, Cismontane woodland, Lower montane coniferous forest. Elevation ranges from 705-4595 feet. Blooms May-Jun.	**Unlikely.** This species is known to occur in chaparral, cismontane woodland and lower montane coniferous forest habitats not found within the Study Area. The Study Area is comprised of North Coast coniferous forest and does not provide suitable habitat for this species.	**Not Present.** No further recommendations for this species.

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Botanical Resources

Botanical surveys were completed by Jacobszoon and Associates Botanist Alicia Ringstad during the preparation of this plan. Prior to conducting surveys, the California Native Plant Society (CNPS) Electronic Inventory of Rare or Endangered Vascular Plants of California and the California National Diversity Data Base (CNDDB) were reviewed to develop a scoping list of potential listed plant species and their habitats. Focused surveys were conducted on 3/14/19, 3/15/19, 5/3/19, 5/6/19, 6/11/19, 6/17/19, 7/1/19, and 7/9/19 for a total of 64 one-person survey hours. The surveys were conducted in a manner consistent with the Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities (CDFG 2009). The Botany Survey is included in Section V.

General Protections:
If a listed plant species is found requiring protection, a EEZ buffer of 50 feet will be established, except where located near a road, where the edge of the road will be the EEZ boundary. The EEZ will be flagged on the ground prior to operations. Trees to be harvested within the EEZ shall be felled away from the core plant populations designated with the EEZ. If the plant population is located on a feature which cannot be avoided, DFW will be consulted and site specific mitigations will be developed and amended into the THP.

A Northern California Black Walnut (*Juglans hindii*) was discovered within the plan area. However, the tree was located within the No Harvest Core Zone WLPZ of the Russian River. The THP WLPZ rules provide adequate protection measures.

Post Approval Discovery Mitigation:
Should a listed plant species be discovered during the timber operations, a 50-foot diameter EEZ shall be flagged around the area and the CDF, DFW, and the plan submitter or his agent shall be immediately notified. If protections are required an amendment shall be filed reflecting such additional protection as is agreed between the plan submitter and the Director after consultation with DFW.

During the pre-operations meeting with the LTO, the RPF will explain the characteristics of wet areas, the location of mapped wet areas, and the importance of protecting them. The RPF will also explain the importance of not operating heavy equipment on saturated soils.

The following table is a botanical list of rare, threatened and endangered species and species of special concern that may be associated with the plan area:

The combination of botanical surveys, existing WLPZ protections, and the general protections listed above will further ensure that the botanical resources are not adversely impacted by the proposed operations.

No other endangered, and threatened, or species of special concern are known to be associated with the assessment area.

Aquatic and Near-Water Habitat Conditions

Pools and Riffles
These habitats are found within the assessment area along Mays Canyon Creek and the Russian River. Mays Canyon Creek is considered a fourth order stream. The Russian River is considered a fourth order stream.

Riffles are areas of swifter flowing water, where the surface is turbulent. Young-of-the-year steelhead like low gradient riffles but coho generally does not. The flowing water delivers insects for food and the broken surface provides cover from predators. Glides (flatwater) are slow moving areas in the stream, where the surface is smooth. Often, streams suffering from cumulative watershed effects have a large percentage of flatwater habitats, such as glides and runs, and riffles. Pools often have filled in and represent a small percentage of habitat types. Plunge pools are formed where water falls over a boulder or log. The falling water scours a hole where juvenile and adult fish often hide. Backwater pools are formed as water swirls around an obstacle such as a root wad, boulder, or stream bank.

The Russian River Stream Habitat Metrics show habitat types for the reach of the Russian River associated with the plan area as follows, 11.8% pools, 34.2% riffles, 53.6% flatwater by channel length (casalmon.org). Pool habitats within the observed areas are comprised of mainly large woody debris from natural streamside processes.

Mays Canyon Creek Stream Inventory Report shows habitat types for the reach of Mays Canyon Creek associated with the plan area as follows, 0.4% pools, 0.3% riffles, 0.2% culverts, 11.4% flatwater, 68.1% dry, and No-survey (marsh) 19.5% by channel length (Mays Canyon Creek Stream Inventory Report, 1998).

Measures to benefit pool habitats are described below under Large Woody Debris discussion. This project as proposed has little or no potential to negatively impact pool habitat conditions. The limited use of equipment and other harvesting related activities in addition to mitigations associated with the Forest Practice Rules will reduce the potential for impacts associated with the operation.

Large Woody Debris
Large woody debris (LWD) is a very important component in the creation of pool habitat in streams. Rainville et al. (1985) found that in nearly 80% of the pools surveyed in small streams, LWD was the structural agent forming the pool or associated with the pool. In general the larger the size of the woody debris the greater its stability in the stream channel. Heavier pieces require higher flows for mobilization and longer pieces are more likely to be caught by the stream bank and its vegetation (Spence et al., 1996). Reeves et al. (1993) found "that wood is a primary element influencing habitat diversity and complexity in streams. Consequences of decreased amounts of wood include loss of cover and structural complexity, decreased availability and abundance of habitat units, and reduced varieties of current velocities and other hydraulic features."

During the 1950s and 60s LWD was considered an impediment problem to fish passage and the Department of Fish and Game removed large amounts of LWD from North Coast streams. The following picture is from a 1956 DFG bulletin (No. 4) indicating past "proper" stream restoration practices.

The amount of large woody debris present in the watercourses in the assessment area varies widely but is not a limiting factor within the Biological Assessment Area. A significant amount of well distributed LWD exists within the plan area and is providing adequate cover.

This plan contains mitigation measures that provide for additional recruitment of LWD, which will result in improved habitat conditions. Recruitment of large woody debris for instream habitat shall be provided by not harvesting within any Class I WLPZ core zone and by retaining at least two living conifers per acre at least 16 inches diameter breast high and 50 ft. tall within 50 ft. of all Class II watercourses.

Near-Water Vegetation
The area of vegetation near streams is known as the riparian zone. A riparian zone helps maintain good stream habitat for salmon and steelhead in the following ways:

- Helps maintain cool water temperatures through provision of shade and creation of a cool and humid microclimate over the stream
- Provides food resources for the aquatic ecosystem in the form of leaves, branches, and terrestrial insects
- Stabilizes banks through provision of root cohesion on banks and floodplains
- Filters sediment from upslope sources
- Filters chemicals and nutrients from upslope sources
- Supplies large wood to the channel which maintains channel form and improves in-stream habitat complexity
- Helps maintain channel form and in-stream habitat through the restriction of sediment input or slowing of sediment moving through the system
- Moderates downstream flood peaks through temporary upstream storage of water

Estimates of canopy cover on the watercourses within the assessment area range from 0% to 100%. There will be no timber harvesting within any Class I WLPZ core zone. There will be no timber harvesting within any Class II WLPZ where current canopy levels are less than 70%. Heavy equipment limitations within WLPZs established on the plan will help to protect near water vegetation on the watercourses. Please see the discussion of stream-side vegetation above under the "Watercourse Condition" heading for a further analysis of near-water vegetation.

Terrestrial Habitat Conditions

Snags/den/nest trees
Snags, den trees, nest trees and their recruitment are required elements in the overall habitat needs of more than 160 wildlife species. Many of these species play a vital role in maintaining the overall health of timberlands. Snags of greatest value are >16" DBH and 20 ft. in height. All snags on the plan area will be retained except where state and federal safety laws require their removal. Small, medium and large size snags in varying decay classes exist in the assessment and project area.

For clarification, the following table describes the 5 classes of decaying snags (adapted from Holloway et al. 2007):

Brown's Snag Decay Classes	Description/Characteristics
Decay Class 1	Recently dead tree with intact tops and the majority of fine branching present.
Decay Class 2	Trees with loose bark, intact tops, and most of the fine branches.
Decay Class 3	Trees ith <50% of coarse branches and <50% bark.
Decay Class 4	Trees with broken tops and few or no coarse branches, less>6 m in height.
Decay Class 5	Trees with broken tops and no coarse branches, less than or equal to 6 m in height.

Conifers and hardwoods that show active signs of use by wildlife will be retained. High levels of standing "live" culls greater than 30" dbh and greater than 100' tall exist and will be retained. Specific trees to be retained are obvious wildlife trees displaying multiple (meaning two or more) wildlife habitat attributes such as basal hollows, small cavities, internal rot or mistletoe broom, crevice cover, broken or multiple crowns, large (greater than 7 inches diameter) lateral limbs, epicormic branching, stick nests and Sonoma tree vole nests. These trees will be evaluated by the RPF, or supervised designee, and retained by marking "NO" or "W" in any color paint, or not marking with a horizontal line in blue paint (which would indicate a harvest tree). These trees will provide for future snag recruitment.

There were no dens located on the plan area however, non-listed wildlife that utilize dens were observed or sign of their presence was observed, and den sites are expected to occur within the BAA. Any den located during operations will be flagged off and protected. No known nest trees of any rare or endangered species exist on the plan area. Nest trees located within the plan area will be protected as per 14 CCR 919.2.

Downed large, woody debris

Large downed logs (particularly conifers) in the upland and near-water environment in all stages of decomposition provide an important habitat for many wildlife species. Large woody debris of greatest value consists of downed logs >16" diameter at the large end and >16 feet in length. Large, down woody debris is a vital component of a properly functioning ecosystem. Large logs serve as "sponges" and maintain moist refugia for numerous insects, amphibians and mammals during the hot summer months.

Some naturally fresh-fallen debris exists, which is anticipated to be merchantable, and will be harvested if located outside the WLPZ. This harvest of LWD will be offset by recruiting additional LWD in the form of breakage or defective segments of proposed harvest trees. Overall, the harvest operation will add to the woody debris already on site and the slash will enhance wildlife habitat. No broadcast burning is proposed.

Multistory Canopy

Multistoried stands are defined as stands composed of two or more canopy layers. Multistoried stands contribute to vertical heterogeneity of stands and influence species diversity. While a majority of the plan area currently contains a generally uneven-aged stand structure with trees in a wide variety of age and size classes, there is not a well-defined over or understory. The stands are situated in an unbalanced or irregular condition with larger overstory trees either clumped in patches or very widely spread out.

The silvicultural methods and management techniques to be utilized during this harvest will retain all

ages and sizes of trees, including larger and older trees and will result in more of a multistory canopy structure in the future. Within the BAA, where un-evenaged management is applied, multistoried stands will be maintained or developed.

Road Density
The primary concerns for excessive road density are the disturbance, displacement and fragmentation of wildlife habitats and mortality of wildlife. For example, declines have been noted in the use of areas adjacent to frequently traveled roads by deer and bear. Deer and bear populations have a permanent home range within the assessment area.

There are two frequently traveled roads within the plan area, Mays Canyon Road and Neely Road. The amount of frequently traveled permanent roads will not increase as a result of the proposed THP.

Hardwood Cover
Hardwoods are present in varied densities and size classes throughout the BAA. Principle species present include tanoak, live oak, California bay-laurel, madrone, black oak, Oregon white oak and maple. The majority of the tree cover in the BAA is provided by conifer trees. The BAA contains hardwoods of the age and size classes necessary for nesting, and foraging habitat for most bird species. Cavities favored by wildlife are more often found in the larger trees and provide potential nesting sites for birds, bats, and rodents. Oak mast and madrone berries are an important food item for deer, squirrels, birds, etc. Berry and mast-bearing trees occur throughout the BAA as food sources and cover for bird and mammal species. Although hardwoods will be damaged in the falling of conifers and may be removed to benefit conifers, large hardwoods shall be retained, especially those with rotten cavities.

Late Seral (Mature) Forest
The characteristics of a late seral forest include large trees as part of a multilayered canopy and the presence of large numbers of snags and downed logs that contribute to an increased level of stand decadence. A late successional forest is defined in 14 CCR 895.1 as stands of dominant and predominant trees that meet the criteria of WHR class 5M, 5D, or 6 with an open, moderate or dense canopy closure classification, often with multiple canopy layers, and are at least 20 acres in size. Functional characteristics of late succession forests include large decadent trees, snags, and large down logs.

Currently there is no late successional forest in the harvest area. The plan has experienced at least three previous harvests, the most recent in 2002. Large residual trees arranged individually or in small groups do exist on the plan area, in large part to the owner's commitment to growing and maintaining a viable commercial forest. From within this component of large trees, those displaying pre-eminent wildlife value, specifically multiple wildlife habitat attributes (defined as two or more) such as basal hollows, small cavities, internal rot or mistletoe broom, crevice cover, broken or multiple crowns, large (greater than 7 inches diameter) lateral limbs, and epicormic branching are considered for retention. A multi-layered canopy will be developed and enhanced by employing uneven-aged management where appropriate, with the goal of trees in all ages and size classes and retention of hardwoods. Connectivity is provided by continuous stand cover of a large conifer component and WLPZ retention. All snags, non-merchantable downed logs outside the WLPZ and all downed logs within the WLPZ will be retained. The proposed project will not result in an adverse impact to late seral mature forest components and continuity of the Biological Assessment Area.

Findings: The distribution of forested habitat within the assessment area provides a diverse forest

environment suitable for wildlife needs. No key habitat elements will be lost because of these operations. There are no other known wildlife or fishery resource concerns. The THP's impact on wildlife habitat has been evaluated across the watersheds, it is not simply site and species specific. This broadens the context within which the THP has been analyzed and thus provides a better understanding of how the individual THP impacts wildlife habitat across a watershed. Based upon the observations and professional opinion of the RPF, no significant cumulative impacts will be incurred by any non-listed species.

4. RECREATION ASSESSMENT AREA

The recreation resources assessment area consists of the THP area plus 300 feet around its perimeter, as per CDF Technical Rule Addendum #2.

Findings: The harvest area is not adjacent to publicly owned land, and recreation that occurs within the recreation assessment area (300') of this plan is limited to the landowner and guests to the property. There is an unusually high number of homeless encampments and trespassers within the project area. Since the harvest area is not open to public use, this project will have an insignificant effect on the Recreational Assessment Area. The Russian River is adjacent to a portion of the plan area The Russian River is commonly used for recreational activities such as swimming, fishing, and kayaking. Johnson beach, a popular beach destination, and Northwood Golf Course are also in the recreation assessment area. No recreational special treatment areas have been designated by the Board of Forestry within or adjacent to the plan area. Timber operations will be conducted primarily during the week on private property and therefore will not impact significant numbers of people. No known past or future projects within the Recreational Assessment Area, when combined with the potential effects of this project, are expected to significantly impact recreational opportunities.

5. VISUAL ASSESSMENT AREA

CDF Technical Rule Addendum #2 states "the visual assessment area is generally the logging area that is readily visible to significant numbers of people who are no further than three miles from the timber operation." Technical Rule Addendum #2 further refers to viewing by "the public".

The plan area is located just outside the town of Guerneville, CA.

The majority of the plan area lies within a County and State Designated Scenic Corridor for Highway 116.

The plan area is readily seen from State Highway 116, Mays Canyon Road, Neely Road, the Russian River, the Northwood Golf Course, and the subdivisions of East Guernewood, West Guernewood, and Vacation Beach. The closest distance significant numbers of people can view the proposed timber operations is approximately 1,000 feet, from a section of Highway 116. This is a busy thoroughfare and many people drive this road daily. People will be viewing the THP area from a moving vehicle traveling east and west on Highway 116.

Findings: The landowner is very aware of public perception and the selected silviculture is a reflection of that concern. The silvicultural prescriptions proposed in this plan provide for significant retention as a visual objective. Form, texture and color will not be significantly altered in portions of the plan area where road, skid trail, or harvest management is proposed. Management activities will be visually subordinate to the characteristic landscape. In the middle ground view, small unconnected areas will be visible from available vantage points, due to the steep mountainous characteristics, bisecting draws, and viewing angles. In the foreground the retention of eye level vegetation will obstruct the view of harvesting activities. Uneven-aged management will provide

sufficient residual trees and vegetation that will not be visually displeasing. No reasonably significant potential effects will occur to visual qualities. No known past or future projects within the Visual Assessment Area, when combined with the potential effects of this project, are expected to significantly impact visual qualities.

6. TRAFFIC ASSESSMENT AREA

CDF Technical Rule Addendum #2 states "the traffic assessment area includes the first roads not part of the logging area on which logging traffic must travel and those roads commonly used by logging traffic."

Findings: Timber will be hauled from this THP via Mays Canyon Road, Neely Road, and State Highway 116, all are paved county maintained roads. These roads have been used historically for log transport. These roads are used by residents of the area and tourists as well as commercial use. Hauling associated with the proposed timber operation will generally take place on weekdays, when tourist traffic is at a minimum, thus minimizing any potential adverse effect log hauling as a part of this THP could have on current traffic conditions. The number of trucks hauling per day is expected to be relatively low. Due to the relatively low volume of conifer to be removed from the plan area the proposed hauling operations will be of short duration. Log truck drivers shall be warned to drive slow through residential areas. As such, the proposed harvest activity will have a nominal impact on the present traffic conditions along the haul route.

7. Green House Gases (GHG)

912.9 Technical Rule Addendum #2 states the following concerning analysis of GHG impacts:

GREENHOUSE GAS (GHG) IMPACTS

Forest management activities may affect GHG sequestration and emission rates of forests through changes to forest inventory, growth, yield, and mortality. Timber Operations and subsequent production of wood products, and in some instances energy, can result in the emission, storage, and offset of GHGs. One or more of the following options can be used to assess the potential for significant adverse cumulative GHG Effects:

1. Incorporation by reference, or tiering from, a programmatic assessment that was certified by the Board, CAL FIRE, or other State Agency, which analyzes the net Effects of GHG associated with forest management activities.

2. Application of a model or methodology quantifying an estimate of GHG emissions resulting from the Project. The model or methodology should at a minimum consider the following:

a. Inventory, growth, and harvest over a specified planning horizon

b. Projected forest carbon sequestration over the planning horizon

c. Timber Operation related emissions originating from logging equipment and transportation of logs to manufacturing facility

d. GHG emissions and storage associated with the production and life cycle of manufactured wood products.

3. A qualitative assessment describing the extent to which the Project in combination with Past Projects and Reasonably Foreseeable Probable Future Projects may increase or reduce GHG emissions compared to the existing environmental setting. Such assessment should disclose if a known 'threshold of significance' (14 CCR§ 15064.7) for the Project type has been identified by the Board, CAL FIRE or other State Agency and if so whether or not the Project's emissions in combination with other forestry Projects are anticipated to exceed this threshold.

Our approach to evaluating this concern is consistent with approach #2 itemized above. Current project parameters were applied to the CalFire model and summarized on the following pages support our conclusion that the project will result in a net reduction in atmospheric carbon dioxide over time (break projected at 16 years). This is possible due two primary processes:

1) Wood products used for building store carbon typically for decades deferring their conversion through the natural carbon cycle process.
2) Forests growing at faster rates store more carbon at a correspondingly faster rate. Younger forests grow more quickly and have lower decay rates than older decadent stands of timber.

Other factors not quantified by the model include:

- A reduction in fire hazard as a result of the planned harvest due to the fact that overgrown roads will be opened and rehabilitated providing much improved access for wildfire fighting equipment in the event of a forest fire.
- California consumes far more natural resources including wood than we produce. This is a type of economic/environmental colonialism which amongst its many other negative attributes increases carbon emissions associated with moving bulky resources long distances. Locally produced wood products have a lower per unit "carbon cost" than those imported from abroad. I think time will show that real solutions to this issue will be more consumer based than producer based.

Climate Change Overview

The scientific literature on the phenomenon of global warming, and impact of greenhouse gas emissions on the State of California, as well as to the remainder of the Earth, is growing, conflicted, and politically charged. Consensus is growing on the occurrence of global warming, although there is considerable debate regarding the causes (Bast and Taylor, 2007; Ferguson, 2006). The Stern Review of the Economics of Climate Change (2006) was a comprehensive report commissioned by the British government and provided projections of economic cost based on assumptions of impacts. Studies of past and present temperatures show a natural variability of Earth's climate. Past climates were as warm as (and even warmer than) what we currently experience, and such warm periods were typically, relatively short-lived respites from ice-age conditions that dominated the past half-million years (Ferguson, 2006).

Regardless of the aforementioned issue, the State of California has recognized climate change and global warming as a threat to health, safety, and the economy. Global warming could result in reductions in water supply due to changes in snow pack levels, adverse health impacts from increases in air pollution, adverse impacts on agriculture caused by changes in quantity and quality of water supplies and significant increases in diseases and pests, increased risk of catastrophic wildfires, and significant impacts to consumers and businesses due to increased costs of goods and services (AB 1493, 2002). In response, the State of California has enacted legislation and policies designed to reduce greenhouse gas emissions and to increase energy efficiency (AB 1493, 2002; AB 32, 2006; Gov. Schwarzenegger Executive Order S-3-05). The Executive Order established greenhouse gas emission targets using 1990 thresholds and established the California Climate Action Team to coordinate the State's efforts to reduce and report on progress of those efforts and on impacts of global warming to the State.

Carbon dioxide (CO2) is considered the greenhouse gas (GHG) that has the greatest effect on the dynamic of global warming due to the fact that it composes the vast majority of the releases by human activities. There are two basic ways carbon emissions are reduced. First is efficiency, where technology or conservation reduces carbon emissions through the use of less energy

(electricity, fuel, heat, etc.) to accomplish an activity. Second is storage, which can be accomplished through geologic or terrestrial sequestration.

Forest activities can result in emissions through harvesting, wildfire, pest mortality and other natural and anthropogenic events. However, forestry is a net sink for carbon, the primary greenhouse gas. Plants absorb CO2 from the air and use the carbon as a building block of plant tissue through the process of photosynthesis. Worldwide forests store approximately 2,000 billion tons (Gt) +/- 500 of CO2 (National Energy Technology Laboratory, 2000). An acre of mature redwood can store between 600-700 ton/ac of CO2, which is the highest of any forest type on Earth. Though redwood forests can store the largest amounts of GHGs per acre of any forest type, the expanse of this forest type is not significant on a global level. The most recent draft Greenhouse Gas Inventory shows the forestry sector to be a net sink with emissions of 6.1 MMT CO2 EQ. and emissions reductions of 21 MMT CO2 EQ (Bemis, 2006).

The forest sector offers the ability to reduce emissions through a suite of possible activities: 1) substitute wood products for more energy-intensive products, 2) reduce demand for energy in growing timber, harvesting, and wood processing, 3) reduce biomass burning (wildfires), 4) afforest marginal croplands, 5) reduce conversion of forestland to non-forest use, 6) improve forest management, 7) reduce harvest, 8) increase agro-forestry, 8) plant trees in urban areas, 9) other combinations (Joyce and Nungesser, 2000). This proposed THP uses several of the activities which are considered to have the effect of reducing the overall forest emissions and improving the storage of GHGs. The harvest will add to the carbon stored in wood products, while at the same time increase the rate of carbon storage by maintaining a healthy, fast-growing forest. Redwood Empires's forest management may result in a reduced risk for wildfire and will maintain maximum sustained productivity of quality forest products. By maintaining timber management there is a reduced risk of deforestation through conversion of the land to non-forest uses.

CEQA Analysis Related to Climate Change

The California Global Warming Solutions Act of 2006 (AB 32) is California's legislative effort aimed at reducing GHG emissions. Pursuant to AB 32, CARB must develop an implementation program and adopt control measures to achieve the maximum technologically feasible and cost-effective GHG reductions. AB 32 requires CARB to prepare a Scoping Plan to achieve reductions in GHG emissions in California. On June 26, 2008 GARB staff presented the initial draft of the AB 32 Scoping Plan for Board review. The Scoping Plan was first considered by the Board in 2008 and must be updated every five years. CARB has updated the Scoping Plan in 2014 (First Update) and again in 2017 (2017 Scoping Plan). Details regarding the latest update are outlined below.

2017 Scoping Plan Update - The 2017 Scoping Plan incorporates, coordinates, and leverages many existing and ongoing efforts and identifies new policies and actions to accomplish the State's climate goals. It builds upon the successful framework established by the Initial Scoping Plan and First Update, while identifying new, technologically feasible, and cost-effective strategies to ensure that California meets its GHG reduction targets in a way that promotes and rewards innovation, continues to foster economic growth, and delivers improvements to the environment and public health, including in disadvantaged communities. It also includes policies to require direct GHG reductions at some of the State's largest stationary sources and mobile sources. These policies include the use of lower GHG fuels, efficiency regulations, and the Cap-and-Trade Program, which constrains and reduces emissions at covered sources.

What are the key focus areas in the 2017 Scoping Plan? - CARB plans to focus on several topics, including enhancing industrial efficiency, transportation, securing water supplies, clean air, putting waste resources to beneficial use, and supporting resilient agriculture and natural and working lands.
What is the status of AB 32 implementation? - The California Global Warming Solutions Act of 2006 (AB 32) has been implemented effectively with a suite of complementary strategies that serve as a model going forward. California is on target for meeting the 2020 GHG emission reduction goal. Many of the GHG reduction measures (e.g., Low Carbon Fuel Standard, Advanced Clean Car standards, and Cap-and-Trade) have been adopted over the last several years and implementation activities are ongoing. California is seeing real reductions to put the state on track for reducing GHG emissions to achieve the AB 32 goal of getting back to 1990 levels by 2020.

In addition to the 2017 Scoping Plan, the California Forest Carbon Plan completed in May of 2018 presents an assessment of forest health across California based on the best currently available information. This plan provides a description of anticipated future conditions given the ongoing and expected impacts of climate change on forested ecosystems and lays out a set of forest management goals to move the state's forests towards a more ecologically resilient state. These goals include:

1. Enhance: Expand and improve forest management to enhance forest health and resilience, resulting in enhanced long-term carbon sequestration and storage potential.
2. Protect: Increase protection of California's forested lands and reduce conversion to non-forest uses, resulting in a more stable forested land base.
3. Innovate: Pursue innovations in wood products and biomass utilization in a manner that reduces or offsets GHG emissions; promotes land stewardship; and strengthens rural economies and communities.

The Forest Carbon Plan provides guidance and input to the Natural and Working Lands Implementation Plan described in the California's 2017 Climate Change Scoping Plan. The Forest Carbon Plan describes a significant deficit in forest management in California, both on private lands and nonfederal public forestlands. To address the forest health and resiliency needs on a state-wide basis on nonfederal lands, the plan states forest treatments need to increase to 500,000 acres per year to make an ecologically significant difference at the landscape scale. The plan further describes the treatments to include those that generate revenue from harvest materials, such as commercial thinning and regeneration harvests. As a forestland owner in the state, Redwood Empire is making a contribution towards achieving the state-wide goal of managing an increasing number of acres to improve forest health and resiliency.

The Project:
The proposed project will result directly and indirectly in carbon sequestration and temporary, insignificant CO2 emissions. Carbon sequestration is achieved through a repeating cycle of planting and growing of trees that remove CO2 from the atmosphere and store carbon in tree fiber. When a tree is harvested, most of the carbon-filled tree fibers become lumber that is sequestered in buildings while a new rotation of trees is planted and grown. Some of the tree fibers such as branches and tops are left in the forest where they are sometimes burned to reduce fire hazard. However, the vast majority of this material is left to decay and will emit CO2 overtime; but, it also supplements the forest soils and forest duff layer where carbon is stored that serves as a substrate for more tree growth. In addition, redwood is a dominant species on Redwood Empires timberlands and redwood slash decays more slowly than slash from hardwood

and whitewood species. Further, when CO2 is released by decaying slash, it is offset by rapid regeneration of tree stands (including sprouts from redwood and hardwood species) and other vegetation that sequesters carbon. Some of this carbon-filled tree fiber, such as bark, shavings, and chips are used in other engineered building products or as fuel used to generate electricity. When this wood fiber is burned to generate electricity the stored carbon is released into the atmosphere, but it is being done in a controlled setting, which also fills a huge demand by our society. Another factor to consider is that when wood biomass is used to generate electricity it directly reduces the amount of fossil fuels required which are non-renewable energy sources and generate CO2 in more substantial quantities. Another point worth mentioning is that if this wood fiber were left to decompose naturally its stored carbon emissions would still nonetheless occur.

Using the CALFIRE GHG calculator, it is estimated that GHG sequestration for this project will be 47,140 metric tons of CO2 over the 100-year planning horizon. This sequestration total includes emissions from site preparation, non-biological emissions associated with harvesting and non-biological emissions associated with milling. GHG emissions associated with this project are insignificant relative to global CO2 emissions that are thought to affect climate. There is virtually no opportunity to reduce these emissions in a manner that would meaningfully benefit the climate because they are already miniscule. (U.S.E.P.A. 2005). An acre of managed forest may be entered with equipment once every 15-20 years with emissions measured in hours of equipment operation over that time period. Few if any other land uses can match the low intensity of CO2 emissions over space and time that are associated with commercial forestry. In urban areas of California, a typical California household will operate one or more vehicles every day and the demands of that household will induce a variety of additional CO2 emissions for other forms of commerce, power production, and consumption. In rural areas, even a typical farm acre in California will be subject to equipment operation for several hours or days every year over 20 years - not once every 20 years.

The insignificant GHG effects of the proposed project are further diminished by the mitigating effects of carbon sequestered in wood products produced from harvest and by the forest stewardship principals used by Redwood Empire, which strives to increase forest stocking over time.

At the project scale, the beneficial impacts on carbon sequestration and the project-related CO2 emissions related to global warming are negligible and undetectable at the global scale. The CO2 emissions from vehicles used to implement the project over several weeks or months are dwarfed by the CO2 emissions from other routine daily activities engaged in by all Californians such as a single morning commute for even one city. Also, impacts from transportation will be further mitigated by the implementation of new standards for diesel engines recently adopted by the CARB (CARB 2008). When considering the impacts of this project on climate it is doubtful that a measurable change could be detected, even at the microclimate level.

Area of Assessment and State Setting

The assessment area for climate effects is the proposed project area, transportation routes to manufacturing facilities, and the milling of forest products. However, qualitative consideration of the carbon cycle in wood products is addressed as a cumulative effect.

There are 16.6 million acres of productive public and private timberland (statutorily available for harvest) in California (California Department of Forestry 2003). Redwood Empire owns approximately 28,000 acres in northwestern California. This represents 0.0017% of the total timberland, and 0.0038% of the 7.3 million acres of the private timberlands in the state. This

proposed timber harvesting plan includes 224 harvestable acres that represent only .001355% of the total private timberland in the state.

Carbon Sequestration and Emissions Resulting from Intensive Forest Management

Forestlands are, in general, a carbon sink where CO2 is captured and fixed by the process of photosynthesis, which removes carbon from the atmosphere and sequesters carbon in wood fiber. (OFRI 2007, U.S.E.P.A. 2005). In California, forested lands are the largest land-based carbon sink with trees and underbrush drawing carbon from the atmosphere and storing it in their cellulosic structure and in forest soils (CA Forest Carbon Plan 2018). Forests in the North Coast, Cascade Northeast and North Sierra regions were estimated to produce a net benefit of 7.2 million metric tons of CO2 equivalents removed from the atmosphere each year (California Energy Commission 2004). Growing forests sequester and store more carbon over time until growth stagnates as trees reach a mature age. Older trees sequester carbon through new growth at a declining rate, but they remain pools of stored carbon until they decay through decline, death, or consumptive use.

Managed commercial forests make a significant contribution to the sequestration of carbon and mitigation of GHG. (IPCC 2007; Mader 2007; OFRI 2006; U.S.E.P.A. 2005). Several studies have documented a positive net effect of carbon sequestration by commercial timberlands where forests are grown, harvested, and processed into wood products. (James et al. 2007; Perez-Garcia et al. 2005; Lippke et al. 2004). Even when CO2 emissions from timberland management, timber harvest, and forest products uses are considered, the long-term, sustainable, and intensive management of commercial timberlands to produce wood products generates a net carbon sequestration benefit that mitigates GHG. These studies investigated timber harvest at various rotation ages relative to no harvest and perpetual old growth stands. They found that intensive forest management can produce net positive carbon sequestration benefits because carbon is sequestered through repeated cycles of tree growth while a substantial percentage of harvested and milled wood is sequestered for decades or centuries in buildings. Life cycle assessment studies have shown that wood products have a much smaller "carbon footprint" compared to other building materials. It is estimated that at the end of 100 years an average of 46 percent of the solid wood products manufactured from the log are still in use, and if the wood placed in landfills is included the average over the 100-year period is 76% percent (US Dept of Energy- 1605(b) Tables).

The proposed project is one of numerous past, present, and future timber harvest projects on RMB Revocable Family Trust ownership that combine to produce substantial net carbon sequestration benefits over time. RMB Revocable Family Trust timberlands are sustainably managed in accordance with the Forest Practice Rules which ensure sustained yield and strict environmental protection for wildlife and water quality. Timber harvests are scheduled across the ownership within management blocks, where unevenage timber stands are reentered every 15-20 years. Harvested timber is converted to wood products that sequester carbon as building materials.

Not all of RMB Revocable Family Trusts timberland is dedicated to intensive forest management. Large areas of the ownership remain un-harvested or lightly harvested to provide various fish, wildlife, and ecosystem benefits. In addition to these areas, extensive riparian protection zones extend like a web across the property. There are also numerous geologic features across RMB Revocable Family Trusts ownership which will experience little or no timber harvesting. These wildlife, riparian, and geologic areas will be managed to develop into late succession forest stands, which will provide critical habitat for wildlife, protecting water quality and is a

diversification of RMB Revocable Family Trusts portfolio for carbon sequestration.

Following each timber harvest, such as the project, RMB Revocable Family Trust manages slash to reduce fire risk and enhance forest soils that will host the next rotation of forest growth. Where necessary to facilitate site occupancy of desired tree species, Selection, Group Selection, Transition, areas are promptly replanted and regenerated with healthy seedlings that combine with advanced regeneration and stump sprouts from harvested redwoods that immediately begin to fix carbon through photosynthesis. Because the plantings require a substantial investment, there is a strong financial incentive to efficiently and effectively re-establish growing forests and timber production on harvested property. For the same reason, there is a strong incentive to protect growing tree stands from mortality that adds to forest fuels and to aggressively prevent and suppress wildfires before they can become catastrophic. The proposed project and similar past, present, and future projects have the cumulative benefit of reducing the risk of catastrophic fire and related adverse impacts to GHG and carbon sequestration.

The project will also result in minimal impacts to the carbon stored in the duff layer and the soil. Because the harvesting minimizes duff and soil disturbance, and very limited broadcast burning occurs, the carbon stored in the duff layer is essentially intact following harvesting. Powers, et al (2005) found that the absolute mass of soil carbon showed little change over time. Redwood/Douglas-fir forests that include sprouting species such as redwood and tanoak are likely to have less fluctuation in soil carbon given that the root systems of these species continue to survive following harvest.

Effects of Climate Change on Timberlands

Regardless of the benefits that the project and similar past, present, and future projects will have on diminishing GHG emissions and promoting carbon sequestration, climate change is likely to occur. The rate and direction of climate change remains very uncertain (IPCC 2007). It is a certainty that the earth's climate has changed in the past with variable cooling and warming trends, but no models exist to reliably predict the rate and direction of climate change or the regional or localized effects on temperatures, precipitation, growing seasons, drought, vegetation, and wildlife (IPCC 2007).

In the face of uncertainty, the impacts of climate change must be assessed in terms of the resilience of RMB Revocable Family Trust timberlands should climate changes occur. There are several indications that RMB Revocable Family Trust timberlands have been and continue to be resilient. After more than a century of timber harvest, most of which occurred without the benefits of modern forest practices regulations and best management practices, RMB Revocable Family Trusts timberlands remain commercially productive and viable. A key tree species on the property is the coast redwood (*Sequoia sempervirens*), which is the epitome of resilience, having persisted for millennia in the coastal climate of northern California. The redwood tree is not expected to be threatened by pests that might be advantaged by global warming, and it is expected to persist at the southern end of its range even if climate change brings higher temperatures and less precipitation. (Battle 2006). The redwood tree also benefits from coppice regeneration, which means that it regenerates from the stump after a tree has been harvested. As such, much of the living root system of redwood trees persists and the genetic diversity of each individual tree is preserved on the landscape as cut trees are replaced by genetically identical sprouts that grow from the same root system. For the same reason, the regeneration and growth of redwood forests after harvest occurs quickly and with more certainty because young trees have the benefit of mature root systems.

In addition to redwood, RMB Revocable Family Trusts timberlands grow hearty and resilient species such as Douglas-fir, a species that thrives in open stands following harvest. Douglas-fir grows in a variety of climates throughout western North America and are believed to have rapidly colonized vast areas following the end of the last Ice Age. Through its substantial and continuous investment in their timberlands, the RMB Revocable Family Trust has a strong incentive to nurture healthy and resilient forest stands on its property.

Findings: This plan, alone or in combination with other harvest plans in the watershed, ownership, Sonoma County, or State of California is not expected to have an adverse impact on global warming. Carbon from trees harvested will be sequestered for decades or longer in the form of the wood products cut from the logs. Importantly, additional carbon will be sequestered in the future as newly planted, sprouting, and growing crop trees occupy and grow on the site.

Silver Estates THP – GHG Summary Estimate

Emissions Source/Sink/Reservoir	**Total Tonnes CO2 Sequestered/Emitted**
Live Trees	32,609
Wood Products	16,151
Site Prep Emissions	0
Non-Bio Harvest Emissions	-489
Non-Bio Milling Emissions	-205
Total Sequestration	47,140
Years to Recoup	16 years

8. Fire Prevention and Protection

Studies have shown that the fire return interval within the coast redwood forests is between 50-250 years (Veirs, 1982). Fire return intensity varies by climate, fuel types, land use patterns and availability of ignition sources. Preventing fires on the forestlands is a priority for all employees and logging contractors at Redwood Empire. Forestry personnel make regular rounds to inspect the adequacy of fire tools and prevention practices of on-site logging subcontractors. These include adequate clearings around yarder cable blocks, spark arresters on chainsaws, proper maintenance of equipment and establishment of fire trails around landing piles. Pre-harvest meetings are held with contractors to address important fire prevention issues such as fire safety, access, fuel humidity, water sources and the company policy regarding smoking and warming fires. Logging debris generated on landings will be spread on tractor roads or piled and burned within two years.

Since the beginning, the RMB Revocable Family Trust has worked to restore forests impacted by previous management regimes. This involves the removal of hardwoods (mainly tanoak) which dominate sites previously well stocked with conifers. Herbicides may be used to treat standing hardwoods to reduce tanoak site occupancy and allow for conifer establishment and release. To provide temporal context of hardwood decomposition, if and when hardwoods are frilled, the following progression has been observed. Foliage from trees usually brown out within the first 6-12 months, subject to nutrient flow processes within the tree during the time of application. At this point cell mitosis ceases and the target tree is essentially dead. Leaves are usually on the

ground within 24 months after application. Trees will usually topple over after 3-5 years after application, subject to climatic patterns (mainly wind events). Once on the ground, plant fungi actively breakdown the downed wood fiber, in a relatively short period of time. The timing of fiber decomposition is subject to configuration of down material on forest floor, season of the year and material's proximity to the ground. Moisture levels are highest, closest to the forest floor, making it a more favorable environment for fungal blooms. Typically, after 8 years, the downed trees have decomposed to a state at which they become incorporated with the organic layer of the forest soil and are hardly visible.

Many have referenced the Elsevier article titled "*Sudden oak death-caused changes to surface fuel loading and potential fire behavior in Douglas-fir-tanoak forest*" (Valachovic et al., 2011), when it comes to evaluating fire behavior associated with herbicide use. While this study provides insight into surface fire behavior following a widespread outbreak of Sudden Oak Death (*Phytophthora ramorum*) or herbicide application, this study was conducted and samples were taken in Douglas-fir-tanoak stands not North Coast Coniferous Forest with coast redwoods. "We avoided other forest types, such as coast redwood stands, as well as drainages or areas differentiated by microclimate and increased moisture availability" (Valachovic et al., 2011). This study was never intended to apply to coast redwood forest types. With that being said, there are aspects of this article which probably translate to coast redwood forest types. We realize that there is a short period of time (2-5 years after application) in which the drier/un-degraded treated trees are more susceptible to ground fires, if weather conditions are right and there is an ignition source. This is juxtaposed against the benefits of having horizontal and vertical fuel continuity disrupted during harvesting operation (substantially reducing the potential for crown fires) and providing favorable access for suppression efforts. "While herbicide treatments temporarily elevate surface fuels, these treatments are limited in area on the landscape, are generally associated with other forest management activities, and, provided that roads remain accessible, generally facilitate, rapid firefighter response. (Valachovic et al., 2011). Fuel loading will be reduced below baseline levels after the treated hardwoods decompose: "Furthermore, decomposition will reduce these single-pulse-driven surface fuels over time" (Valachovic et al., 2011). In Timber Harvest Plans (THPs), that require treatment of tanoaks, Redwood Empire pragmatically evaluates potential fire hazard and visual impacts to adjacent neighbors, local communities, and wildlife habitat. One measure utilized to reduce the potential hazard and visual impact is logging hardwoods near property lines followed by treating stumps. However, there may be steep, remote corners of the forestlands where this is infeasible. Forest managers may consider a *green belt* where treatment of hardwoods is avoided or only limited treatment occurs. RMB Revocable Family Trust foresters also ensure that there are significant areas of untreated forestland between treated areas.

Herbicide treatment of hardwoods has raised the concern about possible exposure to herbicide residues in smoke. Herbicide product labels and Material Safety Data Sheets typically have statements warning about potentially hazardous combustion products that may be present in the event of a fire. This reference is in connection with concentrated forms of herbicides typically associated with storage sites, and not the diluted formulations prescribed for application on forest lands. In most cases, herbicides are applied at rates of only a few ounces or pounds per acre, which represents 2-5% of the original concentration. Laboratory experiments and modeling assessments consistently show that the exposure risk of airborne herbicide residues to individuals inhaling smoke from fires associated with herbicide application is insignificant. Regardless, the question of whether herbicides can be detected in any quantity from smoke resulting from forest fires, was validated by a field study conducted by the U.S. Forest Service and The University of Georgia in 1990 (C.K. McMahon, P.B Bush 1990). The intent of the study was to determine if

herbicides could be recovered from smoke particulate matter. Several sites were operationally burned from 30-169 days following application of common forestry herbicides such as Triclopyr and Imazapyr. Personal smoke monitors and area monitors were deployed during 14 separate fires. Each monitor was capable of detecting particulate residues several thousand times lower than any known herbicide inhalation risk. No herbicides were detected in smoke in any concentration. Thus, the results of this study, in conjunction with laboratory analysis and smoke modeling, all suggest there is no significant risk of herbicide exposure resulting from the burning of herbicide treated vegetation.

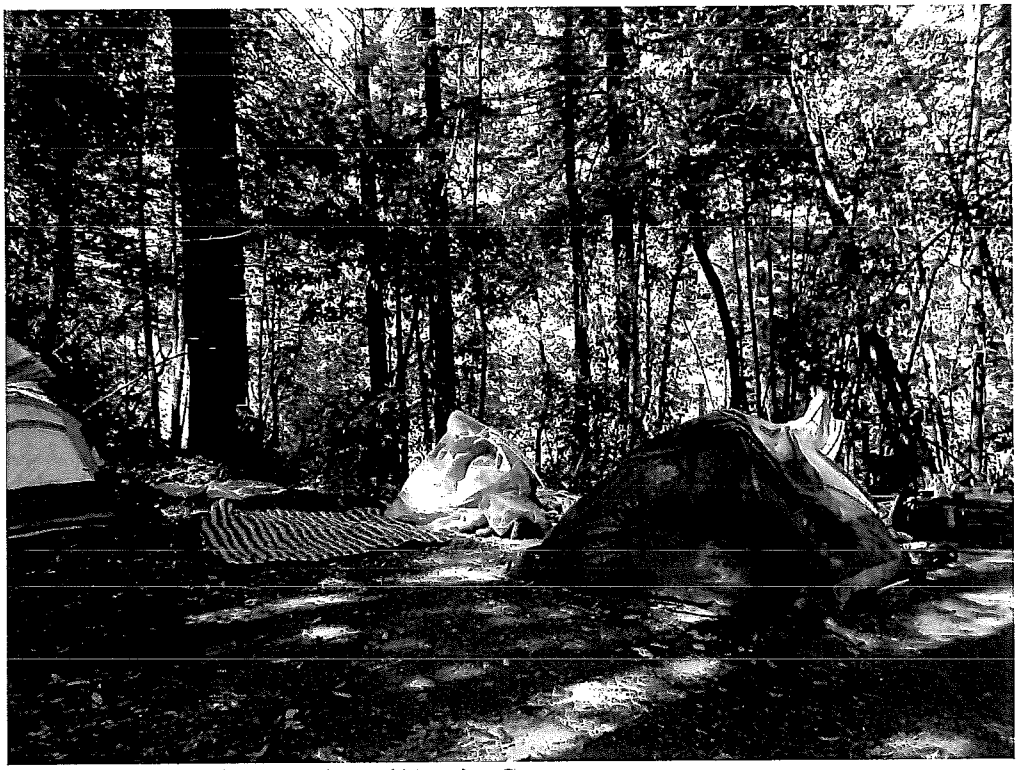
Findings: Given the silvicultures prescribed, the moderate size of the THP, and mitigation measures taken around adjoining property owners, this THP is not expected to have a significant effect on fuel loading or fire behavior within the Watershed Assessment Areas (WAA). No known or future projects within the assessment area, when combined

9) Trespass

The Silver Estate property has experienced trespass and illegal dumping for over 20 years. This has been well documented by the landowner overtime. The landowner has spent thousands of dollars over the last 20 years cleaning up garbage and homeless camps from the Neely Road and Mays Canyon side of the property. Homeless camps and illegal dumping are generally concentrated near the county roads, but old camps, illegal marijuana grows, and dump sites are scattered throughout the entire property. Camps tend to be built on flat surfaces adjacent to watercourses. This has resulted in an unusually large amount of garbage in watercourses and wet areas. During field layout several trespassers were seen on both the Neely Road and Mays Canyon entrances and several homeless encampments were observed. The landowner has attempted to control and limit the trespassing by posting signs, installing video cameras, constructing barricades, doing yearly clean-ups, and regularly patrolling the area. Despite all the effort by the landowner to keep trespassers out, it is still a major problem throughout the property.

(Please see photos below):

Mays Canyon floodplain south of Redwood Empire gate.

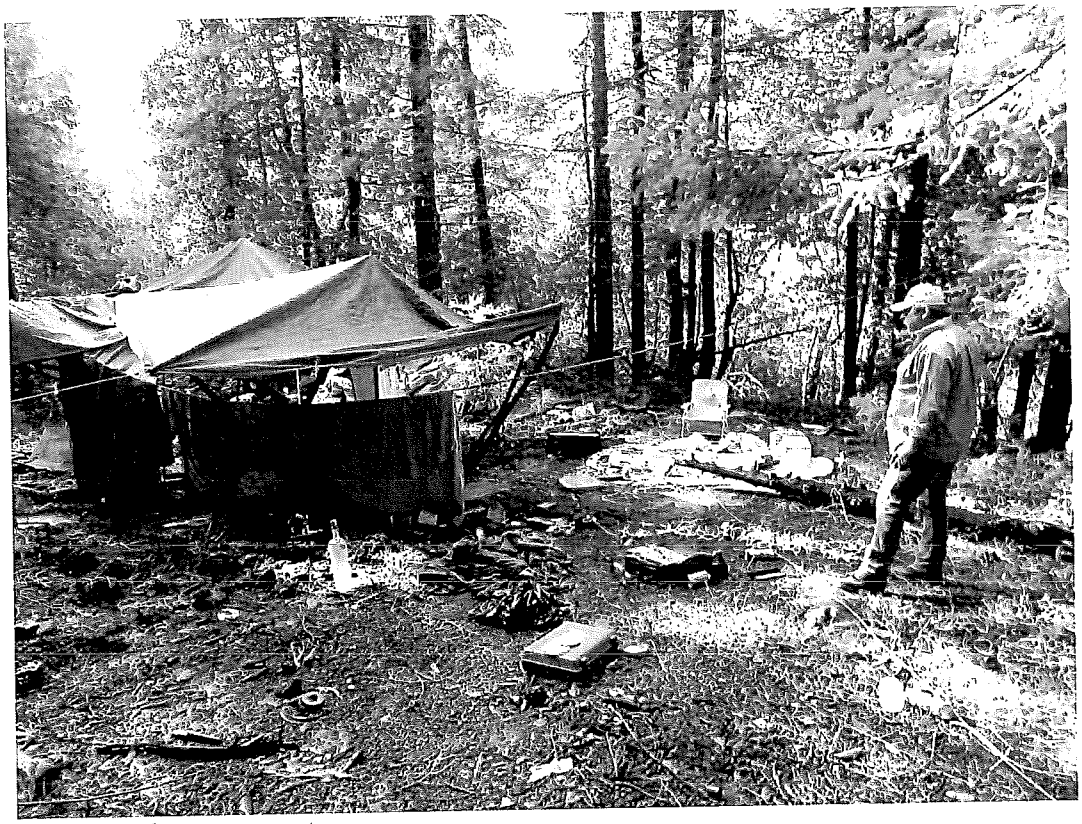


Neely Road just above Redwood Empire Gate.

Mays Canyon floodplain illegal dumping.

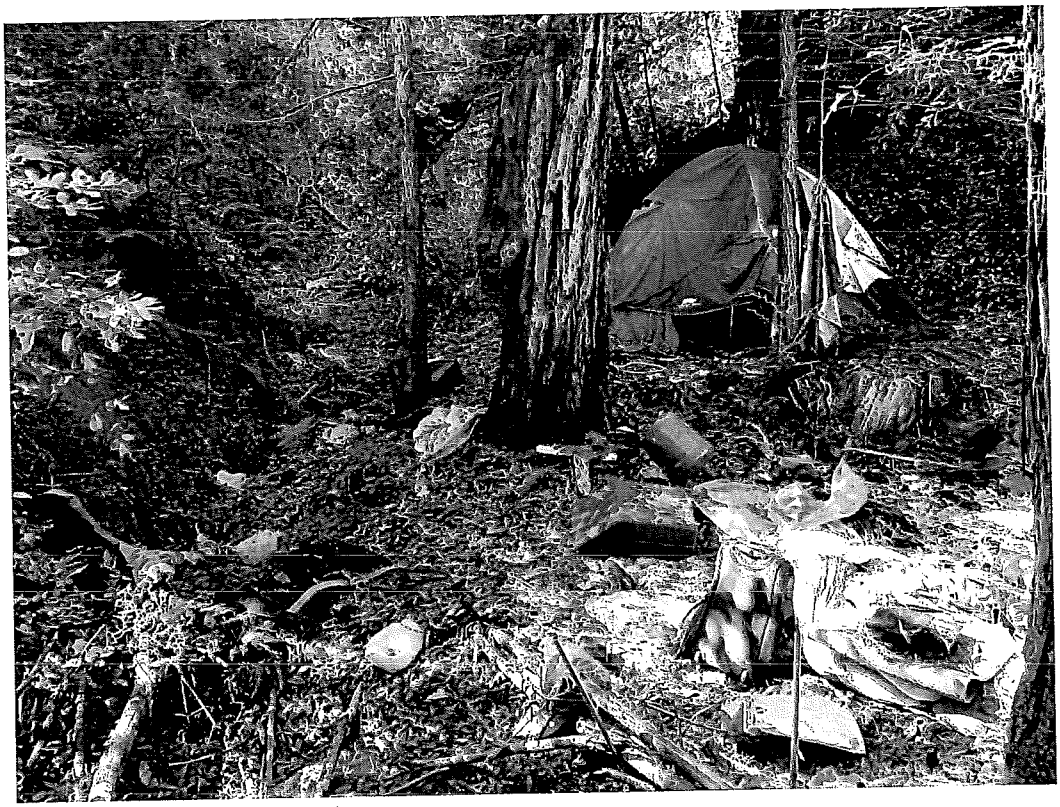
Neely Road encampment.

Neely Road clean-up day.



Neely Road encampment.

Neely Road encampment.



Mays Canyon encampment.

10. Noise

The production of noise is an inherent part of timber operations and has the potential to negatively impact noise sensitive organisms. The noise assessment area involves that area within 0.5 miles of the project area. This is the greater known distance for noise disturbance from timber operations for some listed wildlife species. For people, this distance should be equally acceptable. Noise pollution is defined as an intrusive, unwanted sound. Aircraft, trains, buses, automobiles, and other forms of transportation produce noise pollution that can lower the quality of life. At extreme levels, or at high levels over a long period of time, noise can permanently damage hearing (U.S. Department of Transportation, 2000). Sound is usually measured in decibels. The A-weighted scale, measuring the sound frequencies that humans can most easily hear, is the common reference point. As with the Richter Scale, which measures earthquakes, the measurements of decibels are non-linear; a 10-decibel increase in sound on a scale of A-weighted decibels (dBA) represents a perceived doubling of sound. A vacuum cleaner operating 10 feet away is audible at 70 to 75 dBA. Noise becomes annoying at 65 dBA and painful at 128 dBA (Lbid, 2000).

The following table was taken from the Sonoma County General Plan Noise Element (page NO-6) and describes typical sound levels and relative loudness for various types of noise environments.

Sound	Sound Level (dBA)	Relative Loudness (approximate)	Relative Sound Energy
Jet aircraft, 100 feet	130	128	10000000
Rock music with amplifier	120	64	1000000
Thunder, snowmobile (operator)	110	32	100000
Boiler shop, power mower	100	16	10000
Busy street	80	4	100
Interior of department store	70	2	10
Ordinary conversation, 3 feet away	60	1	1
Quiet automobile at low speed	50	1/2	0.1
Average office	40	1/4	0.01
City residence	30	1/8	0.001
Quiet country residence	20	1/16	0.0001
Rustle of leaves	10	1/32	0.00001
Threshold of hearing	0	1/64	0

Noise is a purely local phenomenon, and its transmission is affected by both manmade structures and natural terrain. Therefore, because of national or even regional measurements are nearly impossible, regulations are based on limiting the sources of noise pollution to safe levels.

There are over 1,500 parcels located within 0.5 miles of the proposed THP area, many of which are residential. The THP, as has been previously described, is located in the city of Guerneville, meaning it is located in a fairly densely populated place. Residents of Guerneville experience similar noise pollution to other small cities including vehicles, buses, garbage trucks, construction, powerline vegetation removal work, and in some cases noise from agricultural equipment including vineyard and logging equipment.

The Noise Element of the Sonoma County General Plan 2020 established the maximum allowable exterior noise exposure to 50 dBA. The draft EIR for the JDSF Management Plan identified noise levels for traditional tractor logging ranging from 68 to 83 dBA at a distance of approximately 50 feet. Traditional tractor logging generates sounds from many sources throughout the harvest area, and usually for the duration of the harvest period. The most concentrated sources of sound occur at the landings. The landing that is closest to a residential house is approximately 500 feet upslope. This is 10 times the distance of JDSF's study, allowing the sound to dissipate drastically. Additionally, the sounds from heavy equipment operating on the ground in a forested setting are often dampened or attenuated by the surrounding trees and soft ground surface. Noise level is inversely proportional to the receptor's distance from the source. This means, the closer you are, the louder the sound. Noise level is also influenced by air density, wind, and obstructions (trees, buildings, and other natural and manmade landscape features).

While the proposed THP is located adjacent to many residential parcels, the relative distance, topography, and forested condition will likely reduce noise levels at those receptor points below the standards for noise which may affect noise sensitive land uses. Furthermore, mitigations provided in the plan sufficiently mitigate noise disturbance during the NSO breeding season. The presence of timberlands yields significant aesthetic and economic benefits to the health and welfare of the residents of the county. People who purchase property near such agricultural lands are notified that they may be subject to inconvenience or discomfort from operations on agricultural lands. These inconveniences or discomfort are recognized as a normal aspect of living in a county with a strong rural character. The parcel where operations are proposed is zoned TPZ. This parcel has been harvested several times within the past century.

Finding: Noise generated from this plan will be of short duration and will not be measurably additive with ongoing projects that may be occurring in the area. Harvesting and truck noise is not anticipated to be more prevalent than what has occurred in past years. No significant and/or cumulative impacts related to noise will occur as a result of this operation.

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I. Noise

Sonoma County General Plan 2020 – Noise Element

Personal Communications

Best, Timothy C., 2006-2015, Certified Engineering Geologist, Santa Cruz, CA

Bartolemei, Jennifer. 2005-2011. Professional Consulting Biologist. North Coast Resource Management. Calpella, CA

Clifton, Estelle. 2005-2015. Botanist. North Coast Resource Management. Calpella, CA

Martin, Stephanie, 2013-2015. Wildlife Scientist, North Coast Resource Management, Calpella, CA

Smythe, Thomas E., 2008-2020, Registered Professional Forester, North Coast Resource Management, Ukiah, CA.

Weaver, Jesse D., Registered Professional Forester and Forest Manager, Redwood Empire Sawmills, Cloverdale, CA.

Project Carbon Accounting: Inventory, Growth, and Harvest Selection

This worksheet addresses the sequestation and emissions associated with the project area's balance of harvest, inventory, and growth plus any emissions associated with site preparation. Complete the input for Steps 0- 8 on this worksheet.

Forest Type			
Multipliers to Estimate Carbon Tonnes per MBF (Sampson, 2002)			
Forest Type	Step 0. Identify the approximate percentage of conifers by volume within the harvest plan. Must sum to 100%	Multiplier from Cubic Feet (merchantable) to Total Biomass	Pounds Carbon per Cubic Foot
Douglas-fir	75%	1.675	14.38
Redwood	25%	1.675	13.42
Pines	0%	2.254	12.14
True firs	0%	2.254	11.18
Hardwoods		2.214	11.76
Conversion of Board Feet to Cubic Feet	0.165	Pounds per Metric Tonne	2.204
Multipliers to Estimate Total Carbon Tonnes per MBF	Conifer	1.77	
	Hardwoods	1.95	
Multipliers to Estimate Merchantable Carbon Tonnes per MBF	Conifer	1.06	
	Hardwoods	0.88	

Harvest Periods	Inventory		Growth Rates		Harvest Volume	
Time of Harvest (years from project approval)	Conifer Live Tree Volume (MBF/Acre) - Prior to Harvest	Hardwood Live Tree Volume (BA square feet/Acre) - Prior to Harvest	Conifer Growth Rate BF/Acre/Year	Hardwood Growth Rate BA/Acre/Year	Conifer Harvest Volume (MBF/acre)	Hardwood Harvested / Treated Basal Area (BA/Acre)
Step 1. Enter the anticipated future harvest entries. The re-entry cycles should be supported by management plan, if available.	Step 2. Enter the estimated conifer inventory (mbf/acre) present in project area prior to harvest.	Step 3. Enter the estimated hardwood inventory (basal area per acre) present in project area prior to harvest.	Step 4. Enter the average annual periodic growth of conifers between harvests based on estimated growth in management plan, if available. Must be entered for each harvest cycle identified in Step 1.	Step 5. Insert average annual periodic growth of hardwoods between harvests based on estimated growth in management plan, if available.	Step 6. Enter the estimated conifer harvested per acre at current and future entries. The estimate should be based on projections from the management plan, if available.	Step 7. Enter estimated hardwood basal area harvested/treated per acre
0	15	80	500	0.5	4	60
20	21	30	480	0.5	3	15
40	27.6	25	550	0.5	6	5
60	32.8	30	650	0.5	8	15
80	37.6	25	800	0.5	10	10
100	43.6	25	950	0.5	12	5
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0

User must enter harvest cycles to 100 years and/or at least three entry cycles.

Harvest Periods	Inventory Conversion to Carbon (prior to harvest)		0		Site Preparation	
	Conifer Live Tree Tonnes (C/acre)	Hardwood Live Trees Tonnes (C/acre)	Conifer Live Tree Tonnes (CO_2 equivalent/acre)	Hardwood Live Tree Tonnes (CO_2 equivalent/acre)	Step 8. Enter the value (in bold) for each harvest cycel that best reflects the site preparation activities, as averaged across the project area:	
from above (Time of Harvest as years from project approval)	Computed: MBF * Conifer Multiplier from Step 0.	Computed: BA*Volume/Basal Area Ration (to convert to MBF) * Hardwood Multiplier from Step 0.	Computed: Conversion of carbon to CO_2 (3.67 tonnes CO2 per 1 tonne Carbon)	Computed: Conversion of carbon to CO_2 (3.67 tonnes CO2 per 1 tonne Carbon)	Heavy- 50% or more of the project area is covered with brush and removed as part of site preparation or stumps are removed (mobile emissions estimated at .429 metric tonnes CO2e per acre, biological emissions estimated at 2 metric tonnes CO2e per acre) Medium - >25% <50% of the project area is covered with brush and removed as part of site preparation (mobile emissions estimated at .202 metric tonnes CO2e per acre, biological emissions estimated at 1 metric tonne per acre). Light - 25% or less of the project area is covered with brush and is removed as part of site preparation (mobile emissions estimated at .09 metric tonnes CO2e per acre, biological emissions estimated at .5 metric tonnes per acre). None - No site preparation is conducted.	
0	27	12	98	43	None	0
20	37	4	137	16	None	0
40	49	4	180	13	None	0
60	58	4	212	16	None	0
80	67	4	245	13	None	0
100	77	4	284	13	none	0
0	0	0	0	0	None	0
0	0	0	0	0	None	0
0	0	0	0	0	None	0
	Difference between ending stocks and beginning stocks		186	-29.51	Sum of emissions (Metric Tonnes CO2e) per acre	0

Project Carbon Accounting: Harvesting Emissions (Selection)

This worksheet addresses the non-biological emissions associated with the project area's harvesting activities. Complete the input for Steps 9- 14 on this worksheet.

Harvest Periods	Falling Operations	Production per Day	Emissions Associated with Yarders and Loaders			Emissions Associated with Tractors and Skidders			Emissions Associated with Helicopters			Landing Saws	Trucking Emissions		
from Inventory, Growth, and Harvest Page (Time of Harvest as years from project approval)	Assumption: ((.25 gallons gasoline per MBF harvestec * 5.33 (pounds carbon per gallon))/2205(conversion to metric tonnes)* mbf per acre harvested	MBF (all species) Yarded Delivered to Landing	Assumption:(((35 gallons diesel per day per piece of equipment * 6.12 pounds carbon / gallon)/2205 to convert to metric tonnes carbon)* 3.67 to convert to metric tonnes CO2 equivalent)/Production per Day			Assumption: (((55 gallons diesel per day per piece of equipment * 6.12 pounds carbon / gallon)/2205 to convert to metric tonnes carbon)* 3.67 to convert to metric tonnes CO2 equivalent)/Production per Day			Assumption: (((200 gallons jet fuel per day per piece of equipment * 5 pounds carbon / gallon)/2205 to convert to metric tonnes carbon)* 3.67 to convert to metric tonnes CO2 equivalent)/Production per Day			Assumption: (((.16 gallons gasoline per MBF * 5.33 (pounds carbon per gallon))/2205(conversion to metric tonnes)* 3.67 to convert to metric tonnes CO2 equivalent)/mbf per acre harvested. Applies to all species whether harvested or not.	Assumption: Round Trip Hours/Load average (from below, to compute the mbf/hour) /((6 gallons diesel/hour * 6.12 pounds carbon/gallon)/2205 (conversion to metric tonnes carbon))*3.67 (conversion to metric tonnes carbon dioxide equivalent)		
	Computed. Metric Tonnes CO2 equivalent per mbf harvested Applies to all species whether harvested or treated	Step 9. Enter the estimated volume delivered to the landing in a day.	Step 10. Enter number of pieces of equipment in use per day for each harvest entry	Computed. Yarders and Loaders CO2 equivalent/mbf (metric tonnes)	Computed. Yarders and Loaders CO2 equivalent per Acre Harvested (metric tonnes)	Step 11. Enter number of pieces of equipment in use per day for each harvest entry	Computed. Tractor and skidder CO2 equivalent/mbf (metric tonnes)	Computed. Tractors and Skidders CO2 equivalent per Acre Harvested (metric tonnes)	Step 12. Enter number of pieces of equipment in use per day for each harvest entry	Computed. Helicopter CO2 equivalent/mbf (metric tonnes)	Computed. Helicopters CO2 equivalent per Acre Harvested (metric tonnes)	Computed. Landing Saws CO2 equivalent per Acre Harvested (metric tonnes)	Steps 13 and 14 below		Computed. Estimated Metric Tonnes CO2e per harvested acre for each harvesting period.
0	(0.02)	40	2	-0.02	-0.06	2	-0.03	-0.10	0	0.00	0.00	-0.01	Step 13. Enter Estimated Load Average: MBF/Truck	6	-0.06794449
20	(0.01)	40	2	0.00	0.00	2	-0.03	-0.07	0	0.00	0.00	-0.01			-0.050958367
40	(0.01)	40	2	-0.02	-0.09	2	-0.03	-0.14	0	0.00	0.00	-0.01			-0.101916735
60	(0.02)	40	2	-0.02	-0.12	2	-0.03	-0.19	0	0.00	0.00	-0.01	Step 14. Enter Estimated Round Trip Haul In Hours	6	-0.13588898
80	(0.02)	40	2	-0.02	-0.15	2	-0.03	-0.24	0	0.00	0.00	-0.02			-0.169861224
100	(0.03)	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	-0.02			-0.203833469
0	-	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00			0
0	-	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00			0
0	-	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00			0
0	-	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00			0
Sum Emissions	-0.11				-0.42			-0.74			0.00	-0.07			-0.73

Project Carbon Accounting: Harvested Wood Products and Processing Emissions (Selection)

This worksheet addresses the non-biological emissions associated with the project area's harvesting activities. Complete the input for Steps 15- 16 on this worksheet.

Harvest Periods	Quantity of Forest Carbon Delivered to Mills				Non-Biological Emissions Associated with Mills	Quantity of Forest Carbon Remaining Immediately After Milling (Mill Efficiency)		Long-Term Sequestration in Wood Products	
	Conifer Percentage Delivered to Mills	Hardwood Percentage Delivered to Mills	Conifer CO2e Delivered to Mills / Acre	Hardwood CO2 equivalent Delivered to Mills / Acre	**Assumption.** 20 kw/hour (mill energy use) /(40mbf lumber processed/hour) *(.05 metric tonnes/kw hour) * mbf processed	**Computed.** Remaining CO2 equivalent after Milling Efficiency for Conifers	**Computed.** Remaining CO2 equivalent after Milling Efficiency for Hardwoods	**Computed.** CO2 Equivalent Tonnes in Conifer Wood Products in Use-100 Year Weighted Average / Acre and Landfill	**Computed.** CO2 Equivalent Tonnes in Hardwood Wood Products in Use-100 Year Weighted Average / Acre
from Inventory, Growth, and Harvest Page (Time of Harvest as years from project approval)	**Step 15.** Insert the percentage of conifer trees harvested that are subsequently delivered to sawmills	**Step 16.** Insert the percentage of hardwoods harvested or treated that are subsequently delivered to sawmills	**Computed:** The merchantable portion determined by the conversion factors (Sampson, 2002) on the Inventory, Growth, and Harvest worksheet. This is multiplied by the percent delivered to mills to reflect the carbon delivered to mills.	**Computed:** The merchantable portion determined by the conversion factors (Sampson, 2002) on the Inventory, Growth, and Harvest worksheet. This is multiplied by the percent delivered to mills to reflect the carbon delivered to mills.	**Calculated.** **The CO2e associated with processing the logs at the mill**	The difference between carbon delivered to mills and carbon remaining after milling is assumed to be emitted immediately		**Estimate.** The weighted average carbon remaining in use at year 100 is 46.3%	**Estimate.** The weighted average carbon remaining in use at year 100 is 23.0%
						The efficiency rating from mills in California is 0.67 (DOE 1605b) for conifers	The efficiency rating from mills in California is .5 (DOE 1605b) for hardwoods	**Estimate.** The carbon in landfills at year 100 is 29.8% of the initial carbon produced in wood products.	**Estimate.** The carbon in landfills at year 100 is 29.8% of the initial carbon produced in wood products.
0	85%	0%	13.21	0.00	-0.09	6.85	0.00	6.73	0.00
20	85%	0%	9.91	0.00	-0.06	6.64	0.00	5.05	0.00
40	85%	0%	19.81	0.00	-0.13	13.27	0.00	10.10	0.00
60	85%	0%	26.42	0.00	-0.17	17.70	0.00	13.47	0.00
80	85%	0%	33.02	0.00	-0.21	22.12	0.00	16.84	0.00
100	85%	0%	39.63	0.00	-0.26	26.55	0.00	20.20	0.00
0	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Sum of emissions associate with processing of lumber			-0.91	Sum of CO2 equivalent in wood products		72.40	0.00

Summary (Selection)			Years until Carbon Stocks are Recouped from Initial Harvest (Includes Carbon in Live Trees, Harvested Wood Products, and Landfill)
	Beginning Stocks	Ending Stocks	
Emissions Source/Sink/Reservoir	Metric Tonnes CO2 Equivalent Per Acre Basis		15 Years
Live Trees (Conifers and Hardwoods)	140.53	297.13	
Wood Products		72.40	
Site Preparation Emissions		0.00	
Non-biological emissions associated with harvesting		-2.08	
Non-biological emissions associated with milling		-0.91	
Sum of Net Emissions/Sequestration over Identified Harvest Cycles (CO2 metric tonnes)		226.01	

Project Summary		
Project Acres	Step 17- Insert the acres that are part of the harvest area.	84
Total Project Sequestration over defined Harvesting Periods (CO2 metric tonnes)		18,985

Project Carbon Accounting: Inventory, Growth, and Harvest Transition Units (Transition)

This worksheet addresses the sequestation and emissions associated with the project area's balance of harvest, inventory, and growth plus any emissions associated with site preparation. Complete the input for Steps 0- 8 on this worksheet.

Forest Type				Harvest Periods	Inventory		Growth Rates		Harvest Volume	
Multipliers to Estimate Carbon Tonnes per MBF (Sampson, 2002)				Time of Harvest (years from project approval)	Conifer Live Tree Volume (MBF/Acre) - Prior to Harvest	Hardwood Live Tree Volume (BA square feet/Acre) - Prior to Harvest	Conifer Growth Rate BF/Acre/Year	Hardwood Growth Rate BA/Acre/Year	Conifer Harvest Volume (MBF/acre)	Hardwood Harvested / Treated Basal Area (BA/Acre)
Forest Type	Step 0. Identify the approximate percentage of conifers by volume within the harvest plan. Must sum to 100%	Multiplier from Cubic Feet (merchantable) to Total Biomass	Pounds Carbon per Cubic Foot	Step 1. Enter the anticipated future harvest entries. The re-entry cycles should be supported by management plan, if available.	Step 2. Enter the estimated conifer inventory (mbf/acre) present in project area prior to harvest.	Step 3. Enter the estimated hardwood inventory (basal area per acre) present in project area prior to harvest.	Step 4. Enter the average annual periodic growth of conifers between harvests based on estimated growth in management plan, if available. Must be entered for each harvest cycle identified in Step 1.	Step 5. Insert average annual periodic growth of hardwoods between harvests based on estimated growth in management plan, if available.	Step 6. Enter the estimated conifer harvested per acre at current and future entries. The estimate should be based on projections from the management plan, if available.	Step 7. Enter estimated hardwood basal area harvested/treated per acre
Douglas-fir	55%	1.675	14.38	User must enter harvest cycles to 100 years and/or at least three entry cycles.	0	7	100	500	0.5	4	75
Redwood	45%	1.675	13.42		20	13	35	480	0.5	3	20
Pines	0%	2.254	12.14		40	19.6	25	550	0.5	6	15
True firs	0%	2.254	11.18		60	24.6	20	650	0.5	8	15
Hardwoods		2.214	11.76		80	29.6	15	800	0.5	10	10
					100	35.6	15	950	0.5	12	15
Conversion of Board Feet to Cubic Feet	0.165	Pounds per Metric Tonne	2.204		0	0	0	0	0	0	0
Multipliers to Estimate Total Carbon Tonnes per MBF	Conifer	1.75			0	0	0	0	0	0	0
	Hardwoods	1.95			0	0	0	0	0	0	0
Multipliers to Estimate Merchantable Carbon Tonnes per MBF	Conifer	1.04			0	0	0	0	0	0	0
	Hardwoods	0.88			0	0	0	0	0	0	0

Harvest Periods	Inventory Conversion to Carbon (prior to harvest)		0		Site Preparation	
	Conifer Live Tree Tonnes (C/acre)	Hardwood Live Trees Tonnes (C/acre)	Conifer Live Tree Tonnes (CO_2 equivalent/acre)	Hardwood Live Tree Tonnes (CO_2 equivalent/acre)	Step 8. Enter the value (in bold) for each harvest cycel that best reflects the site preparation activities, as averaged across the project area:	
from above (Time of Harvest as years from project approval)	Computed: MBF * Conifer Multiplier from Step 0.	Computed: BA*Volume/Basal Area Ration (to convert to MBF) * Hardwood Multiplier from Step 0.	Computed: Conversion of carbon to CO_2 (3.67 tonnes CO2 per 1 tonne Carbon)	Computed: Conversion of carbon to CO_2 (3.67 tonnes CO2 per 1 tonne Carbon)	Heavy- 50% or more of the project area is covered with brush and removed as part of site preparation or stumps are removed (mobile emissions estimated at .429 metric tonnes CO2e per acre, biological emissions estimated at 2 metric tonnes CO2e per acre) Medium - >25% <50% of the project area is covered with brush and removed as part of site preparation (mobile emissions estimated at .202 metric tonnes CO2e per acre, biological emissions estimated at 1 metric tonne per acre). Light - 25% or less of the project area is covered with brush and is removed as part of site preparation (mobile emissions estimated at .09 metric tonnes CO2e per acre, biological emissions estimated at .5 metric tonnes per acre). None - No site preparation is conducted.	
0	12	15	45	54	None	0
20	23	5	83	19	None	0
40	34	4	126	13	None	0
60	43	3	158	11	None	0
80	52	2	190	8	None	0
100	62	2	229	8	none	0
0	0	0	0	0	None	0
0	0	0	0	0	None	0
0	0	0	0	0	None	0
	Difference between ending stocks and beginning stocks		184	-45.60	Sum of emissions (Metric Tonnes CO2e) per acre	0

Project Carbon Accounting: Harvesting Emissions (Transition)

This worksheet addresses the non-biological emissions associated with the project area's harvesting activities. Complete the input for Steps 9- 14 on this worksheet.

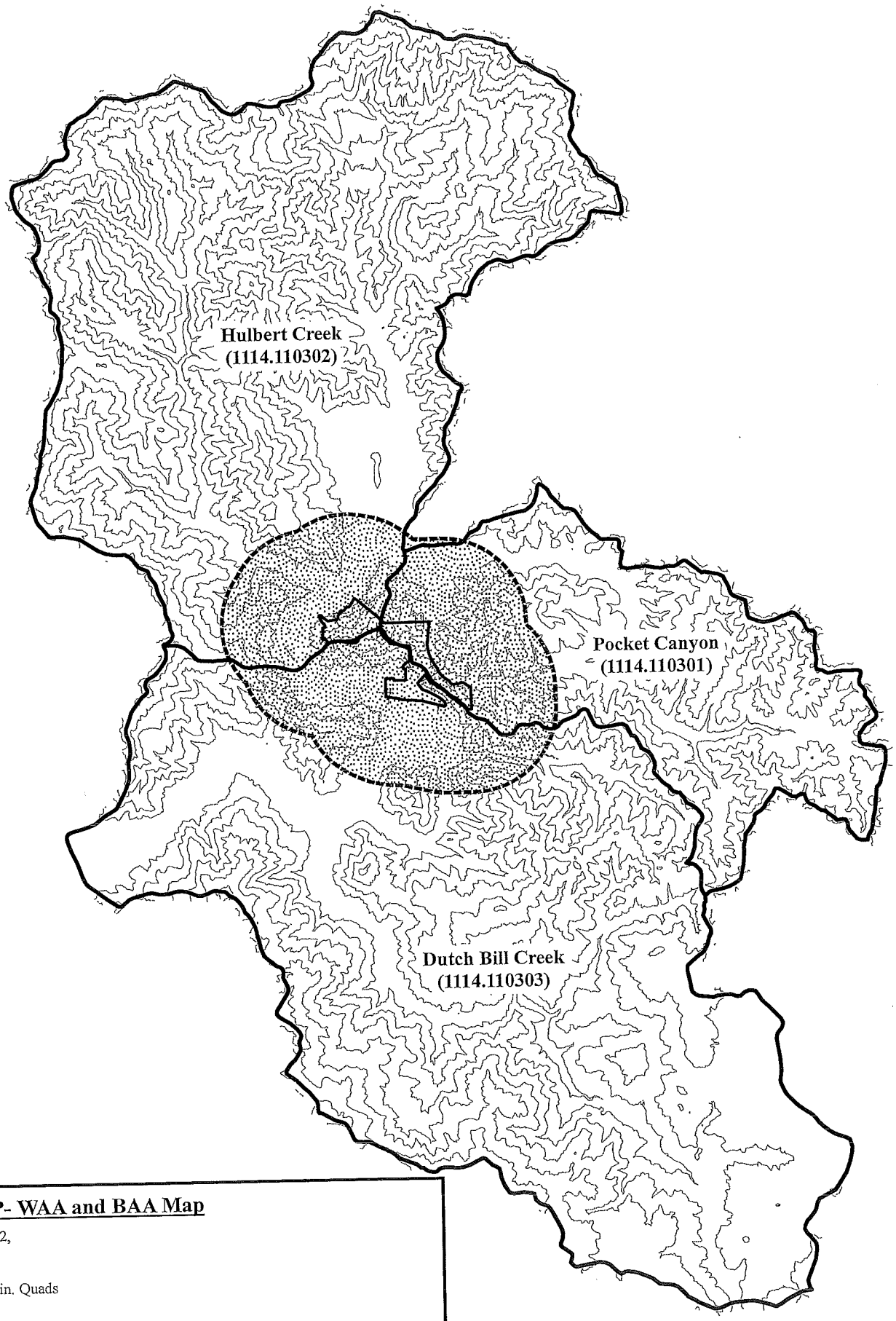
Harvest Periods	Falling Operations	Production per Day	Emissions Associated with Yarders and Loaders			Emissions Associated with Tractors and Skidders			Emissions Associated with Helicopters			Landing Saws	Trucking Emissions		
from Inventory, Growth, and Harvest Page (Time of Harvest as years from project approval)	Assumption: ((.25 gallons gasoline per MBF harvested * 5.33 (pounds carbon per gallon))/2205(conversion to metric tonnes)* mbf per acre harvested - Computed. Metric Tonnes CO2 equivalent per mbf harvested Applies to all species whether harvested or treated	MBF (all species) Yarded Delivered to Landing Step 9. Enter the estimated volume delivered to the landing in a day.	Assumption:(((35 gallons diesel per day per piece of equipment * 6.12 pounds carbon / gallon)/2205 to convert to metric tonnes carbon)* 3.67 to convert to metric tonnes CO2 equivalent)/Production per Day Step 10. Enter number of pieces of equipment in use per day for each harvest entry	Computed. Yarders and Loaders CO2 equivalent/mbf (metric tonnes)	Computed. Yarders and Loaders CO2 equivalent per Acre Harvested (metric tonnes)	Assumption: (((55 gallons diesel per day per piece of equipment * 6.12 pounds carbon / gallon)/2205 to convert to metric tonnes carbon)* 3.67 to convert to metric tonnes CO2 equivalent)/Production per Day Step 11. Enter number of pieces of equipment in use per day for each harvest entry	Computed. Tractor and skidder CO2 equivalent/mbf (metric tonnes)	Computed. Tractors and Skidders CO2 equivalent per Acre Harvested (metric tonnes)	Assumption: (((200 gallons jet fuel per day per piece of equipment * 5 pounds carbon / gallon)/2205 to convert to metric tonnes carbon)* 3.67 to convert to metric tonnes CO2 equivalent)/Production per Day Step 12. Enter number of pieces of equipment in use per day for each harvest entry	Computed. Helicopter CO2 equivalent/mbf (metric tonnes)	Computed. Helicopters CO2 equivalent per Acre Harvested (metric tonnes)	Assumption: (((.16 gallons gasoline per MBF * 5.33 (pounds carbon per gallon))/2205(conversion to metric tonnes)* 3.67 to convert to metric tonnes CO2 equivalent)/mbf per acre harvested. Applies to all species whether harvested or not. Computed. Landing Saws CO2 equivalent per Acre Harvested (metric tonnes)	Assumption: Round Trip Hours/Load average ((from below, to compute the mbf/hour) /((6 gallons diesel/hour * 5.12 pounds carbon/gallon)/2205 (conversion to metric tonnes carbon))*3.67 (conversion to metric tonnes carbon dioxide equivalent) Steps 13 and 14 below		Computed. Estimated Metric Tonnes CO2e per harvested acre for each harvesting period.
0	(0.02)	40	2	-0.02	-0.06	2	-0.03	-0.10	0	0.00	0.00	-0.01	Step 13. Enter Estimated Load Average: MBF/Truck	4.2	-0.080886297
20	(0.01)	40	2	0.00	0.00	2	-0.03	-0.07	0	0.00	0.00	-0.01			-0.060664723
40	(0.02)	40	2	-0.02	-0.09	2	-0.03	-0.14	0	0.00	0.00	-0.01			-0.121329446
60	(0.02)	40	2	-0.02	-0.12	2	-0.03	-0.19	0	0.00	0.00	-0.01	Step 14. Enter Estimated Round Trip Haul in Hours	6	-0.161772595
80	(0.02)	40	2	-0.02	-0.15	2	-0.03	-0.24	0	0.00	0.00	-0.02			-0.202215743
100	(0.03)	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	-0.02			-0.242658892
0	-	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00			0
0	-	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00			0
0	-	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00			0
0	-	0	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00			0
Sum Emissions	-0.12				-0.42			-0.74			0.00	-0.08			-0.87

Project Carbon Accounting: Harvested Wood Products and Processing Emissions (Transition)

This worksheet addresses the non-biological emissions associated with the project area's harvesting activities. Complete the input for Steps 15- 16 on this worksheet.

Harvest Periods	Quantity of Forest Carbon Delivered to Mills				Non-Biological Emissions Associated with Mills	Quantity of Forest Carbon Remaining Immediately After Milling (Mill Efficiency)		Long-Term Sequestration in Wood Products	
	Conifer Percentage Delivered to Mills	Hardwood Percentage Delivered to Mills	Conifer CO2e Delivered to Mills / Acre	Hardwood CO2 equivalent Delivered to Mills / Acre	**Assumption.** 20 kw/hour (mill energy use) /(40mbf lumber processed/hour) *(.05 metric tonnes/kw hour) * mbf processed	**Computed.** Remaining CO2 equivalent after Milling Efficiency for Conifers	**Computed.** Remaining CO2 equivalent after Milling Efficiency for Hardwoods	**Computed.** CO2 Equivalent Tonnes in Conifer Wood Products in Use- 100 Year Weighted Average / Acre and Landfill	**Computed.** CO2 Equivalent Tonnes in Hardwood Wood Products in Use- 100 Year Weighted Average / Acre
from Inventory, Growth, and Harvest Page (Time of Harvest as years from project approval)	**Step 15.** Insert the percentage of conifer trees harvested that are subsequently delivered to sawmills	**Step 16.** Insert the percentage of hardwoods harvested or treated that are subsequently delivered to sawmills	**Computed:** The merchantable portion determined by the conversion factors (Sampson, 2002) on the Inventory, Growth, and Harvest worksheet. This is multiplied by the percent delivered to mills to reflect the carbon delivered to mills.	**Computed:** The merchantable portion determined by the conversion factors (Sampson, 2002) on the Inventory, Growth, and Harvest worksheet. This is multiplied by the percent delivered to mills to reflect the carbon delivered to mills.	**Calculated.** The CO2e associated with processing the logs at the mill	The difference between carbon delivered to mills and carbon remaining after milling is assumed to be emitted immediately		**Estimate.** The weighted average carbon remaining in use at year 100 is 46.3%	**Estimate.** The weighted average carbon remaining in use at year 100 is 23.0%
						The efficiency rating from mills in California is 0.67 (DOE 1605b) for conifers	The efficiency rating from mills in California is .5 (DOE 1605b) for hardwoods	**Estimate.** The carbon in landfills at year 100 is 29.8% of the initial carbon produced in wood products.	**Estimate.** The carbon in landfills at year 100 is 29.8% of the initial carbon produced in wood products.
0	85%	0%	13.03	0.00	-0.09	8.73	0.00	6.64	0.00
20	85%	0%	9.77	0.00	-0.06	6.55	0.00	4.98	0.00
40	85%	0%	19.54	0.00	-0.13	13.09	0.00	9.97	0.00
60	85%	0%	26.06	0.00	-0.17	17.46	0.00	13.29	0.00
80	85%	0%	32.57	0.00	-0.21	21.82	0.00	16.61	0.00
100	85%	0%	39.09	0.00	-0.26	26.19	0.00	19.93	0.00
0	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0%	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Sum of emissions associate with processing of lumber			-0.91	Sum of CO2 equivalent in wood products		71.42	0.00

Summary (Transition)			Years until Carbon Stocks are Recouped from Initial Harvest (Includes Carbon in Live Trees, Harvested Wood Products, and Landfill)
	Beginning Stocks	Ending Stocks	
Emissions Source/Sink/Reservoir	Metric Tonnes CO2 Equivalent Per Acre Basis		17 Years
Live Trees (Conifers and Hardwoods)	98.58	236.56	
Wood Products		71.42	
Site Preparation Emissions		0.00	
Non-biological emissions associated with harvesting		-2.23	
Non-biological emissions associated with milling		-0.91	
Sum of Net Emissions/Sequestration over Identified Harvest Cycles (CO2 metric tonnes)		206.25	
Project Summary			
Project Acres	Step 17- Insert the acres that are part of the harvest area.	140	
Total Project Sequestration over defined Harvesting Periods (CO2 metric tonnes)		28,875	



Silver Estates THP- WAA and BAA Map

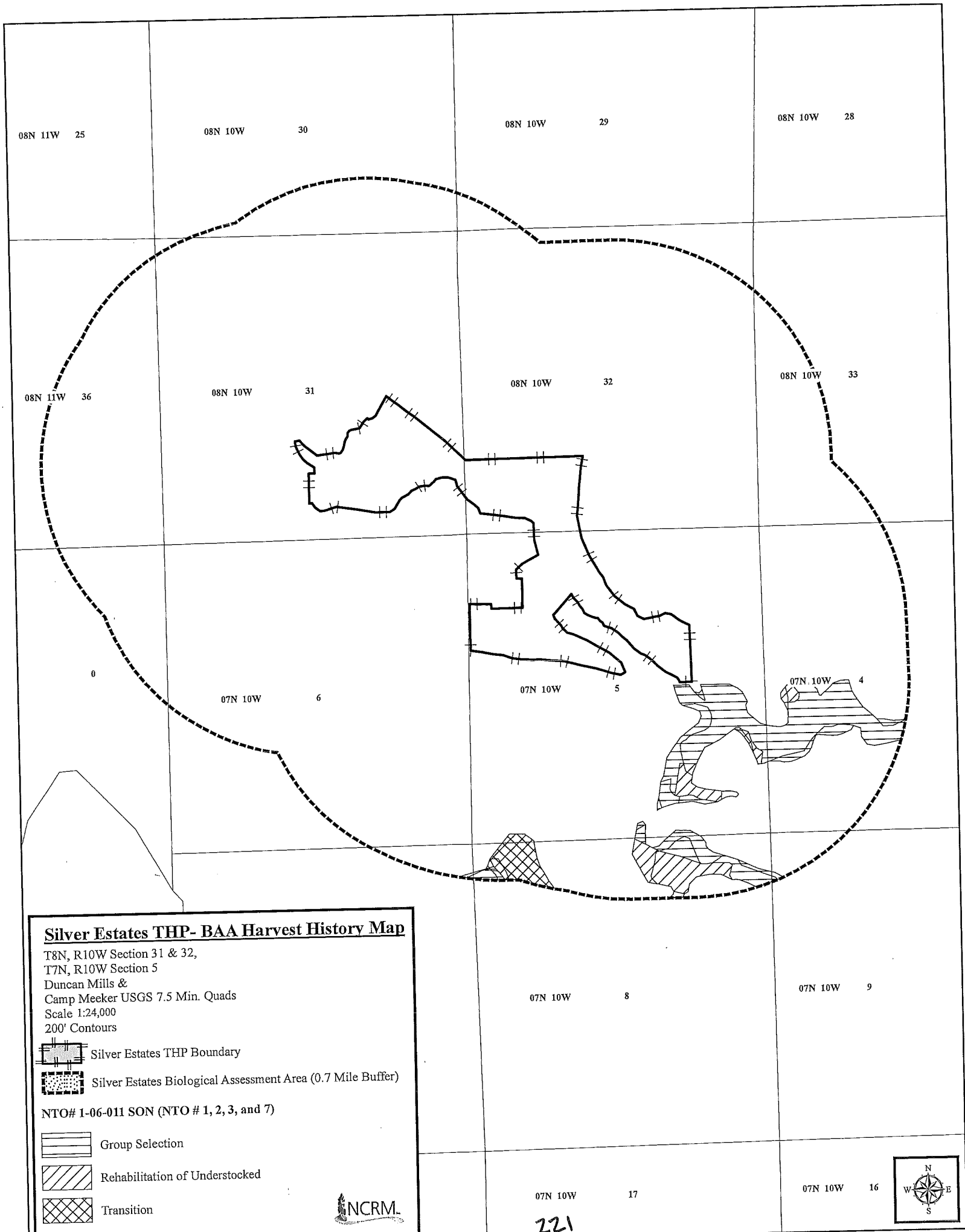
T8N, R10W Section 31 & 32,
T7N, R10W Section 5
Duncan Mills &
Camp Meeker USGS 7.5 Min. Quads
Scale 1:75,000
200' Contours

Planning Watershed

- Dutch Bill Creek
- Hulbert Creek
- Pocket Canyon

- Silver Estates THP Boundary
- Silver Estates Biological Assessment Area (0.7 Mile Buffer)

NCRM



Silver Estates THP- BAA Harvest History Map

T8N, R10W Section 31 & 32,
T7N, R10W Section 5
Duncan Mills &
Camp Meeker USGS 7.5 Min. Quads
Scale 1:24,000
200' Contours

Silver Estates THP Boundary

Silver Estates Biological Assessment Area (0.7 Mile Buffer)

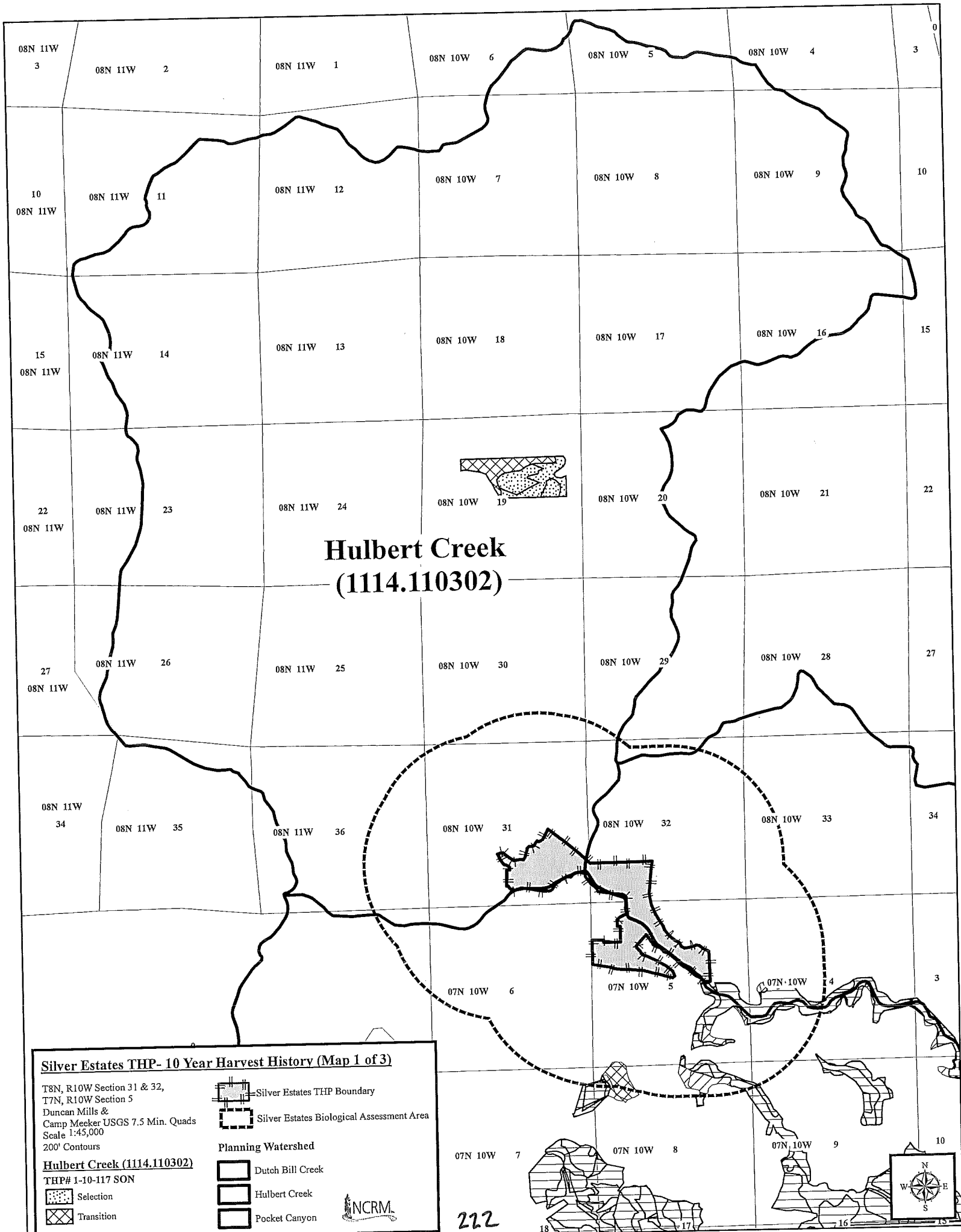
NTO# 1-06-011 SON (NTO # 1, 2, 3, and 7)

Group Selection

Rehabilitation of Understocked

Transition

NCRM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22 08N 11W
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08N 10W 21
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Hulbert Creek
(1114.110302)
27 08N 11W
08N 11W 26
08N 11W 25
08N 10W 30
08N 10W 29
08N 10W 28
27
08N 11W 34
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07N 10W 5
07N 10W 4
3
07N 10W 7
07N 10W 8
07N 10W 9
10
18
17
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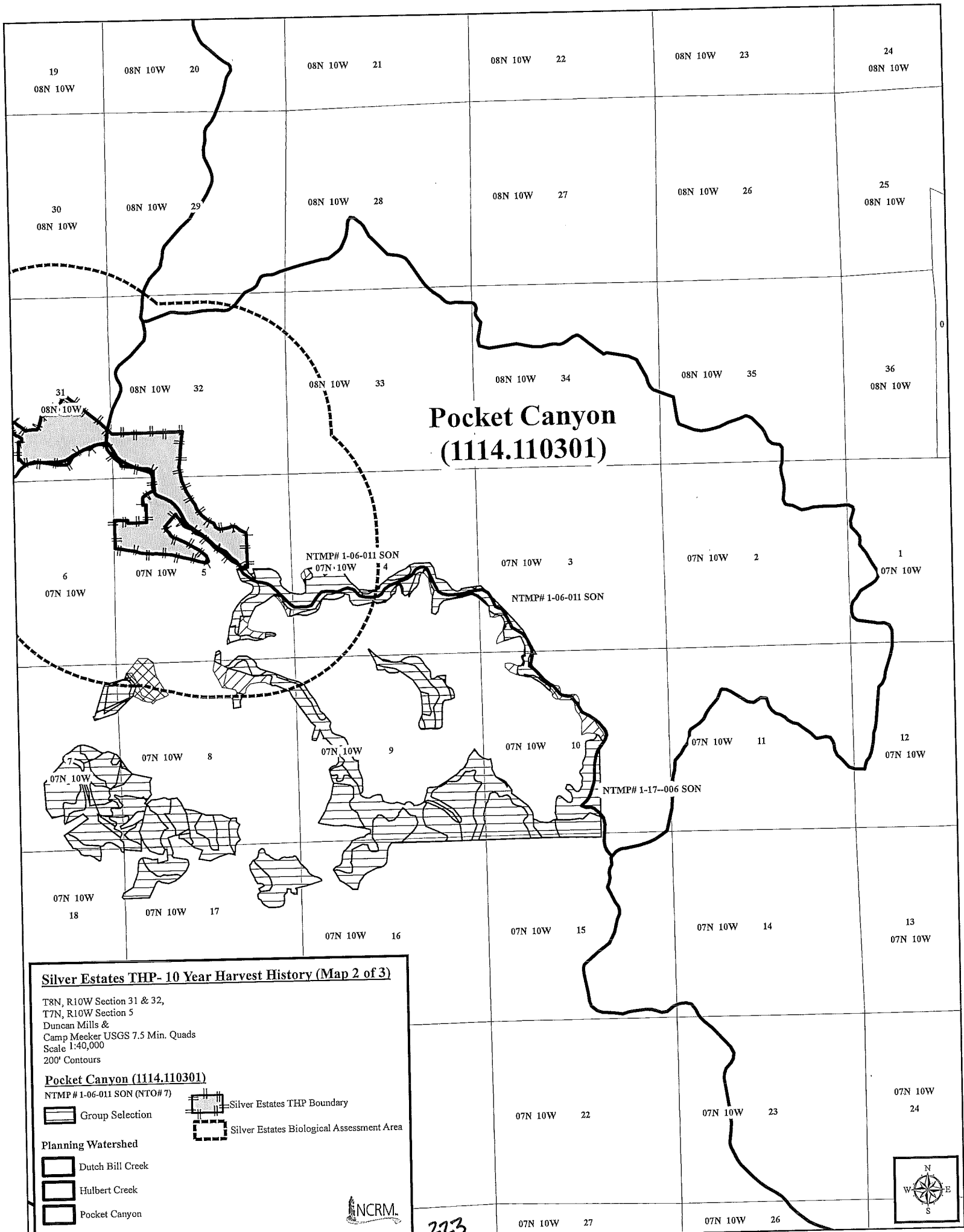
E
S
Silver Estates THP- 10 Year Harvest History (Map 1 of 3)
T8N, R10W Section 31 & 32,
T7N, R10W Section 5
Duncan Mills &
Camp Meeker USGS 7.5 Min. Quads
Scale 1:45,000
200' Contours
Hulbert Creek (1114.110302)
THP# 1-10-117 SON
Selection
Transition
Silver Estates THP Boundary
Silver Estates Biological Assessment Area
Planning Watershed
Dutch Bill Creek
Hulbert Creek
Pocket Canyon
NCRM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08N 10W 33
08N 10W 34
08N 10W 35
36
08N 10W
Pocket Canyon
(1114.110301)
NTMP# 1-06-011 SON
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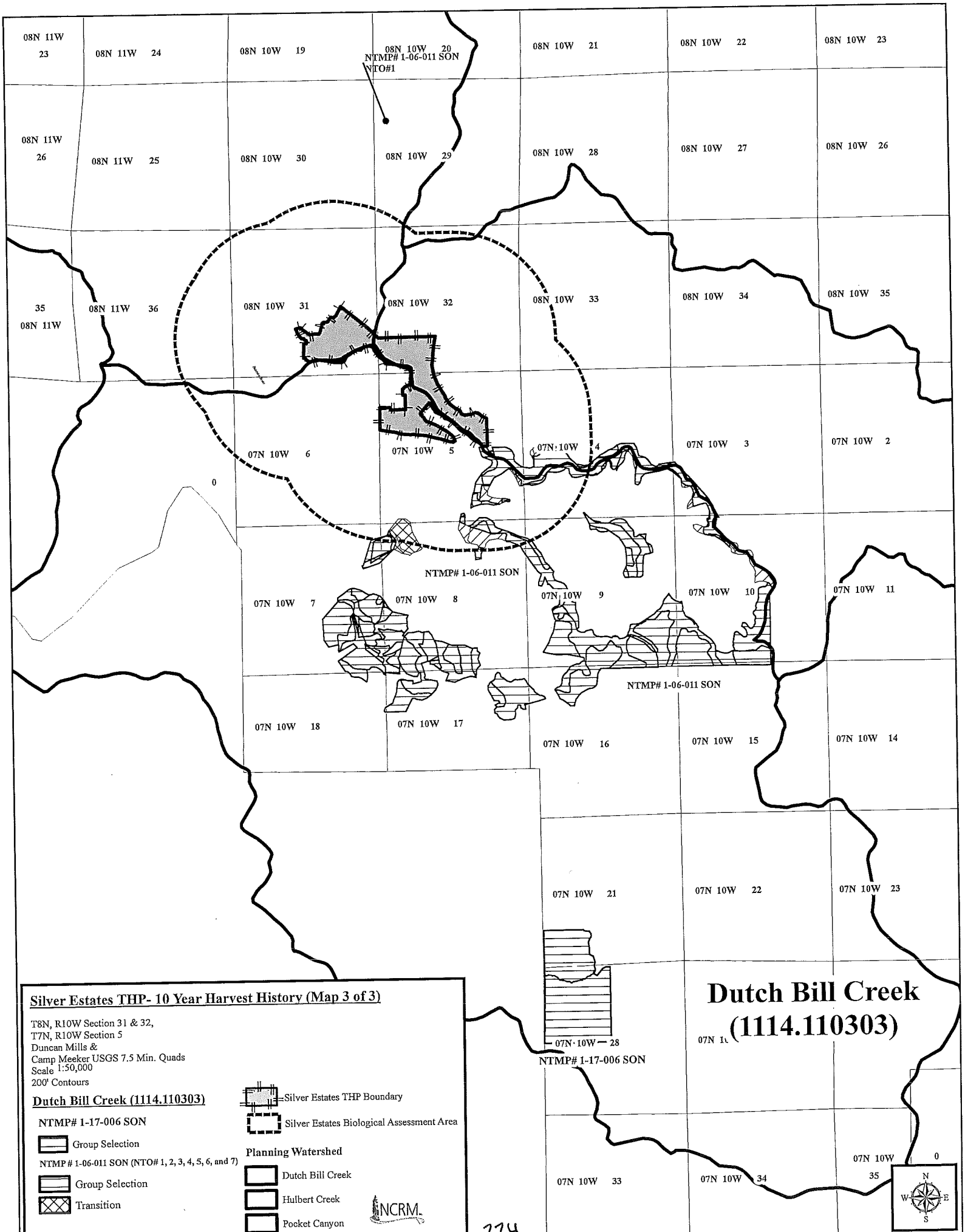
07N 10W
07N 10W 5
07N 10W 4
07N 10W 3
07N 10W 2
1
07N 10W
NTMP# 1-06-011 SON
7
07N 10W
07N 10W 8
07N 10W 9
07N 10W 10
07N 10W 11
12
07N 10W
NTMP# 1-17--006 SON
07N 10W
18
07N 10W 17
07N 10W 16
07N 10W 15
07N 10W 14
13
07N 10W
07N 10W 22
07N 10W 23
07N 10W
24
07N 10W 27
07N 10W 26
Silver Estates THP- 10 Year Harvest History (Map 2 of 3)
T8N, R10W Section 31 & 32,
T7N, R10W Section 5
Duncan Mills &
Camp Meeker USGS 7.5 Min. Quads
Scale 1:40,000
200' Contours
Pocket Canyon (1114.110301)
NTMP # 1-06-011 SON (NTO# 7)
Group Selection
Silver Estates THP Boundary
Silver Estates Biological Assessment Area
Planning Watershed
Dutch Bill Creek
Hulbert Creek
Pocket Canyon
NCRM
N
W
E
S



Silver Estates THP- 10 Year Harvest History (Map 3 of 3)

T8N, R10W Section 31 & 32,
T7N, R10W Section 5
Duncan Mills &
Camp Meeker USGS 7.5 Min. Quads
Scale 1:50,000
200' Contours

Dutch Bill Creek (1114.110303)

NTMP# 1-17-006 SON

Group Selection

NTMP # 1-06-011 SON (NTO# 1, 2, 3, 4, 5, 6, and 7)

Group Selection

Transition

Silver Estates THP Boundary

Silver Estates Biological Assessment Area

Planning Watershed

Dutch Bill Creek

Hulbert Creek

Pocket Canyon

NCRM

Dutch Bill Creek (1114.110303)