License Renewal Application
Appendix E
Applicant's Environmental Report – Operating License Renewal Stage
Amendment 1

1.2 ENVIRONMENTAL REPORT SCOPE AND METHODOLOGY

NRC regulations for domestic licensing of nuclear power plants require environmental review of applications to renew operating licenses. NRC regulation 10 CFR 51.53(c) requires that an applicant for license renewal submit with its application a separate document entitled *Applicant's Environmental Report – Operating License Renewal Stage*. In determining what information to include in the DCPP Environmental Report, PG&E has relied on NRC regulations and the following support documents:

- NRC supplemental information in the *Federal Register* (References 1, 2, 3, 4, and 7)
- *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (References 1 and 8)
- *Regulatory Analysis for Amendments to Regulations for the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses* (Reference 5)
- *Public Comments on the Proposed 10 CFR Part 51 Rule for Renewal of Nuclear Power Plant Operating Licenses and Supporting Documents: Review of Concerns and NRC Staff Response* (Reference 6)

On June 20, 2013, the NRC published a final rule (78 FR 37282, Reference 9) revising its environmental protection regulation, Title 10 of the Code of Federal Regulations (10 CFR) Part 51. Specifically, the final rule updated the potential environmental impacts associated with the renewal of an operating license for a nuclear power reactor for an additional 20 years. The revised GEIS (NUREG-1437, Revision 1, Reference 10) and final rule reflect lessons learned and knowledge gained during previous license renewal environmental reviews.

The final rule identified 78 environmental impact issues, of which 19 require plant-specific analysis. The final rule consolidated similar Category 1 and 2 issues, changed some Category 2 issues into Category 1 issues, and consolidated some of those issues with existing Category 1 issues. The final rule also added new Category 1 and 2 issues. The new Category 1 issues include, but are not limited to, geology and soils, exposure of terrestrial organisms to radionuclides, exposure of aquatic organisms to radionuclides, human health impact from chemicals, and physical occupational hazards. The new Category 2 issues include radionuclides released to groundwater, effects on terrestrial resources (non-cooling system impacts), minority and low-income populations (i.e., environmental justice), and cumulative impacts.

By a letter dated May 2, 2014, the NRC staff advised PG&E that it would need to update the information contained in the environmental report submitted in November 2009 in accordance with 10 CFR 51.45 and 51.53(c). The NRC staff also requested information from PG&E related to the newly-identified generic and site-specific license renewal

issues. PG&E Letter DCL-14-103 amended the DCPP Environmental Report to address these nine new environmental issues.

PG&E has prepared Table 1.2-1 to verify conformance with regulatory requirements. Table 1.2-1 indicates where the environmental report responds to each requirement of 10 CFR 51.53(c). In addition, each responsive section of Chapters 3 and 4 are prefaced by pertinent regulatory language and applicable supporting document language.

1.4 REFERENCES

1. NUREG-1437: Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS), U.S. Nuclear Regulatory Commission, Volumes 1 and 2, Washington, DC, May 1996.

2. Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, Federal Register, Vol. 61, No. 109, U.S. Nuclear Regulatory Commission, June 5, 1996.

3. Environmental Review for Renewal of Nuclear Power Plant Operating Licenses; Correction, Federal Register, Vol. 61, No. 147, U.S. Nuclear Regulatory Commission, July 30, 1996.

4. Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, Federal Register, Vol. 61, No. 244, U.S. Nuclear Regulatory Commission, December 18, 1996.

5. NUREG-1440: Regulatory Analysis for Amendments to Regulations for the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, U.S. Nuclear Regulatory Commission, Washington, DC, May 1996.

6. NUREG-1529: Public Comments on the Proposed 10 CFR Part 51 Rule for Renewal of Nuclear Power Plant Operating Licenses and Supporting Documents: Review of Concerns and NRC Staff Response, U.S. Nuclear Regulatory Commission, Volumes 1 and 2, Washington, DC, May 1996.

7. Changes to Requirements for Environmental Review for Renewal of Nuclear Power Plant Operating Licenses; Final Rules, Federal Register, Vol. 64, No. 171, U.S. Nuclear Regulatory Commission, September 3, 1999.

8. NUREG-1437: Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS), Nuclear Regulatory Commission, Section 6.3, "Transportation" and Table 9-1, "Summary of findings on NEPA issues for license renewal of nuclear power plants," Volume 1, Addendum 1, Washington, DC, August 1999.

9. Revisions to Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, Federal Register, Vol. 78, No. 119, U.S. Nuclear Regulatory Commission, June 20, 2013.

10. NUREG-1437: Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS), U.S. Nuclear Regulatory Commission, Revision 1, Washington, DC, June 2013.

TABLE 1.2-1 Sheet 1 of 2

ENVIRONMENTAL REPORT RESPONSES TO LICENSE RENEWAL ENVIRONMENTAL REGULATORY REQUIREMENTS

Regulatory Requirement	Responsive Environmental Report Section (s)	
10 CFR 51.53(c)(1)	Entire Document	
10 CFR 51.53(c)(2), Sentences 1 and 2	3.0	Proposed Action
10 CFR 51.53(c)(2) Sentence 3	7.2.2	Environmental Impacts of Alternatives
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(1)	4.0	Environmental Consequences of the Proposed Action and Mitigating Alternatives
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(2)	6.3	Unavoidable Adverse Impacts
10 CFR 51.53(c)(2) and	7.0	Alternatives to the Proposed Action
10 CFR 51.45(b)(3)	8.0	Comparison of Environmental Impacts of License Renewal with the Alternatives
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(4)	6.5	Short-Term Versus Long-Term Productivity of the Environment
10 CFR 51.53(c)(2) and 10 CFR 51.45(b)(5)	6.4	Irreversible and Irretrievable Resource Commitments
10 CFR 51.53(c)(2) and 10 CFR 51.45(c)	4.0	Environmental Consequences of the Proposed Action and Mitigating Alternatives
	6.2	Mitigation
	7.2.2	Environmental Impacts of Alternatives
	8.0	Comparison of Environmental Impacts of License Renewal with the Alternatives
10 CFR 51.53(c)(2) and 10 CFR 51.45(d)	9.0	Status of Compliance
10 CFR 51.53(c)(2) and 10 CFR 51.45(e)	4.0	Environmental Consequences of the Proposed Action and Mitigating Alternatives
	6.3	Unavoidable Adverse Impacts
10 CFR 51.53(c)(3)(ii)(A)	4.1	Water Use Conflicts (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a Small River with Low Flow)
	4.6	Groundwater Use Conflicts (Plants Using Cooling Towers or Cooling Ponds and Withdrawing Makeup Water from a Small River)
10 CFR 51.53(c)(3)(ii)(B)	4.2	Entrainment of Fish and Shellfish in Early Life Stages
	4.3	Impingement of Fish and Shellfish
	4.4	Heat Shock
10 CFR 51.53(c)(3)(ii)(C)	4.5	Groundwater Use Conflicts (Plants Using >100gpm of Groundwater)
	4.7	Groundwater Use Conflicts (Plants Using Ranney Wells)
10 CFR 51.53(c)(3)(ii)(D)	4.8	Degradation of Groundwater Quality
10 CFR 51.53(c)(3)(ii)(E)	4.9	~~Impacts of Refurbishment~~*Effects* on Terrestrial Resources
	4.10	Threatened or Endangered Species

TABLE 1.2-1 Sheet 2 of 2

ENVIRONMENTAL REPORT RESPONSES TO LICENSE RENEWAL ENVIRONMENTAL REGULATORY REQUIREMENTS

10 CFR 51.53(c)(3)(ii)(F)	4.11	Air Quality During Refurbishment (Non-Attainment and Maintenance Areas)
Regulatory Requirement	**Responsive Environmental Report Section (s)**	
10 CFR 51.53(c)(3)(ii)(G)	4.12	Microbiological Organisms
10 CFR 51.53(c)(3)(ii)(H)	4.13	Electric Shock from Transmission-Line-Induced Currents
10 CFR 51.53(c)(3)(ii)(I)	4.14	Housing Impacts
	4.15	Public Utilities: Public Water Supply Availability
	4.16	Education Impacts from Refurbishment
	4.17	Offsite Land Use
10 CFR 51.53(c)(3)(ii)(J)	4.18	Transportation
10 CFR 51.53(c)(3)(ii)(K)	4.19	Historic and Archaeological Resources
10 CFR 51.53(c)(3)(ii)(L)	4.20	Severe Accident Mitigation Alternatives
10 CFR 51.53(c)(3)(ii)(O)	*4.0.2*	*Cumulative Impacts*
10 CFR 51.53(c)(3)(ii)(P)	*5.0*	*Radionuclides Released to Groundwater*
10 CFR 51.53(c)(3)(iii)	4.0	Environmental Consequences of the Proposed Action and Mitigating Alternatives
10 CFR 51.53(c)(3)(iv)	6.2	Mitigation
	5.0	Assessment of New and Significant Information
10 CFR 51.*53(c)(3)(ii)(N)*~~, Appendix B, Table B-1, Footnote 6~~	2.6.2	Minority and Low-Income Populations

CHAPTER 2 - SITE AND ENVIRONMENTAL INTERFACES

2.1 LOCATION AND FEATURES

The Diablo Canyon Power Plant (DCPP) site is adjacent to the Pacific Ocean in San Luis Obispo County, California, and is approximately 12 miles west-southwest of the city of San Luis Obispo, the county seat and the nearest significant population center. The reactor for Unit 1 is located at latitude 35°12'44" North and longitude 120°51'14" West. The Universal Transverse Mercator (UTM) coordinates for zone 10 are 695,350 meters East and 3,898,450 meters North. The reactor for Unit 2 is located at latitude 35°12'41" North and longitude 120°51'13" West. The UTM coordinates are 695,380 meters East and 3,898,400 meters N. (Reference 2)

The residential community of Los Osos is approximately 8 miles north of the site. This community is located in a ~~mountainous~~ *coastal hillside* area adjacent to Montana de Oro State Park. The township of Avila Beach is located down the coast at a distance of approximately 7 miles southeast of the site. The city of Morro Bay is located up the coast approximately 11 miles northwest of the site (Reference 3). A number of other cities, as well as some unincorporated residential areas, exist along the coast and inland (Figure 2.1-1). However, these are at distances greater than 8 miles from the site. ~~Only 11 inhabited residences are within 6 miles of the site (Reference 1).~~ *Within 6 miles of the site, the permanent resident population is 168 (Reference 1).* Figure 2.1-2 is a 6 mile vicinity map.

The DCPP site consists of approximately 750 acres of land *(known as Parcel P)* located near the mouth of Diablo Creek, and a portion of the power plant site is bounded by the Pacific Ocean (Figure 2.1-3). Approximately 165 acres of the ~~owner-controlled area~~*DCPP site* are located north of Diablo Creek. The remaining 585 acres are located adjacent to and south of Diablo Creek. The entire acreage is ~~owned~~ *controlled* by PG&E.

PG&E ~~owns~~ *controls* all coastal properties north of Diablo Creek, to the southerly boundary of Montana de Oro State Park and inland a distance of 0.5 to 1.75 miles *(known as North Ranch)*. Similarly, PG&E ~~owns~~ *controls* all coastal properties south of Diablo Creek for approximately 8 miles and inland approximately 1.75 miles *(known as South Ranch)*. Except for the DCPP site, all of the acreage north and south of DCPP is encumbered by two grazing licenses. *PG&E also provides two managed public access programs: the Point Buchon Trail and the Pecho Coast Trail on the North Ranch and South Ranch, respectively. The Point Buchon Trail provides public access to approximately three and a half miles (over six miles round trip) of shoreline along the North Ranch. The Pecho Coast Trail provides docent-led access to approximately seven miles of coastal sage scrub and chaparral habitats on the South Ranch.*

The North Ranch, South Ranch, and Parcel P, together, comprise what is, henceforth, referred to as the Diablo Canyon lands.

Section 3.1 provides a description of the plant and some of its key features.

2.2 AQUATIC ECOLOGY

DCPP uses a once-through cooling (OTC) water system that withdraws seawater from and discharges into the ocean via shoreline intake and discharge structures. A complete description of the circulating water system can be found in Section 3.1.2, *Cooling and Auxiliary Water Systems*.

Table 2.2-3 presents a list of special status aquatic species with the potential to occur in the vicinity of DCPP, in which, special status is defined as species listed under the federal and/or state Endangered Species Acts (ESA/CESA), species proposed for listing under the federal ESA, species that are candidates for listing under the CESA, state Fully Protected species and state Species of Special Concern.

2.2.1 MARINE ECOLOGY

Information presented in the following Marine Ecology sections was compiled from many reports generated from intensive monitoring programs of the marine environment, centered around Diablo Cove, which began in 1976. The program name most commonly used to refer to these studies is the Thermal Effects Monitoring Program (TEMP). The TEMP studies consist of monitoring of intertidal and subtidal algae, invertebrates and fish as well as several physical parameters. The frequency of the sampling each year changed from bi-monthly to quarterly in 1988. Changes in the scope-of-work resulted in various program name changes. Synonymous names for the TEMP are 316(a) Demonstration, Marine Environmental Monitoring Program (MEMP), Ecological Monitoring Program (EMP), and Receiving Water Monitoring Program (RWMP). A summary of the findings of the effects of the heated water discharge on marine communities in Diablo Cove and vicinity are presented in Section 4.4, *Heat Shock.*

Diablo Cove occupies the mid-portion of a rocky headland approximately 12 miles in lateral extent which tends approximately northwest to southeast and which is bounded to the north and south by extensive sand beaches. Point Buchon is the prominent feature of this shoreline which consists of wave exposed headlands alternating with ~~semi-protected~~ coves *that offer some protection from ocean swells*. Stable bedrock and variously sized boulders are the predominant substratum. Sand, as fine gravel and shell-debris, is uncommon in the intertidal areas, where it tends to be ephemeral, but becomes the predominant substrate with increasing distance and depth offshore. The near-shore intertidal and subtidal algae, invertebrates, and fishes in the area lying generally between Point Buchon to the north of DCPP and Point San Luis to the south of DCPP have been well studied (References 2, 13, 25, 26, 30, and 31) and are similar to the marine biological communities found in other areas of central California.

The near-shore marine environment is naturally divided into intertidal and subtidal zones. Maximum tidal range *for the intertidal areas* is approximately 9 ft and extends from 7 ft above mean lower low water (MLLW) to about 2 ft below MLLW. Within the study area used for the ~~MEMPs~~*TEMP studies*, the subtidal zone reaches a maximum

depth of approximately 60 ft below MLLW ~~within 100 ft of shore~~. Based on physical characteristics, seven major *nearshore marine* habitats are ~~represented~~*present*:

INTERTIDAL

Rocky (semi-protected)	Bedrock and semi-stable boulder substrate that is relatively protected from the direct force of ocean swells. Generally of low aspect (slope) where organisms can occur both above and beneath moveable substrate.
Rocky (wave exposed)	Stable rocky headland with occasional very large boulders that is exposed to the direct force of ocean swell. Generally high aspect area where algae and invertebrates colonize higher elevations due to constant wave splash.
Tidepool	Entrapped pools of water that form in bedrock depressions during low tide. ~~Can support~~*Provides habitat for* species that are mainly found in upper subtidal zones. ~~Uncommon within the study area.~~
Sand/Cobble	Beach habitat formed by sand/shell debris or small cobble. Highly unstable during periods of high swell, often covering and uncovering bedrock substrate. ~~Uncommon within the study area.~~

SUBTIDAL

Bedrock/Boulder	Stable bedrock or boulder substrate ranging from shallow wave-exposed depths (0 to *6*~~7~~ m) to deeper, less wave-affected depths below ~~7~~ *6* m. Bathymetric relief ranges from low boulder/flat bedrock to high relief pinnacle.
Sand/Shell debris	Sand/shell debris in small patches between rocks or forming extensive deposits. Can be highly unstable during periods of high swell, often covering and uncovering bedrock substrate.
Open water	Midwater zone from benthic substrate to sea surface.

The diverse assemblages of algae, invertebrates, and fishes within the study area are recognized as typical of the biogeographic transition zone that extends from Monterey Bay to San Diego Bay and includes both cool-temperate organisms typical of the northern Oregonian Province and warm-temperate organisms typical of the southern Californian Province (References 11, 15, 23, and 32). Within the study area, high biological diversity and high natural variation in the abundance and distribution of the plants and animals within the different near-shore zones results from variations in physical factors (for example, temperature, elevation, wave exposure, impact of severe

winter storm waves and surge, open space, and substrate type) and biological factors (for example, grazing, predation, space competition, and recruitment episodes) (References 8, 9, 11, 20, and 33).

2.2.1.1 Species and Relative Abundance

Table 2.2-1 presents a list of ~~nearly~~ *over* 800 *taxonomic categories (*taxa*)*, the majority to species level, of algae, invertebrates, and fishes recorded from the near-shore intertidal and shallow subtidal zone of the DCPP study area. This list is not a complete inventory of all marine plant and animal species which may occur in the area because it includes only those taxa that were observed and recorded using the TEMP monitoring methods from 1976 through ~~2007~~*2013*. Although environmental monitoring was centered on Diablo Cove and became less intensive with increasing distance away from the Cove, this species list is representative of the flora and fauna of the near-shore marine environment for the ~~entire rocky headland~~*intertidal and shallow subtidal areas* between Point Buchon to the north and Point San Luis to the south.

2.2.1.2 Species/Habitat Inventories

Algal Resources
The outer rocky coast of central California is one of the most diverse regions in the world for marine algae due to the presence of nutrient-rich upwelled waters and the variety of coastal habitats (Reference 4). Owing to their typically large size and dense concentrations, these algal species also serve as important habitat and food resources for a variety of aquatic animals. For example, kelp canopies provide important habitat for fishes, particularly juveniles, which closely associate with the kelp fronds for protection from predation. The DCPP study area shares many species and habitat features with other central California areas described by Abbott and Hollenberg (Reference 4). Sparling (Reference 35) developed a list of over 400 taxa of marine algae in San Luis Obispo County, including the DCPP study area. Approximately ~~225~~ *229* species and higher taxa categories of *plants (mostly* algae *and one vascular plant)* have been identified in the TEMP sampling (Table 2.2-1). None of the algal taxa ~~is~~ *are* unique to this area (endemic) and none is federally or state listed as a ~~rare~~ *threatened* or endangered species.

Intertidal Algae. ~~Approximately 176~~ *A total of 179* algal taxa have been identified in the intertidal zone during TEMP studies of the near-shore marine environment (Reference 36) with ~~60~~ *59* of those being unique to the intertidal zone (Table 2.2-1). The abundance and types of algae increase from the high intertidal to the low intertidal zones. Most intertidal algal species are restricted to specific elevation ranges and occur in bands along the shoreline. The upper vertical distribution for most species is largely determined by their ability to withstand desiccation, but shading, competition for space, and grazing are important factors as well. The high intertidal zone is only occasionally wetted by wave splash and is sparsely covered by algae such as the red alga *Bangia* spp., and the green alga *Enteromorpha* spp. The barren appearance of the splash zone disappears lower in the intertidal zone (+4 ft MLLW) as algal cover becomes more

conspicuous with scattered clumps of rockweeds (*Fucus* and *Silvetia)* and the turfy red alga *Endocladia muricata*. A dominant species in the mid- to low intertidal zone is the iridescent red alga *Mazzaella flaccida*. Other abundant red algae include hollow branch seaweed (*Gastroclonium subarticulatum*), grapestone seaweed (*Mastocarpus papillatus*), and Christmas tree seaweed (*Chondracanthus canaliculatus*). Surfgrass (*Phyllospadix* spp.), a flowering plant, is the dominant plant in the transition zone between the low intertidal and the shallow-subtidal. ~~Surfgrass is listed by the California Department of Fish and Game as a species of special concern.~~

Subtidal Algae. ~~Approximately 163~~*A total of 169* algal taxa have been identified in the subtidal zone during TEMP studies with ~~47~~ *49* of those being unique to the subtidal zone (Table 2.2-1). The subtidal algal assemblage is spatially dominated by various species of kelp. Bull kelp (*Nereocystis luetkeana*) is a common surface canopy-forming kelp along the coast in the area of DCPP. Giant kelp (*Macrocystis pyrifera*) occurs with bull kelp in semi-exposed areas, but tends to be more abundant in calmer water. A third surface canopy-forming kelp species, *Cystoseira osmundacea*, also occurs with these two kelps, generally in areas shallower than about 30 ft. The canopies of all three species develop in the spring and become thickest during summer through fall. *Smaller kelp species, the* ~~T~~*t*ree kelps ~~(~~*Pterygophora californica* and *Laminaria setchellii*~~)~~ do not reach the surface but are perennial species that provide subcanopy structure less than ~~3 ft~~*0.9 m* off the bottom. *The extent of surface canopy kelp beds in Diablo Cove have been mapped on an annual basis as part of the TEMP studies.*

Below the kelp canopies are the lower growing foliose, branched, filamentous, and crustose understory species consisting mainly of red and brown algae. Among the red algae, the more common and abundant taxa are articulated coralline algae (*Calliarthron/Bossiella/Serraticardia* complex), and other foliose and branching red algae (*Cryptopleura* spp., *Pikea* spp., *Farlowia* spp., *Callophyllis* spp., *Mastocarpus* spp., and *Rhodymenia* spp.). Common brown algae include *Dictyoneurum californicum* and *Desmarestia* spp.

Invertebrate Resources

Similar to the algal resources, the invertebrate communities that inhabit the intertidal shoreline and shallow subtidal along the central coast of California are very diverse (References 10, 11, and 32). The DCPP TEMP monitoring program has identified ~~nearly 440~~*a total of 523* invertebrate taxa, most to species level, from the near-shore marine environment of the DCPP study area (References 37, 38, 39, ~~and 40~~*, and 133*) (Table 2.2-1). ~~This~~ *The* coast *near DCPP* is part of a faunal transition zone with affinities to areas both north and south of Point Conception. None of the marine invertebrate taxa are endemic, and only one found in the vicinity is federally or state listed as ~~rare~~ *threatened* or endangered. Abalone, including the locally common and formerly abundant red and black abalone (*Haliotis rufescens* and *H. cracherodii*, respectively), have been state-protected from commercial and recreational harvesting in this area and elsewhere since 1997. The black abalone was subsequently added to the federal endangered species list in 2009 *and is discussed in greater detail in Section 2.5*.

Intertidal Invertebrates. TEMP studies from 1976 through ~~2007~~ *2013* have identified ~~over 350~~*a total of 421* invertebrate taxa from the intertidal zone of the DCPP study area. The diversity of invertebrate species increases from high to low elevations. In the splash zone, periwinkle snails (~~*Alia*~~ *Littorina* spp.) are found in rock crevices while the black turban snail (*Chlorostoma funebralis*) and lined shore crab (*Pachygrapsus crassipes*) occur in the shade of boulders. Occasionally a high intertidal tidepool will contain species more commonly found in lower elevation habitats. The barren appearance of the splash zone disappears lower in the intertidal as algal cover becomes more conspicuous. This ~~truly~~ intertidal area (the highest regularly submerged) is inhabited by numerous species of limpets (*Lottia* spp.), the acorn barnacle (*Chthamalus fissus)*, patches of aggregating sea anemone (*Anthopleura elegantissima*), and occasional patches of California mussels (*Mytilus californianus*). At lower intertidal levels, beneath the foliose blades of the algae, abundant organisms include hermit crabs (*Pagurus* spp.*)*, turban snails (*Chlorostoma* spp.), tube-forming polychaete worms (*Phragmatopoma californica* and *Pista* spp.*)*, and encrusting forms of various bryozoans, sponges, and tunicates. Common invertebrate predators in the intertidal zone include seastars (*Pisaster ochraceus* and *Leptasterias* spp.), snails (*Acanthinucella spp.*, *Aptyxis luteopictus, Ocenebrina* spp.), rock crabs (~~*Cancer spp.*~~*Family Cancridae*), and octopus (*Octopus* spp.). Intertidal invertebrate herbivores include purple sea urchins (*Strongylocentrotus purpuratus*) and kelp crabs (*Pugettia* spp.).

Subtidal Invertebrates. ~~Over 330~~*A total of 407* invertebrate taxa have been identified occupying the subtidal zone shallower than 55 ft in the vicinity of the DCPP *during sampling for the TEMP studies* (References 37, 38, 39, ~~and~~ 40*, and 133*). The distribution and abundance of these organisms are controlled by various biotic and abiotic factors which cause their populations to fluctuate over time. Gotshall et al. (Reference 13) and Tenera (References 37, 38, 39, ~~and~~ 40*, and 133*) showed that numerically important invertebrate herbivores include red and purple urchins (*Strongylocentrotus franciscanus* and S. *purpuratus*, respectively), brown turban snails (*Chlorostoma brunnea)*, Monterey turban snails (*C. montereyi*), top snails (*Pomaulax gibberosa* and *P. undosa*), red abalone (*Haliotis rufescens*), giant gumboot chitons (*Cryptochiton stelleri)*, and many smaller species of invertebrates. Invertebrate predators include sunflower seastars (*Pycnopodia helianthoides*), giant spined seastars (*Pisaster giganteus*), short-spined seastars *(Pisaster brevispinus*), rock crab (~~*Cancer*~~ *Romaleon antennarius*), *Kellet's whelk* (*Kelletia kelletii*), octopus (*Octopus* spp.*)*, and a variety of smaller predatory seastars, gastropods, and crustaceans. The common deposit feeders, scavengers, and filter feeders include bat stars (*Patiria miniata*), anemones (*Anthopleura xanthogrammica*, *A. sola* and *Epiactis prolifera*), cup corals (*Balanophyllia elegans*), sponges (*Tethya californiana* and other encrusting forms), tunicates (*Styela montereyensis* and the encrusting colonial/social tunicates), tube snails (*Serpulorbis squamigerus*) and brittle stars (*Ophiothrix spiculata*). Invertebrate grazers include the nudibranchs *Phidiana hiltoni* and *Doriopsilla albopunctata*.

Fish Resources

Fish resources along the central California coast are rich and diverse, in part due to highly productive upwelling in the region and the diversity of habitats. Over 400 taxa of near-shore fishes (in less than depths of 400 ft) have been documented in California, and most of these are known to occur in central California (Reference 21). Habitat structure and fish assemblages along the DCPP coastline are similar to other rocky near-shore areas in central California. The near-shore fish fauna in the DCPP area is characterized by taxa with mostly northern affinities, but some with southern affinities *are also present*. Approximately 120 taxa have been observed within the study area in conjunction with the TEMP monitoring studies (References 37, 38, 39, ~~and~~ 40, *and 133*) (Table 2.2-1). None of the taxa in the vicinity of DCPP are considered to be endemic and none are federally or state listed as rare or endangered.

Intertidal Fishes. Studies on the intertidal fishes of the DCPP study area identified a total of ~~37~~ *43* fish taxa (References 37, 38, 39, ~~and~~ 40, *and 133*), ~~15~~ *21* of which were only found in the intertidal zone and the remainder occurring in both the intertidal and shallow subtidal zone. The assemblage is similar to that described from other central California rocky coast intertidal habitats (Reference 42). Several intertidal fishes are commonly associated with various algal species which they either use directly as a food source or glean other foods from their surfaces (Reference 17).

Common fishes found in the intertidal zone are black and rock pricklebacks (*Xiphister atropurpureus* and *X. mucosus)*, high cockscomb (*Anoplarchus purpurescens*), sculpins (*Artedius* spp. and *Oligocottus* spp.), clingfish (*Gobiesox maeandricus*), juvenile monkeyface eel (*Cebidichthys violaceus*), rockweed gunnel (*Apodichthys fucorum*), and penpoint gunnel (*A. flavidus*). Over 90 percent of the individual fish in the intertidal zone of the project area are small eel-like fishes of the family Stichaeidae (pricklebacks) and Pholidae (gunnels).

Subtidal Fishes. ~~Over 100~~*A total of 102* species of fishes have been identified in the near-shore areas (less than depths of 45 ft) surveyed in the TEMP subtidal fish observation studies. Some of the common adults and juveniles belong to the ~~family of~~*following families of fishes:* rockfishes (Scorpaenidae), surfperches (Embiotocidae), sculpins (Cottidae), wrasses (Labridae), and greenlings (Hexagrammidae). Other schooling fish which can be very common at certain times of the year include northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax)*, jack mackerel (*Trachurus symmetricus*) and tubesnout (*Aulorhynchus flavidus*). Species identified from the TEMP studies are presented in Table 2.2-1.

Because of the proximity of Diablo Cove to Point Conception (the northern boundary of the ~~s~~*S*outhern California ~~b~~*B*ight), fishes with more southern affinities are occasionally found in the area, especially during warm-water years. Sheephead (*Semicossyphus pulcher*), kelp bass (*Paralabrax clathratus*), white seabass (*Atractoscion nobilis*), giant kelpfish (*Heterostichus rostratus*), and garibaldi (*Hypsypops rubicundus*), are among the fishes that can either migrate as adults or be transported from south to north as larvae. These fishes, however, can establish small reproductive populations in the DCPP area.

Marine Mammal Resources
At least 21 species of cetaceans (whales, dolphins, and porpoises) have been reported in central California but few are common to the DCPP vicinity. Gray whale (*Eschrichtius robustus*), humpback whale (*Megaptera novaeangliae*), minke whale (*Balaenoptera acutorostrata*), killer whale (*Orcinus orca*), and common bottlenose dolphin (*Tursiops truncatus)* have been observed in the vicinity of DCPP.

The four common residential marine mammals in the DCPP vicinity are California sea lion (*Zalophus californianus*), harbor seal (*Phoca vitulina*), northern elephant seal (*Mirounga ~~angostrirostris~~angustirostris*), and southern sea otter (*Enhydra lutris*).

Seasonally, several hundred sea lions "haulout" (seek resting habitat on dry land) on Lion Rock, Pup Rock, and Pecho Rock. Diablo Rock and the Intake Cove breakwater are small in comparison and typically provide marginal haulout habitat for sea lions. Local populations reach their peak in the fall as the breeding populations disperse from the Channel Islands in the Southern California Bight. Sea lions are wide ranging and may be found along the entire central California coastline. Northern (Steller) sea lions (*Eumetopias jubatus)* are rare in the DCPP study area but have been observed historically on Lion Rock (Reference 7).

Harbor seals are common, year-round residents in the area of DCPP. Aerial censuses along the coastline between Morro Bay and Point San Luis by California Department of Fish and Game recorded approximately 2,000 seals in 1991 (Reference 14). Harbor seals are observed to breed and pup in the area including the intake cove of DCPP. The many haulout sites used by harbor seals between Point Buchon and Point San Luis are usually flat rock benches or rocks lying on headlands or just offshore or small pocket beaches backed by high cliffs.

A small seasonal aggregation of approximately 50 northern elephant seals began using the Intake Cove in 1986 as a resting and molting site (Reference 18). The haulout site was never used for breeding or pupping, and was last used by elephant seals in 1992. Migrating elephant seals pass through the DCPP area and are commonly observed in the Intake Cove at DCPP, but the nearest concentration of seals (over 3,000) seasonally occupies beaches in the vicinity of Point Piedras Blancas, approximately 69 km (43 mi) north of DCPP.

Through ~~2009~~*2014*, there has not been a known or recorded incident of a marine mammal injury or fatality caused by power plant operations.

Sea Turtle Resources
The species of threatened or endangered sea turtles that may occur in the vicinity of the DCPP facility include the green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), and olive Ridley sea turtle (*Lepidochelys olivacea*).

Through ~~2009~~*2014*, there have been ~~9~~ *14* incidences of power plant intake structure ~~impingement/trapping~~*stranding* of sea turtles (*2-1977,* 1-1994, 2-1997, 2-1999, 1-2000, 1-2001, 1-2007, ~~and~~ 1-2009*, 1-2010, 1-2012, and 1-2014*). All incidences involved the green sea turtle (*Chelonia mydas*). The turtles were discovered by plant operators during routine surveillance on the ocean surface inside the concrete intake curtain wall in front of the debris bar racks. All incidences resulted in live capture and successful release of the turtles to the open ocean. No injuries or other obvious detrimental effects to the turtles were noted as a result of these events.

In 2006, *in response to a consultation initiated by the NRC,* the National Oceanic and Atmospheric Administration developed a biological opinion based on the best available scientific and commercial information that concluded the continued operation of the DCPP was not likely to jeopardize endangered or threatened sea turtle species (Reference 24). ~~This biological opinion was developed in consultation with the NRC.~~ DCPP received a sea turtle incidental take statement in conjunction with the biological opinion.

2.2.1.3 Commercial and Recreationally Important Species

A listing of the commercial and recreationally important marine species known to occur or potentially occurring in near-shore habitats within the vicinity of DCPP is presented in Table 2.2-2. ~~Leet et al. (Reference 19) reviewed the status of California's living marine resources by examining long-term landings data for approximately 120 finfish and shellfish species.~~

Commercial landing data collected by the California Department of Fish and Wildlife (CDFW) for the ports of Morro Bay and Port San Luis show that the species with the largest landings fluctuated from 2009 through 2013. The largest biomass landed during the three years from 2009–2011 was sablefish (Anoplopoma fimbria), while market squid (Doryteuthis opalescens) had the largest biomass landed in 2012 and 2013. The other species with large landings over the five years included hagfish (Eptatretus stoutii), Dungeness crab (Metacarcinus magister), and shortspine thornyhead (Sebastolobus alascanus). The fishery with the highest value for four of the years (2009–2012) was sablefish (Anoplopoma fimbria), while Dungeness crab (Metacarcinus magister) was the highest valued catch in 2013. Total yearly value of all species commercially landed from 2009 through 2013 ranged from $4.8 million in 2009 to nearly $9.0 million in 2013, with an increase in the annual commercial catch value each year except in 2012.~~Commercial fishery data for San Luis Obispo County indicate that the highest biomass came from cabezon (*Scorpanichthys marmoratus*) between 1981 and 2006. The biomass of the top ten taxa came from cabezon (*S. marmoratus*), swordfish (*Xiphias gladius*), Chinook salmon (*Oncorhynchus tshawytscha*), Blackgill rockfish (*Sebastes melanostomus*), English sole (*Parophrys vetulus*), California halibut (*Paralichthys californicus*), lingcod (*Ophiodon elongatus*), Chilipepper (*Sebastes goodie*), petrale sole (*Eopsetta jordani*), and the common thresher shark (*Alopias vulpinus*), respectively. Cabezon biomass totaled 9.5 million lbs. The other taxa listed~~

~~above cumulatively weighed more than 7.75 million lbs for the 26 years of available data.~~

~~Data from the National Oceanic and Atmospheric Administration (NOAA) from the year 2000 suggest that of the 123,441 landings reported in Avila Beach and Port San Luis, rockfish (*Sebastes* spp.) accounted for 93.9 percent of the total. Albacore tuna (*Thunnus alalunga*) landings accounted for 4.6 percent of the total.~~

Recreational fishing activities in California are monitored by the ~~California Department of Fish and Game~~ *CDFW* through the California Recreational Fisheries Survey program. The program surveys recreational anglers and divers using a variety of angling modes including: commercial passenger fishing vessels (CPFV), private vessels (skiffs, kayaks, etc.), beaches and banks, and manmade structures (jetties, piers, and breakwaters) (Reference 6). The primary target species or species groups for CPFVs and private vessels are king salmon, rockfishes/lingcod/cabezon/kelp greenling, California halibut, sanddabs, and albacore (Reference 6). Anglers from beaches and banks typically target surfperches, jacksmelt, and several near-shore rockfishes, and anglers from manmade structures target Pacific sardine, northern anchovy, jacksmelt, surfperches, white croaker, and several near-shore rockfishes. As a group, rockfish dominate the CPFV and private vessel catch. ~~and rockfish landed at Port San Luis/Avila and Morro Bay accounted for over 94 percent of the catch from 1996-1999.~~ *Over the 5 years from 2009 through 2013, the total CPFV catch of fishes and invertebrates for Port San Luis/Avila and Morro Bay ranged from almost 129,000 to 179,000, with the largest catch occurring in 2013. Over the 5 years, CPFVs harvested over 740,000 fishes and invertebrates from the Morro Bay/Port San Luis area. Rockfish landings accounted for over 94 percent of the catch. Other species landed by CPFVs included lingcod (Ophiodon elongatus), cabezon (Scorpaenichthys marmoratus), albacore (Thunnus alalunga), California halibut (Paralichthys californicus), sanddabs (Citharichthys spp.) and Chinook salmon (Oncorhynchus tshawytscha).* ~~Thompson (Reference 41) has estimated that private boats and the CPFV fleet land an equal number of rockfish. Combined they account for 20 percent of the rockfish caught offshore California.~~

A security zone established in ~~2002~~ *2001* prohibits unauthorized entry into marine waters within a one nautical mile radius of the DCPP for any purpose including commercial and recreational fishing. Commercial and recreational fishing is also prohibited in the Point Buchon State Marine Reserve (PBSMR), which was established in 2007 pursuant to the 1999 Marine Life Protection Act (MLPA). ~~and~~*The PBSMR* extends north from the security zone boundary approximately three miles to Point Buchon. The Point Buchon State Marine Conservation Area (PBSMCA), also established under the MLPA, adjoins the western boundary of the PBSMR and extends westward to the 3 nautical mile offshore boundary where state jurisdiction ends. Take of all living marine resources is prohibited in the PBSMCA with the exception of the commercial and recreational take of salmon and albacore.

2.2.2 FRESHWATER ECOLOGY

DCPP is located on a narrow, gently sloping coastal terrace situated between the Irish Hills to the east and the Pacific Ocean to the west. A coastal climate prevails in the region with long, dry, warm summers and short, wet, mild winters. Fog is common in the summer months and rainfall is highly variable within and between winter seasons. The climate and steep topography and soils of the surrounding land result in a limited abundance of aquatic habitat on ~~PG&E-owned~~*Diablo Canyon* lands.

Freshwater aquatic habitat is present within four primary drainages on ~~PG&E-owned~~*Diablo Canyon* lands and ~~four~~ *one* man-made pond~~s~~ *(known as Tom's Pond)*. The primary drainages to the north of DCPP are Coon Creek and Diablo Creek (Figure 2.2-1), which flow in a westerly direction into the Pacific Ocean. Coon Creek is a perennial or intermittent stream located at the northern boundary of *the* ~~PG&E-owned~~*Diablo Canyon* lands and drains a watershed of 5,500 acres. Diablo Creek is the next largest primary drainage with a watershed of 3,190 acres. Surface flow in Diablo Creek is perennial in the lower reaches and intermittent in the upper reaches during the summer and fall (Reference 12). Diablo Creek passes through the DCPP site vicinity beneath the 230-kV and 500-kV switchyards in a large culvert before returning to the natural creek approximately 0.3 miles east of the Pacific Ocean.

To the south of the plant are Irish Canyon Creek and Pecho Creek, which flow in a southerly direction into the Pacific Ocean and drain a combined watershed area of less than 4000 acres. Both creeks have intermittent surface water flow during the dry months. *In the past, two small, man-made irrigation ponds were developed on each stream to support cattle grazing and small-scale agricultural operations. However, since 2005, all crops are dry-irrigated and the creeks have been restored to their natural flow.* ~~The four small man-made ponds (less than one surface acre each) on PG&E-owned lands were developed to provide irrigation water for row crops and drinking water for cattle. Three of the ponds are located at the outlet of small canyons south of DCPP and one~~*Tom's Pond* is located on the coastal terrace to the north. *This pond was originally a spring fed seep that was expanded into an approximately 1/4-acre pond sometime in the late 1960s for ranching purposes (Reference 22).*

DCPP currently uses seawater for once-through cooling. In the past, several wells and diversions along Diablo Creek were used to supply daily makeup water for the plant and water for other operational needs. Currently, naturally occurring freshwater for plant use can only be provided by a single permitted well (Deep Well #2) located adjacent to Diablo Creek. The well is intended only for ~~infrequent~~ use as a supplemental freshwater resource. The other drainages and ponds on the site are isolated from the facility and not impacted by DCPP operations.

Information presented in the following Freshwater Ecology sections was compiled from field surveys conducted between 1986 and ~~2008~~ *2012* by PG&E staff biologists and various biological consulting firms. ~~Vertebrate species investigations of Diablo Creek were conducted in 1986 and 1990 and in other aquatic habitat on PG&E-owned lands~~

~~from 1990 through 1993. Fishery investigations were conducted more recently on Coon Creek in conjunction with a steelhead habitat improvement project (Reference 43), and in 2006 as part of a comprehensive inventory of natural resources prepared in support of the Point Buchon Trail public access program (Reference 44).~~

2.2.2.1 Species and Relative Abundance

The results of past fisheries investigations indicate that Diablo Creek and Coon Creek are the only streams on the ~~PG&E-owned~~*Diablo Canyon* lands that support fish populations. Fish sampling efforts on both streams documented the presence of self-sustaining populations of rainbow trout/steelhead (*Oncorhynchus mykiss [O.mykiss]*), but no other fish species have been observed. ~~The fishes observed in Coon Creek belong to the South-Central California Coast steelhead (SCCC) Distinct Population Segment (DPS) and are federally listed as threatened. There is some question as to whether the fishes observed in Diablo Creek are SCCC steelhead or are resident *O.mykiss*. A barrier at the mouth of Diablo Creek is reported to be potentially impassible to the upstream migrating steelhead, making upstream reaches inaccessible for spawning (Reference 28). Consequently, the *O.mykiss* in Diablo Creek may meet the DPS Policy criteria for marked separation of population groups (physically, physiologically, ecologically, and behaviorally) and therefore would not be included in the South-Central California Coast steelhead DPS listing.~~

Rainbow trout/steelhead surveys were conducted on Coon Creek from 2004 through 2007 in conjunction with a steelhead habitat improvement project (Reference 134), in 2006 as part of a comprehensive inventory of natural resources prepared in support of the Point Buchon Trail development (Reference 44), and from 2007 through 2011 as part of the Point Buchon Trail Managed Access Monitoring Program (Reference 135). Based on the studies conducted, Coon Creek in the Point Buchon Trail area is in good health, and supports a small, but viable, steelhead population. Juvenile steelhead were observed in Coon Creek each year from 2007 through 2011.

In 2012, a Streambed Alteration Agreement was issued to PG&E by the CDFW for vegetation trimming in the riparian corridor of Diablo Creek. Under this agreement, the lower portion of Diablo Creek traversing the plant site was surveyed for rainbow trout/steelhead as a protective measure implemented to avoid impacts to rainbow trout/steelhead during trimming activities. No rainbow trout/steelhead were encountered in Diablo Creek during this time (Reference 136).

The other drainages on the property are small ephemeral streams located south of DCPP including the two primary drainages, Irish Canyon Creek, and Pecho Creek. Stream surveys conducted on ~~PG&E-owned~~*Diablo Canyon* lands from 1992 through 1993 found no fish present in any of the streams south of the power plant. *These types of streams do not constitute viable systems for rainbow trout/steelhead because rainbow trout/steelhead require two or three years in freshwater to rear before returning to the ocean as smolts during the winter and spring high flow periods (Reference 22).*

~~Ponds to the south of the power plant were surveyed for presence of fish in 1990 (Reference 22), and again in 1993 (Reference 12), and none were found.~~ It has been reported that ~~the~~ *Tom's* pond located north of the power plant was planted with several species of fish including *rainbow trout/*steelhead from Coon Creek, by a local caretaker; date unknown (Reference ~~12~~22). When sampled in 1990, three-spined stickleback (*Gasterosteus aculeatus*; not the federally listed subspecies *G. a. williamsoni)*, and mosquito fish (*Gambusia affinis*) were found in the pond, while two specimens of larger fish were *observed, but* not identified. The larger fish may have been either *rainbow trout/*steelhead, black bullheads (*Ictalurus melas*), or largemouth bass (*Micropterus salmoides*) (Reference 12).

In addition to fisheries investigations, protocol surveys for the federally threatened California red-legged frog (*Rana aurora draytonii*) were conducted in August 1999, within and adjacent to Diablo Creek, and again in 2002. *Diablo Creek was also surveyed for California red-legged frog in 2012 as part of a pre-activity survey to support the Streambed Alteration Agreement with the CDFW referenced above (Reference 136).* The results of ~~both~~ *all* surveys were negative.

Southwestern pond turtle (*Actinemys marmorata pallida*) surveys were ~~also~~ performed on Diablo Creek in 2002 *and in 2012 as a protective measure under the Streambed Alteration Agreement with the CDFW reference above (Reference 136). The results of both surveys were negative*~~with negative results~~.

Surveys for ~~California red-legged frogs,~~ southwestern pond turtles, and two-striped garter snakes (*Thamnophis hammondii*) were also conducted in Coon Creek and Tom's Pond *from 2007 through 2011 as part of the Point Buchon Trail Managed Access Monitoring Program*~~during 2005 and 2007 for the DCPP North Ranch Access Monitoring project~~ (Reference*s* 27 *and 135*). Although suitable habitat for ~~all three~~*both* special status species was present, ~~none were~~ *only two-striped garter snakes have been* detected (Reference*s* 27 *and 135*).

In addition to the aquatic species status species listed in Table 2.2-3, Table 2.4-1 presents a list of terrestrial special status species with the potential to occur on the Diablo Canyon lands including some freshwater species discussed above.

2.2.2.2 Species/Habitat Inventories

Watershed Descriptions
An ecological profile of Diablo Creek was prepared by PG&E in 1991 (Reference 12). The ecology of Coon Creek is believed to be similar to that of the natural flow reaches of Diablo Creek. A description of the ecology of Diablo Creek, taken from Reference 12 is presented below.

Geology and Soils
The Diablo Creek watershed is similar to many coastal canyons of the western San Luis Mountains, consisting of a narrow gently sloping coastal terrace with sharply rising

adjacent uplands. Underlying the watershed is the Miocene Monterey formation, consisting of resistant hard siliceous shale and interbedded chert (Reference 45). The color is variable, generally white and brown to gray and reddish-brown on fresh surfaces, weathering to chalky white. The formation shows evidence of many sedimentary layers with great total depth. Individual beds are brittle and fracture easily, with thickness varying between 0.5 and 6 inches. Evidence of bedding is common from channel invert to ridge tops.

The length of the watershed is about four times its average width. Hillside slopes of 30 to 75 percent are common throughout. Upland soils on the steeper slopes are thin, with a shallow depth to parent material. They are typical of the loose, rocky, coarse-textured, acidic Santa Lucia soils, and are characterized by low fertility and low water retention capabilities.

Channel Morphology

The total channel length is about 5.1 miles from watershed ridge crest to ocean outfall. *Surface flow in Diablo Creek is perennial in the lower reaches and intermittent in the upper reaches during the summer and fall.* ~~Surface water flow is intermittent seasonally over the lower 2 miles of stream channel.~~ This may be true, as well, for the upper 3 miles of Diablo Creek. Detailed field surveys in this part of the watershed have not been undertaken. The banks of Diablo Creek in the areas inspected are composed of multiple strata of alluvial materials of varying thickness and composition, deposited over geologic time. At least one of the layers is composed of very porous cobble and gravel materials. In the lower watershed, channel banks are generally at a slope of 1:1 or steeper, with depths of 3 to 8 ft. Natural banks appear to be generally stable on a long-term basis, with mature oak trees and other vegetation growing down the channel bank. The channel slope, averaging about 5 percent throughout much of the watershed, is generally steep enough to prevent significant sediment or bed load deposition.

Extensive local geologic investigations have been made in conjunction with switchyard fill design. Results reported from test borings indicate that subsurface alluvial materials exposed in the channel invert may be as deep as 30 ft, extending up to 200 ft laterally from the channel. This finding is consistent with observed surface dewatering of significant segments of the Diablo Creek channel, except in periods of high flow. Subsurface water available in the extensive alluvial beds may be partially recovered in the wells at the lower end of the watershed.

DCPP began diverting water from three points on Diablo Creek, hereafter referred to as Diversion Points 1, 2, and 3, in 1968. Records maintained for purposes of necessary annual filings with the California State Water Resources Control Board show that Diversion Point 2 served as a supplemental or backup source to Diversion Point 1, and both contributed raw water to the power plant makeup water system. Diversion Point 3 was a water source for dust control during early construction of DCPP (1968-1973). Figure 2.2-2 includes the locations of Diversion Points 1, 2, and 3. As indicated in Section 3.1.2, DCPP no longer withdraws surface water from Diablo Creek.

A natural waterfall (hereafter referred to as Diablo Falls) exists in the channel about 2 miles upstream of Diversion Point 1, or 3 miles above the ocean outfall. Bedrock conditions at Diversion Point 1 are believed to force migrating groundwater to the surface, where total flow may be measured. Flow over the waterfall was estimated at 300 gpm in early March 1991, about two to three times that observed on the same date at Diversion Point 1.

The lower 3 miles of creek channel is composed of deep and extremely porous cobbles and gravel of native materials. Such bed conditions result in subsurface flow of all or part of the total flow. This condition is influenced by the magnitude of flow and location in the watershed channel. Late season flow downstream of the waterfall is entirely subsurface for more than 1 mile. About one-third to one-half of the late season subsurface flow was observed to return to the surface at Diversion Point 1, where it was captured and used for power plant purposes prior to 2007. Some of the subsurface flow may be captured by the remaining freshwater well located immediately upstream of the 500 kV switchyard (Figure 2.2-2).

Erosion Potential

A uniform and healthy ground cover is desirable for maximizing water retention while minimizing erosion and sediment transport from steep hillside areas. A healthy plant community provides mechanical protection from rainfall, sheet, and rill erosion. The plant canopy provides surface protection from the thermal and convective effects of the air mass, helping to conserve and retain moisture. Organic matter also helps to improve soil infiltration and moisture retention. Ground cover in the watershed consists of a mosaic of plant communities in generally good hydrologic condition. Vegetative cover is poorest where rocky outcrops or road cuts prevent satisfactory soil depth for plant establishment. Sediment loading and erosion potential are maximized in areas where runoff flow is concentrated by road cuts, culverts, and equipment trails. Fuel load management areas where mechanical and hand clearing have recently occurred are at higher risk for runoff and erosion than similar untreated areas. A catastrophic event such as a large-scale range fire would be expected to change hydrologic conditions by increasing peak runoff flows and associated sedimentation, while reducing the magnitude of late season return flows. Tower access roads in the lower watershed may contribute to sedimentation. Exposed cut and fill slopes lacking vegetation, and unprotected drainage features tend to concentrate runoff flows.

Hydrology

Peak runoff flows for different return periods were estimated using a Soil Conservation Service hydrologic model. Precipitation frequency data and watershed area measurements taken from the Port San Luis 7.5 minute USGS Topographic Quad were used to obtain the model outputs. These modeled values are statistical estimates of short-term peak runoff flows, which differ from the average residual flows. Rather than being precise, estimates of this kind are order-of-magnitude in nature. The 3,200 acre watershed is drained by a 5.1-mile main channel with numerous ephemeral tributaries. Runoff is rapid because of steep slopes and the presence of shallow soils with low water-holding capacity in upland areas. Modeled short-duration peak flows at the

watershed outlet for a 100-year storm (1 percent annual probability of occurrence) are estimated at between 500 and 2,500 cfs (0.22 to 1.12 million gpm; 1 cfs equals 450 gpm), and depend on assumptions made about upland soil and vegetation conditions. These extreme values are consistent with the 10 ft diameter culvert and emergency overflow channel designs used at the switchyard complex. Peak watershed runoff measured by PG&E staff to date is a flow of about 2,600 gpm after a 24-hour period with 5 inches of rainfall in March 1980. Observed peak flows are lower than expected for a watershed of this size and steepness. This likely is a result of the highly porous nature of the watershed.

Maximum and minimum flows in Diablo Creek are highly variable. Average flows tend to be nearer the minimum flow values. Maximum flows reflect short-term conditions associated with storm events. Usually within 1 or 2 days following a storm, flows return to normal. Flows during the wet season (October through April) vary daily and monthly. Dry season flows are sustained by groundwater seepage and are more consistent from day to day, gradually tapering off over time.

To date, the highest recorded flow (2,596 gpm) occurred in March 1980, when in one day, 5 inches of rainfall were recorded. Average maximum flows during the wet season range between 500 and 1,000 gpm. The lowest recorded flow to date (32 gpm) occurred in October 1968. During the mid-1970s drought, minimum flows (average of mean monthly data) were about 200 gpm. Applying this statistic to flow data for the 1970s 5-year drought shows minimum flows averaging about 65 gpm, or 32 percent of the minimum flows recorded during the last significant statewide drought.

Aquatic Biology

Refer to Section 2.2.2.1 above. ~~Thirty-three invertebrate taxa and one fish (*O.mykiss*) were identified in the 1986 aquatic survey of Diablo Creek. *O.mykiss* is the only fish species known to occur in Diablo Creek, and they are present in all four stream sections. They occur in upstream areas where surface water flow is present throughout the year. They also occur in pools that remain watered when adjacent stream reaches are reduced to subsurface flows.~~

~~The results of fish sampling in Diablo Creek in 1986 and 1990 also showed relatively low numbers of *O.mykiss* with a high ratio of juvenile/adult fishes (greater than 4 inches) to young-of-the-year (YOY) fishes (less than 4 inches). This suggests either low reproductive success or high juvenile mortality. The portion of the creek above Diversion Point 1 (upper reaches starting about one-half mile above the Independent Spent Fuel Storage Installation site) supported higher numbers of *O.mykiss* than were found below the diversion. This is primarily due to the better overall habitat conditions above the diversion. Because of the intermittent nature of surface flows in Diablo Creek, resident *O. mykiss* tend to concentrate in still pools or where flowing water is present year-round.~~

Water Quality

~~Water quality is further monitored according to conditions specified in NPDES Permit CA0003751. Water from several yard storm discharge points is sampled annually for grease and oil contaminants. Results of this monitoring are reported to the Central Coast Regional Water Quality Control Board (CCRWQCB).~~*Water quality is further monitored according to conditions specified in the facility NPDES Industrial Wastewater Discharge Permit CA0003751, and the California General Permit for Industrial Storm Water Discharges (General Permit). Water from several yard storm discharge points is sampled annually for grease and oil contaminants in accordance with the NPDES Permit. More frequent and substantial storm run-off sampling and monitoring is also conducted throughout the plant site in accordance with the State General Permit. Results of NPDES monitoring are reported quarterly and annually to the Central Coast Regional Water Quality Control Board (CCRWQCB) via the internet-based California Integrated Water Quality System (CIWQS) implemented by the State Water Resources Control Board (SWRCB). Additionally, the results of General Permit monitoring are reported annually using the SWRCB Storm Water Multiple Application and Report Tracking System (SMARTS).*

A report titled Potential Effects of Storm Water Discharges on Diablo Creek (Reference 46) provides analysis of 14 water quality parameters and pollutants associated with yard and storm drain runoff samples. Other pollutants were also identified that could potentially enter the stream as a result of accidental spills. These data were then compared with published toxicity levels for aquatic organisms. The report concluded that pollutant levels in the sampled discharges were below concentrations known to affect rainbow trout, and the potential of storm and yard water runoff to cause adverse effects in Diablo Creek was mitigated by a short residence time and rapid dilution under storm flow conditions. The study was conducted during a relatively high runoff year placing greater emphasis on wet season than dry season flows. The presence of *O.mykiss* in Diablo Creek is an indication of good overall water quality, as the species is known to be sensitive to changes in a variety of water quality parameters.

Riparian Vegetation

Riparian vegetation forms a narrow band along both sides of Diablo Creek in all open channel sections. It is characterized by the least amount of prior disturbance upstream from Diversion Point 3, reaching its best expression in the vicinity of Diablo Falls. This habitat type is dominated by extensive stands of red willow (*Salix laevigata*), big-leaf maple (*Acer macrophyllum*), elderberry (*Sambucus mexicana*), wild cucumber (*Marah fabaceus*), poison hemlock (*Conium maculatum*), nettle (*Urtica holosericea*), and rush (*Juncus balticus*). Although this habitat type is the least abundant in the watershed, it is characterized by a high index of floristic diversity and provides important habitat elements for fish and wildlife.

2.2.2.3 Commercial and Recreationally Important Species

No commercially important species are known to occur in freshwater habitats within the ~~PG&E-owned~~*Diablo Canyon* lands. Steelhead are the only recreationally important species occurring on ~~PG&E-owned~~*Diablo Canyon* lands; however, recreational steelhead fishing has been curtailed since the federal listing of the South-central California Coast *(SCCC)* DPS steelhead in 1997 as a threatened species (62 FR 43937). The waters of Coon Creek are listed under California freshwater sportfishing regulations as closed to steelhead fishing throughout the year. Regulations also prohibit steelhead fishing in Diablo Creek and other drainages on the ~~PG&E-owned~~*Diablo Canyon* lands surrounding DCPP. Additionally, public access is restricted on the site and the recreational use of streams is not allowed.

2.3 GROUNDWATER RESOURCES

Groundwater at the DCPP site is limited to the streambed of Diablo Creek within the geographically isolated Diablo Canyon. No significant groundwater has been encountered outside of the stream bed gravels. Three small springs were encountered during excavation for plant construction; two of these were wet spots and the third had a flow of less than 30 gpm. The water was analyzed and found to be very hard (1050 mg/1 $CaCO_3$ and high in dissolved residue (2148 mg/1). Groundwater and domestic water supplies are not affected by the operation of the plant (Reference 3). Use of onsite groundwater is limited to supplementing the supply of the Raw Water Storage Reservoirs which feed the emergency firewater, plant site domestic water, and power production makeup water systems.

The main groundwater table beneath the coastal terrace north and south of the plant is controlled by sea level at the coastline and gradually rises beneath the hills southeast of the plant. Hence, this water table beneath the plant is about the elevation of Diablo Creek, sloping upward from sea level at the coast to 200 ft above the 500-kV switchyard.

Groundwater in the alluvium of Diablo Creek is documented from makeup water wells that were operated on the plant site during the current licensed period. Makeup water wells No. 1 and No. 2 with collar elevations at 232 ft above mean sea level (MSL) and 333.3 ft MSL, respectively, produced water from the alluvium in Diablo Creek and from fractured sandstone and dolomite of the Obispo Formation. The water table varies, depending on the month of the year, but is generally controlled by flows in the alluvium near elevation 200 ft MSL. Makeup water well No. 2 (Deep Well #2) is currently the only operable permitted freshwater well. Former makeup water well No. 1 is no longer active or serviceable.

Groundwater above the base of the thick terrace deposits is recorded in several places. On the terrace north of Diablo Creek, monitoring wells MW-1 through MW-4 (collar elevations range between 115 and 210 ft MSL) at the closed waste holding pond showed water levels in 1985 at elevations between 64 and 127.5 ft MSL. These monitoring wells were subsequently closed and filled in 2005, and therefore are no longer operable. In parking lot 7, south of DCPP, two piezometers in 1996 and 1997, recorded groundwater at a depth of 40 to 77 ft and recorded a perched water table near the top of the wave-cut bedrock platform. Groundwater seeps also issue from a perched water table on the marine terrace platform (about 30 ft MSL) in Patton Cove. Local perched water tables also occur within the Obispo Formation above the marine bedrock platforms. These perched water tables occur on impermeable strata, such as clay beds, within the Obispo Formation. An example is the small spring that issues from the hillslope above and east of Patton Cove at elevation about 600 ft MSL. A few areas of dense vegetation indicative of seeps also issue from bedrock along the lower canyon walls of Diablo Creek below the Raw Water Reservoir.

DCPP groundwater use is limited to the ~~periodic~~ draw of freshwater supply from an onsite deep well. The groundwater source is geologically isolated to the DCPP

watershed, and is therefore not hydraulically connected to other area groundwater resources. The surface streambed of Diablo Creek is not used as a freshwater supply resource. Groundwater is used only as required to supplement supply of the Raw Water Storage Reservoirs which feed the emergency firewater, plant site domestic water, and power production makeup water systems. The primary source of freshwater for power plant operations is seawater reverse osmosis. Uses of groundwater will not change as a result of the proposed action.

2.3.1 Groundwater Monitoring

In 2006, the Nuclear Energy Institute (NEI) launched the Groundwater Protection Initiative (NEI 07-07) to provide an industry-wide approach to unexpected groundwater and soil releases at operating and decommissioned nuclear power plants. In support of this industry initiative, DCPP implemented the DCPP Radiological Environmental Monitoring Program (REMP). The REMP samples from several onsite observation wells as well as Deep Well #2 (see Figure 2.3-1) to monitor for tritium. Tritium groundwater monitoring is also discussed in Chapter 5 *and in the Annual Radiological Environmental Operating Report (AREOR)*.

2.4 ~~CRITICAL AND~~ IMPORTANT TERRESTRIAL HABITATS

DCPP is located in coastal San Luis Obispo County, California directly southeast of Montana de Oro State Park. The DCPP industrial site encompasses approximately ~~585~~ *750* acres. The site contains the main generating facilities, office buildings, warehouses, parking lots, *equipment storage facilities,* switchyard, Independent Spent Fuel Storage Installation (ISFSI), and the Old Steam Generator Storage Facility *(Figure 3.1-1)*.

As discussed in Section 2.1, PG&E ~~owns~~ *controls* approximately 12,000 acres of land north and south of DCPP *known as the Diablo Canyon lands*. These lands form a long relatively narrow strip comprised of gently sloping coastal marine terrace with steeply rising hills to the east. The ~~PG&E owned~~*Diablo Canyon* lands extend approximately 14 miles from near the community of Avila Beach, north to the southern boundary of Montano de Oro State Park. They vary from about 0.5 miles to 1.75 miles in width.

Table 2.4-1 presents a list of special status terrestrial species (vegetation and wildlife) with the potential to occur on the Diablo Canyon lands, in which, special status is defined as species listed under the federal and/or state Endangered Species Acts (ESA/CESA), species proposed for listing under the federal ESA, species that are candidates for listing under the CESA, state Fully Protected species and state Species of Special Concern. PG&E completed a comprehensive survey of the Diablo Canyon lands in their entirety in 1995 and 1997 (References 29 and 61). This survey inventoried and mapped sensitive natural communites, plants, and wildlife under the direction of the Diablo Canyon Land Stewardship Committee, and the results were presented in two documents covering different parts of the total acreage (References 29 and 61). Further studies were conducted over the period of 2005 to 2006 on the North Ranch as part of a comprehensive baseline inventory performed in preparation of development of a public access trail (Reference 44). This area was continually monitored from opening of the public access trail in 2007 to 2012 (Reference 135).

Some species presented in Table 2.4-1 have the potential to occur on the DCPP site (Parcel P). However, PG&E has no plans to conduct refurbishment activities at DCPP during the license renewal term. Therefore, there would be no refurbishment-related impacts to special-status species and no further analysis of refurbishment-related impacts is warranted. Furthermore, in the almost 30 years of DCPP operation, PG&E has not identified any direct operational adverse impacts to terrestrial species. Plant operations will continue to be conducted in accordance with the Environmental Protection Plan (Reference 198) which ensures that the plant is operated in an environmentally acceptable manner, as established by the FES and other NRC environmental impact assessments. Therefore, continued operation during the renewal period is not expected to adversely affect special status terrestrial species listed in Table 2.4-1.

Further discussion of each federally listed species with the potential to occur on the DCPP site (Parcel P) is provided in Section 2.5, along with a discussion of potential impacts due to DCPP continued operation.

2.4.1 Land Use for Stock Animals and Grazing

High-Intensity Short-Duration (HISD) grazing, sometimes called ~~holistic~~ *rotational* grazing (Reference 56), or high intensity – low frequency grazing (Reference 52) has been in use on PG&E lands north of DCPP since 1991. HISD grazing attempts to more closely mimic the grazing behavior exhibited by wild free ranging ungulate populations (e.g., bison, antelope, etc.). Wild herds tend to remain bunched for protection from predators, while continuously moving across seasonal ranges following traditional movement corridors. HISD grazing places an entire herd of livestock together in one relatively small paddock for a short period of time (typically a few days) before the herd is moved to the next paddock, allowing the first paddock to rest. Because of the high number of paddocks involved each receives significant rest between grazing episodes. This results in more uniform forage use while improving growth and reproduction of native perennial grass species.

Transitioning to HISD grazing *on the Diablo Canyon lands* required an investment in new infrastructure (fencing and water systems) that PG&E helped to facilitate. This *transition to HISD grazing* was ~~necessary because of the need to begin rotating livestock through a larger number of smaller paddocks~~*implemented* to achieve more uniform forage use, and eliminate areas of over use.

Over the past 15 years, the property north of DCPP has been primarily a cow-calf operation. This means that a production herd is maintained on the property year-round, and the annual calf crop is sold after weaning. Quantitative assessments of grazing capacity have been conducted on these lands to guide management decisions and administrative policy (References 50 and 57).

Grazing is also practiced on lands located south of DCPP. A small cow-calf herd is maintained year-round on paddocks that occur on the coastal terrace. Larger numbers of stocker cattle are seasonally pastured on uplands to the east of the coastal terrace.

Since 1991, grazing has been monitored annually in three ways: (1) stock flow records *are* kept by the rancher on the northern lands *to* document numbers of animals and time spent in each paddock throughout the year, (2) photo monitoring from permanent stations established throughout the property is conducted ~~twice~~ annually ~~(spring and~~*in the* fall~~)~~, and (3) ~~quantitative~~ *qualitative* measurement of residual dry matter is performed annually in the fall, before the first soaking rains.

2.4.2 Federally Designated Critical Habitat Areas

Refer to Section 2.5 for discussion of federally designated critical habitat areas pursuant to the Endangered Species Act (ESA) of 1973 (16 USC 1361 et seq). ~~Critical habitat is~~

~~a term defined and used in the federal Endangered Species Act of 1973 (16 USC 1361 et seq), as amended (ESA). It is a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery. An area is designated as "critical habitat" after the U. S. Fish and Wildlife Service (FWS) publishes a proposed Federal regulation in the Federal Register and then receives and considers public comments on the proposal. The final boundaries of the critical habitat area are also published in the Federal Register. Section 7 of the ESA prohibits the destruction or adverse modification of designated critical habitat areas by actions with a Federal nexus (i.e., occurring on Federal land, authorized under a Federal permit or license, or receiving Federal funding).~~

~~Critical habitat areas near or associated directly with the DCPP lands were identified using a geographic information system, and were verified using on-line maps available from the USFWS (Reference 58), or the National Marine Fisheries Service (Reference 54) website.~~

~~Several miles north of DCPP in the vicinity of Morro Bay and estuary, critical habitat areas have been designated for the following federally listed species:~~

- ~~Morro Bay shoulderband snail - endangered~~
- ~~Morro Bay kangaroo rat - endangered~~

~~One critical habitat area occurs along the coast in the immediate vicinity of DCPP and the PG&E-owned lands north and south of the plant site:~~

- ~~South-Central Coast Steelhead DPS - threatened~~

~~Following the listing of the south-central coast steelhead DPS as threatened in 1997, the National Marine Fisheries Service, Department of Commerce, established critical habitat for the species (Reference 55). DCPP lies within the southern most Hydrologic Unit (Estero Bay 3310) of this DPS. All of the PG&E-owned lands north and south of the plant site also lie within this critical habitat area. The Federal Register rule package identifies streams that provide habitat suitable for this species within each Hydrologic Unit. Within the vicinity of DCPP, only Coon Creek, located north on the boundary with Montana de Oro State Park, is described.~~

~~Beginning in 2002, PG&E partnered with the City of San Luis Obispo, the National Marine Fisheries Service, and the California Department of Fish and Game in a successful steelhead habitat restoration project on this stream (Reference 48).~~

~~Steelhead (*O.mykiss*) are migratory anadromous rainbow trout. They hatch in fresh water, descend to the ocean, and return to fresh water to spawn. Depending on the stream, steelhead can be either summer or winter migrators but regardless of migration~~

~~period, spawning usually takes place from March to early May. Steelhead were once common to most streams in central California (Reference 53).~~

~~Steelhead constitute various races of ocean-going forms of rainbow trout that are native to Pacific coast streams from Alaska south to northwestern Mexico. Once hatched, juvenile steelhead may stay in freshwater for 1 or 2 years before migrating to the ocean. This outward migration primarily occurs during the winter and spring months when river flows are relatively high. Steelhead mature at ages two to four and migrate back upstream to natal spawning areas. The upstream migration generally occurs from January through March, but is dependent on the intensity of storms and subsequent outflow. After a female steelhead lays her eggs in a gravel nest, a male fertilizes the eggs. After fertilization, the nest is covered by a layer of gravel and the eggs incubate and hatch, repeating the cycle.~~

~~Section 3.1.7 describes the transmission lines that were built to connect DCPP to the transmission grid system (Figure 3.1-6). The three 500 kV lines each traverse approximately 80 miles of ecologically diverse landscape. The double-circuit 230 kV line traverses approximately 10 miles of landscape. Beginning just east of DCPP, these lines cross steep upland terrain with dense vegetative cover of chaparral, coastal scrub, and oak woodland. Further east, the landscape changes to rolling hills with grassland cover. Patches of brush and oak occur here as well as narrow bands of riparian vegetation located along stream courses. Considerable agricultural development is also prevalent including row crops, irrigated pasture and vineyards. Still further east, the landscape becomes increasingly arid, tree cover diminishes and is replaced by desert saltbush scrub and grass cover. This condition persists into the San Joaquin Valley where agricultural development is again possible due to the importation of water resources through the canals of California's extensive Central Valley Water Project.~~

~~Designated watershed areas crossed by the transmission lines include: Carrizo Plain, Coast Range, Estero Bay, Estrella River, Upper Tulare, Lower Tulare, Salinas, Santa Maria, Sunflower Valley, and Temblor (Reference 47).~~

~~Within the vicinity of the project high-voltage transmission lines, critical habitat areas have been designated for the following federally listed species:~~

- ~~Vernal pool fairy shrimp - threatened~~
- ~~Vernal pool longhorn fairy shrimp - endangered~~
- ~~California red-legged frog - endangered~~
- ~~California tiger salamander – endangered~~
- ~~California condor – endangered~~

~~Of those federally listed species above, the vernal pool fairy shrimp currently has critical habitat that is crossed by the Diablo-Gates 500 kV transmission line and associated towers and access roads.~~

~~The vernal pool fairy shrimp has a life span from December to early May (if water temperature stays below 75°F). Vernal pool fairy shrimp are filter and suspension feeders. Their diet mainly consists of unicellular algae, bacteria, and ciliates. They may also scrape algae, diatoms, and protists from the surface of rocks, sticks, and plant stems.~~

~~Shrimp eggs are laid by the adults each winter season. However, eggs may lie dormant in the soil for up to 10 years before hatching. Genetic diversity is important for the survival of any species. One pool's shrimp population may have genes another pool's population lacks. This diversity may mean that the first population survives a disease or other threat, which kills the population that does not have the needed gene. The genes of different shrimp populations can be mixed when eggs are moved from one pool to another via wind, water, or in the stomachs of migrating birds. Small, isolated populations of shrimp are more likely to become extinct because they lack the genetic diversity to withstand threats.~~

~~The vernal pool fairy shrimp is found scattered throughout the Central Valley from Shasta County to Tulare County, along the Coast Range from Solano County to San Luis Obispo and Santa Barbara Counties, and in southern California in Riverside and San Diego Counties.~~

~~A recently proposed expansion of critical habitat for the federally endangered California red-legged frog in San Luis Obispo County, if adopted, would involve another portion of the Diablo Gates 500 kV transmission line located north of Highway 101 and east of Highway 41 (Reference 49).~~

2.4.3 Important State Natural Communities

Other important terrestrial habitats in the DCPP vicinity include community types considered unique or sensitive within California. These habitats include central maritime chaparral, coastal and valley freshwater marsh, coastal bluff scrub, valley saltbush scrub, valley sink scrub, vernal pool areas, serpentine chaparral and grasslands, and stream and river riparian habitats.

In the vicinity of DCPP, coastal maritime chaparral occurs on the higher ridges of the Irish Hills, north and south of the plant site where it has been reduced somewhat in area by transmission tower and access road development and maintenance. The central coast interior live oak riparian woodland associated with Diablo Creek, east of the 500 kV switch yard, and the central coast willow riparian community associated with Coon Creek north of the plant site, are managed using Best Management Practices developed by the Diablo Canyon Land Stewardship program and are treated as sensitive resource areas. North of the plant site, two sensitive community types, coastal bluff scrub and willow scrub riparian habitat support sensitive plant, animal, and fish populations. These communities were intensively studied from 2005 through 2006 in association with development of the Point Buchon Trail public access program that opened in 2008. PG&E ~~monitors~~ *monitored* the effects of public access on sensitive species and communities, cultural resources, and

sustainable agriculture annually *through 2012* and ~~reports~~ *reported* the results to the California Coastal Commission (References 44 and 27).

Most of the sensitive habitat types listed above can be found along the transmission line corridors. Map figures identifying these natural community types, wetland areas, and other land cover classifications associated with the project transmission corridors are presented in the Transmission Corridor Terrestrial Ecology Technical Report (Reference 51).

2.5 THREATENED OR ENDANGERED SPECIES

DCPP is located in San Luis Obispo County, as discussed in Section 2.1. Transmission lines from DCPP extend into Kern County, Fresno County, Kings County, and Monterey County.

The Federal Endangered Species Act (ESA) of 1973 (16 USC 1361 et seq) authorizes the determination and listing of species as endangered or threatened, and prohibits unauthorized taking, possession, sale, and transport of those species. "Endangered" means a species is in danger of extinction throughout all or a significant portion of its range. "Threatened" means a species is likely to become endangered within the foreseeable future. The purpose of the ESA is to protect and recover imperiled species and the ecosystems upon which they depend. It is administered by the U.S. Fish and Wildlife Service (USFWS) and the Commerce Department's National Marine Fisheries Service (NMFS).

Critical habitat is a term defined by the ESA. It is a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species, but that will be needed for its recovery. An area is designated as "critical habitat" after the USFWS or NMFS publishes a proposed federal regulation in the Federal Register and then receives and considers public comments on the proposal. The final boundaries of the critical habitat area are also published in the Federal Register.

A 2004 report written for the U.S Department of Energy *(DOE)*, identified 85 *Federally* threatened or endangered species that could be present in the vicinity of DCPP *or its transmission lines* (Reference 62). The report also stated that as many as 36 of these species could be affected by operation and maintenance of the plant or transmission lines and associated rights-of-way. Many of these species ~~(see Table 2.5-1)~~, though present in California, have very limited geographical distributions that are further restricted by their dependence on certain special habitat elements. For this reason, many are not known to occur, nor are they likely to occur, within the vicinity of DCPP or its transmission lines. *In addition, the transmission lines that connect the DCPP switchyard to the regional transmission system are no longer in the scope of the license renewal environmental review (further discussed in Section 2.5.2 below).*

The intertidal and shallow subtidal areas off the coast of DCPP have been the subject of extensive and ongoing monitoring from prior to plant start up to present (discussed in detail in Section 2.2.1). In addition to the nearshore marine environment, the Diablo Canyon lands have been inventoried for the presence of threatened and endangered species on numerous occasions from 1992 to present under the direction of the Diablo Canyon Land Stewardship Committee (discussed in detail in Section 2.4). PG&E reviewed results of these extensive monitoring efforts, along with the 2004 DOE report, responses from USFWS and NMFS to an NRC request for list of threatened and endangered species (References 189 and 190), and the NMFS biological opinion on the

effects of continued operation of DCPP on federally-listed aquatic species in accordance with Section 7 of the ESA (Reference 24). In the course of this review, PG&E identified 21 federally threatened and endangered species that are known to occur or may occur on the DCPP site (Parcel P) or immediately offshore; 3 of which have designated critical habitat in the area (SCCC steelhead DPS, leatherback sea turtle, and black abalone). These 21 species are discussed in detail in Section 2.5.1 below, along with a discussion of potential impacts to these listed species as a result of continued operation.

2.5.1 PLANT SITE AND VICINITY

~~PG&E-owned lands in the vicinity of DCPP were inventoried for the presence of threatened and endangered species over the period of 1992 to 1997. This work was performed under the direction of the Diablo Canyon Land Stewardship Committee and the results were presented in two documents covering different parts of the total ownership (References 29 and 44). Additional studies were carried out in 1999 within and adjacent to Diablo Creek from near the outlet to the Pacific Ocean, to a point approximately one-half mile upstream from the 500 kV switch yard. These studies focused on the California red-legged frog (*Rana aurora draytonii*), which at that time had been recently listed by the U. S. Fish and Wildlife Service as threatened under the federal Endangered Species Act. No California red-legged frogs were found in the study area during this survey.~~

~~Further studies of threatened and endangered species were conducted over the period of 2005 to 2006 on lands north of the plant site (Reference 44).~~

~~The American peregrine falcon, California brown pelican, south-central coast steelhead trout DPS, and black abalone are species that are currently listed as threatened or endangered and have been identified as occurring within or near the plant site.~~

~~Among those marine mammals that frequent near-shore areas within the vicinity of the DCPP site, the southern sea otter is listed as threatened under the federal Endangered Species Act. One marine reptile, the green sea turtle, is known to occasionally frequent near-shore areas within the DCPP site vicinity. This species is listed as threatened under the federal Endangered Species Act.~~

Terrestrial Listed Species

As shown in Table 2.4-1, the two federally listed terrestrial species with the potential to occur on the DCPP site (Parcel P) are the California tiger salamander and California red-legged frog. In addition, the American peregrine falcon and California brown pelican are species formerly listed as endangered and have been identified as occurring on the DCPP site or vicinity.

American Peregrine Falcon - *Falco peregrinus anatum*

The peregrine falcon occupies breeding territories at select sites along the California coast north of Santa Barbara, in the Sierra Nevada Mountains, and in other mountains of northern California. In winter, this species is found throughout the Central Valley, and occasionally on the Channel Islands. Migrants occur along the coast and in the western Sierra Nevada *Mountains* in spring and fall. Breeding occurs mostly in woodland, forest, and coastal habitats. Riparian areas and coastal and inland wetlands are important habitats year-long. Suitable nesting habitat occurs in the form of isolated off-shore rocks and cliffs. Foraging habitat includes the air space above coastal terraces, coastal bluffs, and near-shore areas where prey (birds up to the size of ducks) are hunted on the wing.

~~Although the peregrine falcon habitat has not been mapped on the PG&E-owned lands, t~~*T*wo active year-round peregrine falcon nesting territories are known to occur ~~within the project vicinity~~*on the Diablo Canyon lands*. Both territories include nest sites located on off-shore rocks (References ~~44 and 61~~).

Once listed as endangered under the federal Endangered Species Act (ESA), the peregrine falcon has made a good recovery and the USFWS delisted the peregrine falcon from the federal endangered species list in 1999. *No critical habitat for the peregrine falcon was or is listed in the vicinity of DCPP.* As a condition of delisting, the USFWS has established a monitoring program to document breeding status of the falcon through 2015. The peregrine falcon is also designated by the USFWS as a "Bird of Conservation Concern" (BCC). Bird species with a BCC designation represent the USFWS's highest conservation priorities and draw attention to species in need of conservation action. In addition, the peregrine falcon continues to be protected under the federal Migratory Bird Treaty Act.

~~Although the peregrine falcon is currently listed as endangered under the California Endangered Species Act (CESA), the California Department of Fish and Game (CDF&G) has recommended delisting, and the Fish and Game Commission has voted to accept the petition to remove the peregrine falcon from the list of state endangered birds. Hearings on the proposed regulatory change will be held by the Fish and Game Commission during 2009. If delisted under CESA, the peregrine falcon will~~ *The peregrine falcon was removed from the California endangered species list in November 2009. While no longer listed as endangered under the California Endangered Species Act (CESA), the peregrine falcon* continue*s* to be a "fully protected species" under Fish and Game Code Section 3511. Therefore, ~~whether or not the species is listed pursuant to CESA,~~ the legal prohibition on "take" of the species ~~will~~ remain*s* in effect.

The peregrine falcon is also designated as "sensitive" by both the California Department of Forestry and Fire Protection (~~CDF~~*CAL FIRE*) and the U.S. Department of Agriculture Forestry Service (USDA Forest Service). ~~The CDF~~*CAL FIRE* classifies sensitive species as those species that warrant special protection during timber operations. The USDA Forest Service defines sensitive species as those species for which population

viability is a concern, as evidenced by downward trends in population numbers or density, or in habitat capability that would reduce a species' existing distribution.

In the history of the DCPP operations, there has only been one event (May 10, 1987) involving peregrine falcon injury or mortality in which a peregrine falcon fledging collided with a meteorological tower guy wire on the DCPP site.

~~Continuing e~~*E*xposure to toxic pesticides, primarily through migrant prey species, is the ~~most important~~*primary* endangerment factor *for peregrine falcon*. *While the lands south of the plant site are used for cattle grazing and small scale agricultural operations, in accordance with the license agreement, the licensee (Mello) is required to keep a log of the type, amount, and location of any pesticide, fertilizer, or herbicide that the licensee uses on the property (Reference 191). PG&E is unaware of any pesticide use by the licensee on Diablo Canyon lands that would impact peregrine falcon populations. Additionally,* ~~P~~*p*eregrine falcon populations have rebounded significantly since restrictions were placed on use of DDT in the United States.

California Brown Pelican - *Pelicanus occidentalis californicus*

The brown pelican is found in estuarine~~, marine subtidal, and marine pelagic waters~~ *and coastal habitats* along the entire California coastline. Brown pelicans breed on the Channel Islands (Anacapa, Santa Barbara, and Santa Cruz) from March to early August. In southern California, the brown pelican is common along the coast from June to October, especially within 20 miles of shore, but can be found as far as 100 miles out to sea. Off-shore rocks and coastal bluffs overlooking the water are used for roosting. No nesting by this species occurs along the Pecho Coast. Foraging is limited to off-shore open water areas.

Although, brown pelican *nesting* habitat has not been mapped on the ~~PG&E-owned~~*Diablo Canyon* lands, brown pelicans are frequently observed, outside the breeding season, along the Pecho Coast where they feed in open water areas off-shore and rest on off-shore rocks and along the outer edges of the coastal bluffs. When present in the vicinity, and accompanied by calm weather and ocean conditions, large numbers of brown pelicans can be observed resting on the intake cove breakwater structures during routine power plant operations.

The brown pelican was first declared endangered in 1970 under the Endangered Species Conservation Act (precursor to the ESA) due to sharp population declines and the threat of further declines from pesticide-contaminated food supplies. ~~The brown pelican is still currently listed as endangered under the ESA, however in February 2008 the U.S. Fish and Wildlife Service published their proposed rule to remove the brown pelican from the Federal List of Endangered and Threatened Wildlife.~~ *No critical habitat was ever designated for the California brown pelican and the USFWS removed the California brown pelican from the federal list of threatened and endangered species in November 2009.* ~~O~~*However, o*ther federal laws such as the Migratory Bird Treaty Act

and the Lacey Act ~~will~~ continue to protect the brown pelican, its nests, and its eggs ~~should the rule be made final~~.

The brown pelican was *also* officially removed from the California Endangered Species list in July 2009; however the brown pelican remains a fully protected species under Fish and Game Code Section 3511.

In spite of known threats (i.e., human disturbance, domoic acid poisoning, oil spills, starvation events, fish hook/line mortality), the breeding population of brown pelicans in California has increased substantially after the banning of DDT. ~~In addition, the birds have returned to previously abandoned nesting sites in the Channel Islands. Many of the downlisting criteria for the brown pelican now meet or exceed the 5-year standard noted in the recovery plan.~~

While the lands south of the plant site are used for cattle grazing and small scale agricultural operations, in accordance with the license agreement, the licensee (Mello) is required to keep a log of the type, amount, and location of any pesticide, fertilizer, or herbicide that the licensee uses on the property (Reference 191). PG&E is unaware of any pesticide use by the licensee on Diablo Canyon lands that would impact brown pelican populations. In addition, brown pelicans are not known to breed on the Diablo Canyon lands; the Santa Barbara Channel Islands support the entire California breeding population for brown pelicans (Reference 44). In the history of DCPP operation, there has been no known incident of brown pelican mortality or injury on the DCPP site due to plant operations. ~~N~~*Therefore, n*o local endangerment factors associated with the plant site *or operations* have been identified for this species.

California Tiger Salamander *– Ambystoma californiese*

Along the Coast Ranges, the California tiger salamander occurs in the Santa Rosa area of Sonoma County (Sonoma DPS), Southern San Mateo County south to San Luis Obispo County (Cental DPS), and northwesten Santa Barbara County (Santa Barbara DPS) (Reference 187).

California tiger salamander breeding and estivation habitat includes vernal pools, and seasonal and perennial ponds and surrounding upland areas in grassland and oak savannah plant communities (Reference 187). In drought years, the seasonal pools may not form and the adults may not breed. The females lay their eggs in the water and after 10 to 14 days the eggs hatch. After breeding, adults leave pools and return to surrounding uplands. The larval stage of California tiger salamander is aquatic and lasts geneally 3 to 6 months. Amphibian larvae must grow to a critical minimum body size before they can metamorphose to the terrestrial stage. However, if the site dries before they complete metamorphosis, the larvae perish.

The rangewide population of California tiger salamander was listed as federally threatened in August 2004 (Reference 187). In addition critical habitat for the Central Population was designated in August 2005 (Reference 188). The primary threat to

California tiger salamander is habitat loss and degradation due to intensive agriculture and urban development (Reference 187).

Critical habitat for the California tiger salamander does not include any portion of the DCPP site (Parcel P) or the surrounding Diablo Canyon lands. Therefore, there is no anticipated threat to California tiger salamander critical habitat due to DCPP continued operation. There is only limited habitat for the California tiger salamander on the DCPP site and despite long-term monitoring and other site specific surveys, no California tiger salamander have ever been recorded on the plant site or on the surrounding Diablo Canyon lands. In addition, there are no refurbishment activities or construction associated with DCPP license renewal. Thus, there is no anticipated threat to the California tiger salamander or potential habitat due to DCPP continued operation.

California Red-legged Frog *– Rana draytonii*

The California red-legged frog is now found primarily in wetlands and streams in coastal drainages of central California. It has been extirpated from 70 percent of its historical range (Reference 189).

California red-legged frogs typically lay eggs between December and early April. Eggs hatch within 6 to 14 days depending on water temperatures and require approximately 20 days to develop into tadpoles. Tadpoles, in turn, require anywhere between 11 to 20 weeks to develop into terrestrial frogs. Water bodies suitable for tadpole rearing must remain watered at least until the tadpoles metamorphose into adults, typically between July and September. Adult California red-legged frogs can survive in moist upland areas after breeding habitat has dried, and can live several years to make new breeding attempts (Reference 189).

The California red-legged frog was listed as federally threatened in May 1996. In addition, critical habitat was designated for the species in April 2006 (Reference 190), and expanded in March 2010 (Reference 191). California red-legged frog is threatened by a wide variety of human impacts included urban encroachment, construction of reservoirs and water diversions, introduction of exotic predators and competitors, livestock grazing, and habitat fragmentation (Reference 189).

Critical habitat for the California red-legged frog does not include any portion of the DCPP site (Parcel P) or the surrounding Diablo Canyon lands. Therefore, there is no anticipated threat to California red-legged frog critical habitat due to DCPP continued operation. While there is some habitat for the California red-legged frog on the DCPP site (upper Diablo Creek), despite long-term monitoring and other site specific surveys, no California red-legged frogs have ever been recorded on the plant site or on the surrounding Diablo Canyon lands. In addition, there are no refurbishment activities or construction associated with DCPP license renewal. Thus, there is no anticipated threat to the California red-legged frog or potential habitat due to DCPP continued operation.

Aquatic Listed Species

Entrainment, impingement, and thermal effects studies are discussed in Sections 4.2 through 4.5. Because the NRC is responsible for licensing nuclear power plants to operate, it is their responsibility under Section 7(a)(2) of the ESA to request consultation on the take of listed species during the operation of DCPP. The NMFS issued a biological opinion on the effects of continued operation of DCPP on federally listed aquatic species subsequent to formal consultation with the NRC (Reference 24). The biological opinion evaluated direct and indirect effects of DCPP operations over a study area including DCPP facilities, the intake and discharge structures, and the region where the discharge of warmed water extends. Additionally, the biological opinion issued terms and conditions for the minimization of incidental take of federally listed sea turtles discussed below associated with power plant operation.

The biological opinion concluded that operation of DCPP is not likely to jeopardize federally listed green sea turtles, leatherback sea turtles, loggerhead sea turtles, and olive ridley sea turtles (Reference 24). In addition, blue whale, sperm whale, fin whale, humpback whale, sei whale, Guadalupe fur seal, white abalone, green sturgeon, and steelhead may be found in the study area for limited amounts of time, but in the NMFS opinion, are not likely to be adversely affected by DCPP operation. Species-specific conclusions of the 2006 biological opinion are provided below.

In response to an NRC request for information on threatened or endangered species in the vicinity of the DCPP site, the NMFS identified killer whale and north Pacific right whale (in addition to the whale species listed in the 2006 biological opinion) as species with the potential to occur in the study area. While killer whale and north Pacific right whale were not identified as a threatened or endangered species that may be present in the study area at the time the biological opinion was published, the potential effects to killer whale and north Pacific right whale would be the same as those whale species discussed in the 2006 biological opinion, and thus, PG&E concludes killer whale and north Pacific right whale are not likely to be adversely affected by DCPP continued operation.

Steelhead (south-central California coast DPS) – *Oncorhynchus mykiss irideus*

Recent surveys and relative abundance of steelhead on Diablo Canyon lands are discussed in Section 2.2.2.1.

Steelhead trout belong to the family Salmonidae which includes all salmon, trout, and chars. Steelhead are the anadromous form of rainbow trout, native to western North America and the Pacific Coast of Asia. The term anadromous refers to fish species born in fresh water that migrate to the ocean for an extended period of time before returning to fresh water to spawn. *Once hatched, newly emerged fry move to shallow protected areas of the stream (usually in the stream margins) and establish feeding areas which they defend. Most juveniles can be found in riffles, although larger ones*

will move to pools or deeper areas of streams. Juvenile steelhead may stay in freshwater for 1 or 2 years before migrating to the ocean. This outward migration primarily occurs during the winter and spring months when river flows are relatively high. ~~Steelhead may spend their first 1-3 years of life in fresh water.~~ After spending between 1 to 4 growing seasons in the ocean, where most of their growth occurs, steelhead return to their native fresh water stream to spawn. *The upstream migration generally occurs from December through March, but is dependent on the intensity of storms and subsequent outflow. In California, most steelhead spawn from December to April in small streams and tributaries where cool, well oxygenated water is available year round.* Unlike Pacific salmon, steelhead do not necessarily die after spawning and may spawn more than once.

~~In California, most steelhead spawn from December through April in small streams and tributaries where cool, well oxygenated water is available year round. Following hatching, newly emerged fry move to shallow protected areas of the stream (usually in the stream margins). They establish feeding areas which they defend. Most juveniles can be found in riffles, although larger ones will move to pools or deep runs.~~

~~In California, steelhead were once abundant in coastal and Central Valley rivers and streams, however the statewide steelhead population has been in decline for more than 30 years. The major factor causing steelhead population decline is freshwater habitat loss and degradation. This has resulted from three main factors: inadequate stream flows, blocked access to historic spawning and rearing areas due to dams, and human activities that discharge sediment and debris into waterways.~~

Listed as a threatened species on August 18, 1997, threatened status was reaffirmed on January 5, 2006 (~~Federal Register, Vol. 17, No. 3~~*Reference 53*). The south-central California coast *(SCCC)* DPS includes all naturally spawned *O. mykiss* (steelhead) populations below natural and manmade impassable barriers from the Pajaro River in Santa Cruz county south to but not including the Santa Maria River. *Diablo Creek passes through the DCPP site in a large culvert before returning to the natural creek approximately 0.3 miles upstream of the Pacific Ocean. However, Diablo Creek ascends steeply over naturally occurring rocky substrate at the mouth of the creek, precluding upstream migrating steelhead from ever reaching the culvert. This natural barrier at the mouth of Diablo Creek is impassable to upstream migrating steelhead, making upstream reaches inaccessible for spawning (Reference 28). This impassible barrier leads to the conclusion that fishes observed in Diablo Creek are resident rainbow trout and not the federally threatened SCCC steelhead DPS.*

In contrast, the fishes observed in Coon Creek belong to the federally threatened SCCC steelhead DPS. Following the listing of the SCCC steelhead DPS as threatened in 1997, the NMFS established critical habitat for the species in September 2005 (Reference 55). DCPP lies within the southernmost Hydrologic Unit (Estero Bay 3310) of this DPS. The Federal Register rule package identifies streams that provide habitat suitable for this species within each Hydrologic Unit. Within the vicinity of DCPP, only

Coon Creek, located north on the boundary with Montana de Oro State Park, is described.

~~Critical habitat was designated in September 2005 and includes selected watersheds and coastal waters in San Luis Obispo County. Coon Creek, located north of DCPP, is identified as potential habitat within the Estero Bay Hydrologic Unit (3310) of this critical habitat designation.~~

The major factor causing steelhead population decline is freshwater habitat loss and degradation. This has resulted from three main factors: inadequate stream flows, blocked access to historic spawning and rearing areas due to dams, and human activities that discharge sediment and debris into waterways. Freshwater habitat on the Diablo Canyon lands is not anticipated to decline with continued operations, as current operation has no effect on this habitat. Therefore, there is no anticipated adverse effect on steelhead critical habitat (Coon Creek) due to DCPP continued operation. In contrast, beginning in 2002, PG&E partnered with the City of San Luis Obispo, the NMFS, and the CDFW in a successful steelhead habitat restoration project on Coon Creek (References 48 and 134).

Given that steelhead are an anadromous species (spawn in fresh water), there is no anticipated entrainment of steelhead larvae because presence of larval steelhead in the vicinity of the intake cove is not likely. In addition, the likelihood of adult steelhead impingement is low due to the low uniform intake approach velocity (which would allow fish to swim away from the screens) and lack of any steelhead identified in the vicinity of the intake cove in past DCPP monitoring efforts. Therefore there is no anticipated adverse effect to steelhead as a result of continued operation.

Tidewater Goby – *Eucyclogobius newberryi*

The tidewater goby is a small (less than 6.4 cm [2.5 in]) benthic fish species that inhabits coastal lagoons and streams between Del Norte County in northern California to San Diego County in southern California. The species was listed as federally endangered in 1994 and currently (March 13, 2014) is proposed for downlisting to threatened status (Reference 137).

Tidewater goby have what is generally described as an annual life cycle that is tied to the seasonal cycles of the coastal streams and lagoons in which they live. Tidewater goby populations undergo large fluctuations in abundance within a year that can vary from a few individuals in late winter to tens of thousands or even hundreds of thousands of individuals by late summer or fall. The species tolerates a wide range of salinity, water quality conditions, and environmental factors, but are typically encountered in low-salinity waters of coastal streams or lagoons. Following the initial listing, researchers determined that the species has the ability to survive in the marine environment and re-colonize streams from which it was previously extirpated. A distance of 10 km (6 mi) is generally accepted for adult tidewater goby dispersal through the marine environment although dispersal may occur over longer distances (Reference 138). Gaps in the distribution of tidewater goby occur in areas along the coast lacking lagoons or

estuaries, or where steep topography or swift currents may prevent the tidewater goby from dispersing between adjacent locations. The coastal reach from the mouth of Morro Bay south to Point San Luis appears to be one such gap in the species' distribution.

Two recovery units for the species are present within San Luis Obispo County; the Central Coast Recovery Unit and the northern part of the Conception Recovery Unit (Reference 139). Tidewater goby populations have been documented at a number of locations both to the north (Central Coast Unit- Sub-Unit CC3) and south (Conception Unit-Sub-Unit CO1) of the DCPP site. Since the species' listing, the presence of tidewater goby has been recorded in many of the drainages within Estero Bay to the north of the DCPP site, with Toro Creek being the nearest extant population. Tidewater goby were documented in Los Osos Creek as late as 1981, but were not found to be present at the time of listing in 1994. The species is reported to have been observed in the Los Osos Creek again in 2001 (Reference 138), but this occurrence may be related to the collection of a fish larva in Morro Bay that was initially identified as a tidewater goby, but was later found to be a shadow goby (Quientula y-cauda) through genetic testing. To the south of the DCPP site, a well-documented, extant population is reported in San Luis Obispo Creek. No records of adult tidewater goby presence, historical or recent, were found for drainages on the DCPP site.

No streams traversing the Diablo Canyon lands have designated critical habitat for the tidewater goby (78 FR § 8745). There are historical records of tidewater goby larvae in nearshore areas in the vicinity of the Diablo Canyon lands. These could represent larvae transported north or south from locations with existing populations, or more likely, were another species of goby misidentified as tidewater goby, similar to the Morro Bay occurrence. No suitable habitat is present in Diablo Creek as the creek has no estuary and ascends steeply over naturally occurring rocky substrate from the mouth upstream, precluding the occurrence of gobies. Coon Creek, approximately four miles upcoast from DCPP, presents very limited and marginal habitat for the tidewater goby at the very mouth of the stream, however, no adult gobies are currently or historically known to inhabit this stream.

Entrainment of tidewater goby larvae is unlikely due to the lack of historical presence or potential habitat (coastal lagoon or estuary) in the vicinity of the intake cove. In addition, the likelihood of adult tidewater goby impingement is low due to the lack of habitat. Tidewater gobies are uniquely adapted to coastal lagoons and the uppermost brackish zone of larger estuaries, rarely occurring in marine habitats. Therefore, it is highly unlikely that tidewater goby would be in the vicinity of the intake cove. This is supported by the fact that there are no records of adult tidewater goby presence in the vicinity of the intake cove throughout the history of DCPP operation during extensive marine monitoring. Therefore, there is no anticipated adverse effect to tidewater goby as a result of continued operation of DCPP.

Green Sturgeon *– Acipenser medirostris*

The green sturgeon is a long-lived, anadromous fish species that spends most of its life in the marine environment. It is the most marine-oriented species of sturgeon (74 FR § 52300). Green sturgeon range from the Bering Sea to Ensenada, Mexico, with abundance increasing north of Point Conception, California (Reference 140). The species occupies freshwater rivers from the Sacramento River up through British Columbia (Reference 140), and inhabits coastal marine waters along the central California coast and between Vancouver Island, British Columbia, and southeast Alaska over the winter (Reference 141). Spawning has been confirmed in only three rivers: the Rogue River in Oregon and the Klamath and Sacramento rivers in California (74 FR § 52301). They are occasionally captured in Monterey Bay, but the southernmost spawning population is in the Sacramento River (Reference 140).

NOAA Fisheries has designated two distinct population segments (DPS). The Northern DPS consists of populations originating from coastal watersheds northward of and including the Eel River (i.e., the Klamath and Rogue rivers). The Southern DPS consists of populations originating from coastal watersheds south of the Eel River, with the only known spawning population in the Sacramento River.

The Southern DPS was listed as threatened on April 7, 2006 under the federal Endangered Species Act (71 FR § 17757). NOAA Fisheries listed the primary factors responsible for the decline of the Southern DPS as the destruction, modification, or curtailment of habitat and the inadequacy of existing regulatory mechanisms. Critical habitat was designated on October 9, 2009, and includes coastal marine areas from Monterey Bay up to the Strait of Juan de Fuca; portions of the Sacramento River, lower Feather River, and lower Yuba River; the Sacramento-San Joaquin Delta; and certain coastal bays and estuaries in California, Oregon, and Washington (74 FR § 52300). No critical habitat is designated in the vicinity of the DCPP, and green sturgeon spawning grounds are very distant from DCPP. Although the marine habitat around DCPP is within the range of green sturgeon, no individuals have been identified in past DCPP monitoring efforts.

Given that green sturgeon are an anadromous species (spawn in fresh water), there is no anticipated entrainment of green sturgeon larvae. In addition, green sturgeon spawning grounds are very distant from DCPP (several hundred miles away), with the nearest confirmed location in the Sacramento River. Therefore, presence of larval green sturgeon in the vicinity of the intake cove is highly unlikely. Although the marine habitat around DCPP is within the range of adult green sturgeon, the likelihood of adult green sturgeon impingement is low due to the low uniform intake approach velocity (which would allow fish to swim away from the screens), and the lack of any green sturgeon identified in the vicinity of the intake cove throughout the history of DCPP operation during extensive marine monitoring. Therefore, there is no anticipated adverse effect to green sturgeon as a result of continued operation of DCPP.

Coho Salmon *– Oncorhynchus kisutch*

The coho salmon Central California Coast Evolutionarily Significant Unit (ESU) is a federal and state endangered species. Recent findings of the five-year review, released on August 15, 2011, determined that the Central California Coast coho salmon ESU should remain listed as endangered.

The coho salmon is an anadromous fish that spends most of its life in the ocean, but returns to freshwater streams to spawn. The range of the Central California Coast coho salmon ESU includes accessible reaches of all naturally spawned populations of coho from Punta Gorda in northern California south to, and including, the San Lorenzo River at the north end of Monterey Bay, including two streams entering San Francisco Bay (Arroyo Corte Madera Del Presidio and Corte Madera Creek) (64 FR § 24049).

In May 1999, critical habitat was designated for the Central California Coast coho salmon ESU (64 FR § 24049). No critical habitat is designated in the vicinity of DCPP, but adult coho have been observed off of Point Buchon (Reference 192).

Given that coho salmon are an anadromous species (spawn in fresh water), there is no anticipated entrainment of coho salmon larvae because presence of larval coho salmon in the intake cove is highly unlikely. Although the marine habitat around DCPP is within the range of adult coho salmon, the likelihood of adult coho salmon impingement is low due to the low uniform intake approach velocity at DCPP (which would allow fish to swim away from the screens), and the lack of any coho salmon identified in the vicinity of the intake cove throughout the history of DCPP operation during extensive marine monitoring. Therefore, there is no anticipated adverse effect to coho salmon as a result of continued operation of DCPP.

Southern Sea Otter - *Enhydra lutris nereis*

The southern sea otter, which originally ranged from Baja California to at least Washington State and perhaps to south-central Alaska, was generally considered extinct by 1920 (Reference 60). Apparently, however, a group of 50 to 100 individuals survived off central California in the vicinity of Monterey. By 1970, the population had grown to include about 1,800 individuals. The southern sea otter now regularly occurs along about 300 km of the central California coast, and recently, individual sightings have been documented as far north as Fort Ross, California.

Although the sea otter is a marine mammal, it rarely ventures more than 1 km from shore. It forages in both rocky and soft-sediment communities, on or near the ocean floor. Off California, sea otters seldom enter waters of greater depth than 20 m. The sea otter is capable of spending its entire life at sea, but sometimes rests on rocks near the water. The diet consists mainly of slow-moving fish and marine invertebrates, such as sea urchins, crabs, abalones, and other mollusks.

Sea otter populations from Pt. Buchon to near Pt. San Luis (including the area adjacent to DCPP) have been monitored ~~monthly~~ since 1973. Average population size has varied over the years, but has seasonally ranged from less than 40 to over 100 individuals (Reference 59). In recent years, the study area population has remained relatively stable with an annual mean of approximately 70. Their distribution is known to change with local conditions and the population size appears to be largely influenced by the availability of food resources, suitable resting sites, pupping success, and movement of otters between adjacent coastal areas. Females and pups now dominate the study area, representing about 95 percent of the resident population. The females and pups form "rafts" where they float in small groups while resting and grooming.

A group of approximately 30 southern sea otters *periodically* reside~~s~~ within the DCPP Intake Cove. These animals typically overnight within the cove and disperse to offshore foraging areas during the day. Preferred rafting locations in the immediate vicinity of the power plant include the protected areas of the intake cove, north Diablo Cove, and Lion Rock.

The southern sea otter is currently listed under the federal Endangered Species Act as threatened (listing date: January 14, 1977)*, but no critical habitat area has been designated for the southern sea otter*. Since receiving federal ~~and state~~ protection, the species has increased significantly in numbers throughout its current range. Local populations are affected to some extent by natural mortality factors such as predation and disease. Other factors affecting the abundance and availability of food resources also contribute to population fluctuations. *Sea otter population monitoring has identified no impact to southern sea otter populations from DCPP operation. There has never been a recorded incident of injury or mortality of a sea otter due to plant operation. Therefore, incidental take is unlikely, and PG&E concludes that impacts to the southern sea otter from continued operations would not likely adversely affect the species.*

Guadalupe Fur Seal – *Arctocephalus townsendi*

The Guadalupe fur seal is a federal and state listed threatened species under the ESA and CESA, and a fully protected species under California Fish and Game Code Section 4700, subdivision (b)(4). Guadalupe fur seals pup and breed at Isla Guadalupe, Mexico; however, in 1997, a second rookery was discovered at Isla Benito Del Este in Baja California. Though individuals have been sighted or stranded as far north as Blind Beach, California, they are typically found farther south. While once abundant, these seals almost became extinct due to extensive commercial harvest in the 19th century. The population is now listed as a threatened species under both the state and federal ESAs. The population is considered a single stock (Mexico stock) from one breeding colony. The minimum population estimate for this species is 3,028 and is likely increasing in abundance (Reference 192).

During breeding season, Guadalupe fur seals are found in coastal rocky habitats and caves, though little is known about their whereabouts during the non-breeding season

(September to May) (Reference 192). Some individuals travel north to the Channel Islands in late summer and may occur in small numbers in central California, although no sightings were recorded in the 2007 review by NOAA National Centers for Coastal Ocean Science (Reference 193).

Marine mammal populations directly off the coast of DCPP have been monitored since 1973. This monitoring effort has identified no impact to Guadalupe fur seal populations from DCPP operation. There has never been a recorded incident of injury or mortality of a Guadalupe fur seal due to plant operation. Therefore, there is no anticipated adverse effect to the Guadalupe fur seal resulting from continued operation.

Green Sea Turtle - *Chelonia mydas*

On the Pacific coast, the green sea turtle was once common as far north as San Quintin Bay, Baja California, and occasionally reached bays along the coast of extreme southern California. It was formerly common in San Diego Bay. The green sea turtle inhabits lagoons and bays of the continental shores and oceanic islands, especially where there are sandy beaches. It is most often encountered in relatively shallow water where it feeds upon marine plants, but individuals are also occasionally seen considerable distances from shore. Beds of algae (seaweed) or eelgrass are likely places of occurrence~~. R~~ *and r*ock cavities may be used as places of retreat. ~~The Pecho Coast affords little in the way of nesting habitat for this species.~~

Monitoring (i.e., adult fish populations) has been conducted in the areas around DCPP as part of the NPDES permit requirements for thermal discharge since 1976, almost 10 years before DCPP began commercial operation. Monitoring is conducted on a quarterly sampling schedule. The purpose of the monitoring is to compare potential effects of the thermal discharge on natural marine communities at various sites within Diablo Cove to multiple control sites located north and south of DCPP. Green sea turtles have been recorded in the DCPP vicinity on multiple occasions, being recorded both in the open ocean and in the power plant intake cove.

The non-breeding populations of green sea turtles, including those with the potential to occur in the DCPP vicinity, were listed as threatened under the ESA on July 28, 1978, (43 FR § 32800) due to declining populations; however, there is no critical habitat designated for the green sea turtle along the Pecho coast. The principal cause of the historical, worldwide decline of the green sea turtle is the long-term harvest of eggs and adults on nesting beaches. However, there are no known nesting sites for the green sea turtle along the western coast of the U.S.

Incidental capture in fishing gear, primarily in gillnets, but also in trawls, traps and pots, longlines, and dredges is a serious ongoing source of mortality that also adversely affects the species' recovery. Green sea turtles within the vicinity of DCPP are protected from the threat of incidental capture in fishing gear due to the establishment of a security zone in the Pacific Ocean from surface to bottom, within a 2,000-yard radius

of DCPP. No person or vessel may enter or remain in the security zone without permission of the Captain of the Port of Los Angeles-Long Beach.

NMFS issued a Biological Opinion and Incidental Take Statement, in accordance with Section 7 of the ESA (16 U.S.C 1531 et seq.), on September 18, 2006, for the possession and disposition of impinged or stranded sea turtles within the DCPP intake structure (Reference 24). The biological opinion on the effects of DCPP operation on federally listed species issued by NMFS in September 2006 concluded operation of DCPP is not likely to jeopardize green sea turtles. Sea turtles would not likely be directly harmed by elevated water temperatures. While it is possible that temperature increases from thermal discharge could affect the turtle's normal distribution or foraging patterns (as sea turtles have been known to aggregate in warm water effluent elsewhere), based on stranding and sighting data, there have been no known cases of sea turtles aggregating near the DCPP discharge area. In addition, the warm water effluent does not extend to the intake cove and therefore, would not likely modify turtle behavior near the intake structure (Reference 24).

~~Green sea turtles have been recorded in the DCPP vicinity on multiple occasions, being observed both in the open ocean and in the power plant intake cove. On two occasions in 1977 (prior to reactor start-up and plant commercial operation), once in 1994, two occasions in 1997, two occasions in 1999, once in 2000, once in 2001, once in 2007, and once in 2009,~~*There have been 14 total occurrences of a* green sea turtle~~s were~~ found *stranded* in the forebay of the DCPP intake structure *throughout the history of the plant*. The turtles were discovered on the ocean surface inside the concrete intake curtain wall*, which extends approximately 8 ft below MSL,* in front of the debris exclusion bar racks. *They apparently become stranded inside the concrete intake curtain wall because they cannot initiate a steep enough dive angle to exit beneath the curtain wall and return to the open intake cove; they do not actually been impinged on the intake structure bar racks.* On each occasion, the turtles appeared unharmed *and uninjured*, and swam freely once returned to the open ocean. *Stranding of green sea turtles within the intake structure at DCPP has never resulted in a green sea turtle mortality or injury, and there has never been an instance of sea turtle impingement against the bar racks at DCPP due to the low uniform intake approach velocity.*

~~This species is listed as threatened under the federal Endangered Species Act (listing date: July 1978) due to declining populations and limited breeding areas. No local endangerment factors have been identified for this species.~~

Leatherback Sea Turtle – *Dermochelys coriacea*

Leatherback sea turtles are commonly known as pelagic animals, but they also forage in coastal waters. Leatherback sea turtles mate in waters adjacent to nesting beaches and along migratory corridors. After nesting, female leatherbacks migrate from tropical waters to more temperate latitudes, which support high densities of jellyfish prey in the summer.

Following the listing of the leatherback sea turtle as endangered in 1970, the USFWS and NMFS designated critical habitat for the species consisting of a strip of land 0.2-miles wide on, and marine waters adjacent to, Sandy Point Beach, St. Croix, U.S. Virgin Islands. On January 26, 2012, the NMFS issued a final rule to revise the critical habitat designation for the leatherback sea turtle to include areas off the U.S. West Coast. This revised critical habitat includes geographic area off the coast of the Diablo Canyon lands.

The greatest causes of decline and the continuing primary threats to leatherbacks worldwide are long-term harvest and incidental capture in fishing gear, such as gillnets, longlines, trawls, traps or pots, and dredges. Together, these threats are serious ongoing sources of mortality that adversely affect the species' recovery.

Sea turtles within the vicinity of DCPP would be protected from the threat of incidental capture in fishing gear due to the establishment of a security zone within a 2,000-yard radius of DCPP. Monitoring has been conducted on a quarterly basis in the areas around DCPP as part of the NPDES permit requirements for thermal discharge since 1976.

NMFS issued a Biological Opinion and Incidental Take Statement, in accordance with Section 7 of the ESA (16 U.S.C 1531 et seq.), on September 18, 2006, for the possession and disposition of impinged or stranded sea turtles within the DCPP intake structure (Reference 24). The biological opinion on the effects of DCPP operation on federally listed species issued by NMFS in September 2006 concluded operation of DCPP is not likely to jeopardize leatherback sea turtles. Sea turtles would not likely be directly harmed by elevated water temperatures. While it is possible that temperature increases from thermal discharge could affect the turtle's normal distribution or foraging patterns (as sea turtles have been known to aggregate in warm water effluent elsewhere), based on stranding and sighting data, there have been no known cases of sea turtles aggregating near the DCPP discharge area. In addition, the warm water effluent does not extend to the intake cove, and therefore, would not likely modify turtle behavior near the intake structure (Reference 24).

While PG&E is covered under the Biological Opinion and Incidental Take Statement for the possession and disposition of impinged or stranded sea turtles at DCPP, throughout the history of DCPP operation and extensive marine monitoring, PG&E has never observed leatherback sea turtles in the vicinity of DCPP. Based on past stranding events with green sea turtles, which have not resulted in an injury or mortality, there would be no anticipated injury or mortality from stranding of a leatherback. Additionally, there would be no anticipated impingement of a leatherback sea turtle due to the low uniform intake approach velocity, and the lack of any sea turtle impingement against the bar racks throughout the history of DCPP operation. Therefore, there is no anticipated adverse effect to leatherback sea turtles as a result of continued operation of DCPP.

Olive Ridley Sea Turtle *– Lepidochelys olivacea*

The olive ridley is mainly a pelagic sea turtle, but has been known to inhabit coastal areas, including bays and estuaries. Olive ridleys are globally distributed in the tropical regions of the South Atlantic, Pacific, and Indian Oceans. The olive ridley is considered the most abundant sea turtle in the world with an estimated 800,000 nesting females annually (Reference 194). The normal range for olive ridley turtles in the eastern Pacific is from southern California to northern Chile (Reference 195). However, because they prefer warmer tropical waters, they are rarely found in southern California and no abundance estimates are available. The California/Oregon drift gillnet fishery has documented the capture of only one olive ridley off southern California; it was captured in 1999.

The non-breeding populations of Pacific olive ridley sea turtle were listed as threatened under the ESA on July 28, 1978 (43 FR § 32800). No critical habitat rules have been published for the olive ridley sea turtle. The principal threat to non-breeding populations of olive ridley sea turtles is incidental capture in fishing gear, such as gillnets, longlines, trawls, traps or pots, and dredges.

Sea turtles within the vicinity of DCPP would be protected from the threat of incidental capture in fishing gear due to the establishment of a security zone within a 2,000-yard radius of DCPP. Monitoring has been conducted on a quarterly basis in the areas around DCPP as part of the NPDES permit requirements for thermal discharge since 1976.

NMFS issued a Biological Opinion and Incidental Take Statement, in accordance with Section 7 of the ESA (16 U.S.C 1531 et seq.), on September 18, 2006, for the possession and disposition of impinged or stranded sea turtles within the DCPP intake structure (Reference 24). The biological opinion on the effects of DCPP operation on federally listed species issued by NMFS in September 2006 concluded operation of DCPP is not likely to jeopardize olive ridley sea turtles. Sea turtles would not likely be directly harmed by elevated water temperatures. While it is possible that temperature increases from thermal discharge could affect the turtle's normal distribution or foraging patterns (as sea turtles have been known to aggregate in warm water effluent elsewhere), based on stranding and sighting data, there have been no known cases of sea turtles aggregating near the DCPP discharge area. In addition, the warm water effluent does not extend to the intake cove, and therefore, would not likely modify turtle behavior near the intake structure (Reference 24).

While PG&E is covered under the Biological Opinion and Incidental Take Statement for the possession and disposition of impinged or stranded sea turtles at DCPP, throughout the history of DCPP operation and extensive marine monitoring, PG&E has never observed olive ridley sea turtles in the vicinity of DCPP. Based on past stranding events with green sea turtles, which have not resulted in an injury or mortality, there would be no anticipated injury or mortality from stranding of an olive ridley sea turtle. Additionally, there would be no anticipated impingement of an olive ridley sea turtle due

to the low uniform intake approach velocity and the lack of any sea turtle impingement against the bar racks throughout the history of DCPP operation. Therefore, there is no anticipated adverse effect to olive ridley sea turtles sea turtles as a result of continued operation of DCPP.

***Loggerhead Sea Turtle** – Caretta Caretta*

Loggerheads are circumglobal, occurring throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. Loggerheads are the most abundant species of sea turtle found in U.S. coastal waters. The majority of loggerhead nesting occurs in the western rims of the Atlantic and Indian Oceans. In the eastern Pacific, loggerheads have been reported as far north as Alaska, and as far south as Chile. In the U.S., occasional sightings are reported from the coasts of Washington and Oregon, but most records are of juveniles off the coast of California.

The North Pacific Ocean DPS of loggerhead sea turtles, ranging from the equator to south of 60° N. Lat, was listed as endangered on September 22, 2011 (76 FR § 58868). No critical habitat rules for the North Pacific Ocean DPS of loggerhead sea turtles have been published. Loggerheads face threats on both nesting beaches and in the marine environment. The greatest cause of decline and the continuing primary threat to loggerhead turtle populations worldwide is incidental capture in fishing gear, primarily in longlines and gillnets, but also in trawls, traps and pots, and dredges.

Sea turtles within the vicinity of DCPP would be protected from the threat of incidental capture in fishing gear due to the establishment of a security zone within a 2,000-yard radius of DCPP. Monitoring has been conducted on a quarterly basis in the areas around DCPP as part of the NPDES permit requirements for thermal discharge since 1976.

NMFS issued a Biological Opinion and Incidental Take Statement, in accordance with Section 7 of the ESA (16 U.S.C 1531 et seq.), on September 18, 2006, for the possession and disposition of impinged or stranded sea turtles within the DCPP intake structure (Reference 24). The biological opinion on the effects of DCPP operation on federally listed species issued by NMFS in September 2006 concluded operation of DCPP is not likely to jeopardize loggerhead sea turtles. Sea turtles would not likely be directly harmed by elevated water temperatures. While it is possible that temperature increases from thermal discharge could affect the turtle's normal distribution or foraging patterns (as sea turtles have been known to aggregate in warm water effluent elsewhere), based on stranding and sighting data, there have been no known cases of sea turtles aggregating near the DCPP discharge area. In addition, the warm water effluent does not extend to the intake cove, and therefore, would not likely modify turtle behavior near the intake structure (Reference 24).

While PG&E is covered under the Biological Opinion and Incidental Take Statement for the possession and disposition of impinged or stranded sea turtles at DCPP, throughout the history of DCPP operation and extensive marine monitoring, PG&E has never

observed loggerhead sea turtles in the vicinity of DCPP. In addition, the only known nesting areas for loggerheads in the North Pacific are found in southern Japan. Based on past stranding events with green sea turtles, which have not resulted in an injury or mortality, there would be no anticipated injury or mortality from stranding of a loggerhead sea turtle. Additionally, there would be no anticipated impingement of a loggerhead sea turtle due to the low uniform intake approach velocity and the lack of any sea turtle impingement against the bar racks throughout the history of DCPP operation. Therefore, there is no anticipated adverse effect to loggerhead sea turtles as a result of continued operation of DCPP.

Black Abalone - *Haliotis cracherodii*

The black abalone is one of seven species of abalone that occur in California, and is the only species that occurs primarily in the marine intertidal zone where it is found on the faces, overhangs, and cracks of rocks. This species of abalone has a geographic range from Mendocino County in northern California south to southern Baja California. *As reported in the Rulemaking To Designate Critical Habitat for Black Abalone, the ocean temperatures in the geographic range for black abalone range from 54–77°F (12–25°C), but that the optimum range is 64–72°F (18–22°C) (Reference 199).* Though less desirable from a fisheries perspective than other abalone ~~types~~*species*, commercial harvesting of black abalone occurred within the species' range peaking in 1973 at almost 2 million lbs, followed by declines leading to catches of less than 220,000 lbs by 1988.

Surveys of black abalone in the Channel Islands by the ~~CDF&G~~*CDFW* in the mid-1970s were conducted prior to opening the area to commercial harvesting. Data from those surveys recorded densities of greater than 100 black abalone per m^2. Black abalone also occurred in high abundances in the areas around DCPP including Diablo Cove where the population was estimated at over 13,000 individuals in 1981.

In 1986 and 1987, black abalone with severely shrunken body masses were found in several of the Channel Islands off the coast of California (References 65 and 69). The afflicted animals were characterized by epipodial and mantle tissue that was discolored, flaccid, and atrophied. In severe cases abalone that were normally firmly attached to rocks by their foot muscle were hanging from the rocks barely attached. The condition was termed withering syndrome (WS) (Reference 65) *and was subsequently found to be caused by a Rickettsiales-like prokaryotic pathogen that invades digestive epithelial cells and disrupts absorption of digested material (Reference 64). The pathogen responsible for WS has been formally described and is presently known as 'Candidatus Xenohaliotis californiensis'*. In areas with WS, *there were large declines in abundance.* ~~t~~*T*here were also large numbers of *clean, undamaged,* empty shells *indicating that the likely cause of death was WS and not predation, which is usually evidenced by cracked or broken shells.*~~that appeared to be the result of recent deaths. Between 1986 and 1989 population declines in excess of 90 percent had occurred on the southernmost Channel Islands, while on the more northern island of San Miguel, declines were less severe (References 65 and 69).~~

In June 1988, black abalone with WS were found along the shoreline of north Diablo Cove. *It is likely that the abalone with WS were found inside Diablo Cove prior to observations from other mainland areas of the state because of the large abundances of black abalone in the area, the extensive monitoring efforts in the cove, and the experience of the field biologists at DCPP that had worked in the Channel Islands where WS was first discovered in 1987. The black abalone with WS that were found in Diablo Cove and the surrounding areas had symptoms that were identical to those observed in the Channel Islands.* A black abalone population census in Diablo Cove was conducted as part of the Receiving Water Monitoring Program for DCPP from 1981 through 1998. Similar to the rapid population declines observed in the Channel Islands, results from this study showed that mean density of black abalone declined from approximately 0.9 per m^2 in 1988 to approximately 0.1 per m^2 in 1991. ~~The black abalone with WS that were found in Diablo Cove and the surrounding areas had symptoms that were identical to those observed in the Channel Islands. Further evidence showed that WS is caused by a Rickettsiales-like prokaryotic pathogen that invades digestive epithelial cells and disrupts absorption of digested materials from the gut lumen into the tissues (Reference 64). The pathogen has been found in black abalone from throughout the state. The initial appearance on the mainland of WS with accompanying die-off at DCPP likely resulted from the absence of any other long-term monitoring program along the coastline, and the general low abundances of black abalone in the populated areas of southern California.~~

Continued monitoring of the condition at DCPP occurred following the initial WS-related die-off in 1988. Although populations increased during some years, WS contributed to an overall decline in Diablo Cove. ~~by~~ *By* 1998, *populations had decreased by* ~~from peak abundances in the early 1980s of greater than~~ 95 percent *from abundances in the early 1980s prior to the onset of WS*. *Following the identification of WS in the Channel Islands and Diablo Cove, monitoring programs for black abalone were established throughout the state, and* ~~M~~*m*onitoring at stations in areas outside of Diablo Cove showed similar levels of decline (Reference 67). As of January 2008, all known black abalone populations south of Monterey County, California, have experienced major losses, which have been largely attributed to WS (Reference 70). Available evidence indicates that mass mortalities associated with the disease continue to expand northward along the California coast especially during warm water El Niño periods (Reference 67). *Presently, abalone infected with the pathogen have been found in all areas of the state*. Similar widespread mass mortalities of black abalone over the past two decades have also been reported from Mexico verifying the widespread nature of WS (Reference 70).

The relationship between the rate of WS-related mortalities in black abalone and increased seawater temperature was established in experiments done at DCPP (Reference 68). *Although increased seawater temperatures were shown to increase the mortality rate associated with WS,* ~~O~~*o*ther experiments conducted in more detail using different test temperatures showed similar results and concluded that "elevated temperature was not a direct cause of WS, but accelerated the mortality of black abalone with WS" (Reference 63). *In fact, the ocean temperatures inside Diablo Cove*

during plant operations are within the optimum temperature range for the species (Reference 199).

In contrast to the WS-related mortalities associated with increased seawater temperatures, ~~earlier laboratory temperature studies on black abalone at DCPP prior to plant operations showed high levels of temperature tolerance (Reference 66).~~*it should be noted that temperatures found in Diablo Cove are within the black abalone biogeographical water temperature range of 53.6 to 77°F (Reference 199). Additionally, earlier laboratory temperature studies on black abalone at DCPP prior to plant operations showed high levels of temperature tolerance (Reference 66).* Growth studies conducted over a 90 day period showed that optimal growth occurred at approximately 64°F and that abalone held at approximately 75°F over the same period showed no mortality. These ~~results~~ *studies* showed that healthy black abalone would be expected to survive the temperature regime in Diablo Cove during plant operation that began in 1985 and were consistent with the results from ~~cove-wide census~~*monitoring* showing a healthy population of black abalone in Diablo Cove during the period of plant operation through 1988 when WS-related mortalities were first observed ~~at the location~~*in the cove*. ~~T~~*The t*hermal discharge from the operating power plant was therefore not a direct cause of black abalone WS later observed in *other* ~~the~~ coastal *areas around DCPP*~~vicinity~~.

Monitoring data from the TEMP studies on black abalone, show that numerous factors, in addition to WS, likely contributed to declines in the population prior to the start of plant operation. The primary factor contributing to the steep decline in black abalone before the start of plant operation was the appearance of sea otters in the area during the 1970s (see Figure 2.5-2). Sea otters preyed on black abalone, especially those that were not in deep crevices where they were somewhat protected from predation. In addition, large storms during February 1983 resulted in additional losses to black abalone in some of the TEMP study areas, especially in the South Control area (see Figure 2.5-2). Despite these effects, there were still healthy populations of black abalone inside and outside of Diablo Cove during plant operation and before the onset of WS.

The monitoring data from the TEMP intertidal studies show that black abalone abundances at the monitoring stations in North Diablo Cove declined rapidly after the onset of WS, but abundances at stations upcoast in Field's Cove and North Control declined at a slower rate. The warmer ocean temperatures associated with the 1997 El Nino resulted in further declines at all the locations where abalone were still present in the TEMP study areas.

As a result of the risk to the black abalone due to WS, the State of California suspended all forms of legal harvest of black abalone in 1993, and in 1997 placed all abalone harvests south of the Golden Gate under indefinite moratorium. On June 23, 1999 black abalone was added to the list of Candidate Species by the National Marine Fisheries Service (NMFS; Federal Register 64 33466), in the context of consideration for federal protected status pursuant to the Endangered Species Act of 1973 as

amended. The black abalone was transferred to the NMFS List of Species of Concern on April 15, 2004 (Federal Register 69 19975). The NMFS initiated a formal status review in June 2007 as mandated by the ESA.

As a result of the status review, a proposal to list black abalone as endangered, a solicitation for public comment on the proposed rule, and solicitation for additional information regarding black abalone status and habitat needs, were published in the Federal Register on January 11, 2008 (Federal Register 73 1986). A final rule formally designating the black abalone as an endangered species was published on January 14, 2009 (Federal Register 74 1937). *Critical habitat was designated for the black abalone in October 2011, including areas off the coast of DCPP (76 FR 66805). This designation includes rocky intertidal and subtidal habitats from the mean higher high water (MHHW) line to a depth of six meters (relative to the mean lower low water [MLLW] line), as well as the coastal marine waters encompassed by these areas.*

As discussed above, while elevated water temperature has been demonstrated to accelerate the mortality of black abalone with WS, it is not a direct cause of WS. The rate of decline due to WS was greater in areas within the range of the DCPP thermal plume; however, areas within the range of the thermal plume and areas outside the range of the thermal plume (other areas of the central coast south of Cayucos) eventually reached the same level of absolute population decline. This is shown in the DCPP monitoring data depicted in Figure 2.5-2.

Entrainment of fish and shellfish larvae is discussed in detail in Section 4.2. While there is potential for entrainment of black abalone larvae at DCPP, there are factors which greatly reduce the potential for entrainment to impact the species. The duration of time that abalone larvae are in the water column where they might be subject to entrainment is limited by the short dispersal potential for this species. Laboratory studies at DCPP showed that the larval stage where dispersal is most likely to occur is limited to 10 to 20 hours. Therefore, any larvae would only be subject to entrainment for a limited period of time and within an area limited to the direct vicinity of the intake cove and any minimal entrainment would not adversely affect the population.

There would be no anticipated impingement of juvenile or adult black abalone because black abalone are a sessile species, not free swimming. In addition, black abalone do not occur on or within the intake structure itself due to lack of suitable protective habitat.

2.5.2 TRANSMISSION LINE CORRIDORS

The discussions regarding transmission lines were not amended. In accordance with the revised GEIS (NUREG-1437, Revision 1, Reference 8), since the transmission lines discussed in the FES would remain energized regardless of a license renewal decision, the transmission lines that connect the DCPP switchyard to the regional transmission system are no longer in the scope of the license renewal environmental review. These transmission lines are now a critical part of PG&E's high voltage transmission system, providing other services in addition to those related to DCPP. The only transmission

lines remaining in the scope of the license renewal environmental review are those from the DCPP power block to the DCPP switchyard. Therefore, the below discussions regarding the DCPP transmission lines that connect the DCPP switchyard to the transmission system are provided for historical purposes and are not updated.

In 2008, a review was performed of known information regarding special-status plant and wildlife species and habitats within 1 mile of the DCPP transmission lines. Special-status species include (1) those listed or considered candidates for listing under the state and/or federal endangered species acts; (2) species designated "of concern" by the USFWS and/or ~~California Department of Fish and Game (CDF&G~~*CDFW*~~)~~, or (3) are listed as threatened or endangered (Lists 1 and 2) by the California Native Plant Society (CNPS). Sources used in identifying these species are included in the Transmission Corridor Terrestrial Ecology Technical Report (Reference 51).

Sensitive species and habitats known to occur or potentially occurring in the vicinity of the DCPP transmission line corridors are shown in Tables 2.5-2 and 2.5-3. Table 2.5-2 lists special-status plant species with potential to occur within the DCPP transmission line corridors, their status, habitat requirements, and project quads (see Figure 2.5-1) in which they occur. Thirty-nine special-status plant species were identified from background research. Of these, six plant species are federally- or California state-listed as rare, threatened, or endangered:

- San Luis Obispo fountain thistle (*Cirsium fontinale var. obispoense*)
  Federally and California state endangered, CNPS list 1B.2
- Pismo clarkia *(Clarkia speciosa ssp. immaculata)*
  Federally endangered, California state rare, CNPS list 1B.1
- Kern mallow (*Eremalche kernensis*)
  Federally endangered, no state status, CNPS list 1B.1
- Indian Knob mountainbalm (*Eriodictyon altissimum*)
  Federally- and California state endangered, CNPS list 1B.1
- San Joaquin woollythreads (*Monolopia congdonii*)
  Federally endangered, no state status, CNPS list 1B.2
- adobe sanicle (*Sanicula maritima*)
  No federal listing, California state rare, CNPS list 1B.1

All six species occur in close proximity to one or more of the DCPP transmission lines and suitable habitat may occur on private lands within the corridors.

Table 2.5-3 lists wildlife species with potential to occur along the lines, their status, habitat requirements, and project quads (see Figure 2.5-1) in which they occur. Twenty-three special-status wildlife species were identified from background research. Of these, the following 13 species are federally- or California State listed as threatened or endangered:

- Nelson's antelope squirrel (*Ammospermophilus nelsoni*)
  No federal status, California state threatened

- Longhorn fairy shrimp (*Branchinecta longiantenna*)
  Federally endangered, no state status
- Vernal pool fairy shrimp (*Branchinecta lynchi*)
  Federally threatened, no state status
- Morro Bay kangaroo rat (*Dipodomys heermanni morroensis*)
  Federally and California state endangered
- Giant kangaroo rat (*Dipodomys ingens*)
  Federally and California state endangered
- Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*)
  Federally and California state endangered
- Tidewater goby (*Eucyclogobius newberryi*)
  Federally endangered, no state status
- Blunt-nosed leopard lizard (*Gambelia sila*)
  Federally and California state endangered
- Steelhead - south/central California coast DPS (*Oncorhynchus mykiss irideus*)
  Federally threatened, no state status
- California red-legged frog (*Rana aurora draytonii*)
  Federally threatened, California state species of concern
- Buena Vista Lake shrew (*Sorex ornatus relictus*)
  Federally threatened, no state status
- Giant garter snake (*Thamnophis gigas*)
  Federally and California state threatened
- San Joaquin kit fox (*Vulpes macrotis mutica*)
  Federally endangered and California state threatened

Of these listed species, blunt-nosed leopard lizard, Nelson's antelope squirrel, and San Joaquin kit fox are the most likely to occur within the corridors because of suitable habitat and known proximity to the transmission lines. In particular, the San Joaquin kit fox could potentially occur throughout much of the corridors; this species is known to occur in the San Joaquin Valley, California Valley, and in valleys just inland of the Coast Ranges in Santa Barbara, San Luis Obispo, and Monterey counties. California coastal steelhead and California red-legged frog have potential to occur in several coastal streams that are within the corridors. Approximately 2 miles of the Diablo-Midway #2 & #3 500 kV lines lie just outside (~ 260 ft, south) of federally designated Longhorn Fairy Shrimp critical habitat, located in the Carrizo Plain region of the project, and approximately nine-miles of the Diablo-Gates #1 500 kV line is located within federally designated Vernal Pool Fairy Shrimp critical habitat.

On September 16, 2008 the USFWS proposed a significant new expansion of critical habitat for the California red-legged frog (*Rana aurora draytonii*) (53492 Federal Register / Vol. 73, No. 180 / Tuesday, September 16, 2008 / Proposed Rules). If adopted as proposed the new critical habitat designation for this species in San Luis Obispo County would include approximately 12 miles of the Diablo-Gates # 1 500 kV transmission line.

Among the sensitive, non-listed species, American badger and burrowing owl could potentially occur in grassland and open oak woodland habitats. Silvery legless lizard could occur in chaparral and coastal scrub habitats. Refer to Table 2.5-3 for details of the listed and other sensitive wildlife species with potential to occur in the DCPP transmission line corridors.

Table 3 of the Transmission Corridor Terrestrial Ecology Technical Report summarizes habitats, wetlands, and special-status species referenced by tower span. ~~For more on designated Critical Habitat Areas, refer to Section 2.4.~~

The following is historical information moved over from Section 2.4.2.

Within the vicinity of the project high-voltage transmission lines, critical habitat areas have been designated for the following federally listed species:

- *Vernal pool fairy shrimp - threatened*
- *Vernal pool longhorn fairy shrimp - endangered*
- *California red-legged frog - endangered*
- *California tiger salamander – endangered*
- *California condor – endangered*

Of those federally listed species above, the vernal pool fairy shrimp currently has critical habitat that is crossed by the Diablo-Gates 500-kV transmission line and associated towers and access roads.

The vernal pool fairy shrimp has a life span from December to early May (if water temperature stays below 75°F). Vernal pool fairy shrimp are filter and suspension feeders. Their diet mainly consists of unicellular algae, bacteria, and ciliates. They may also scrape algae, diatoms, and protists from the surface of rocks, sticks, and plant stems.

Shrimp eggs are laid by the adults each winter season. However, eggs may lie dormant in the soil for up to ten years before hatching. Genetic diversity is important for the survival of any species. One pool's shrimp population may have genes another pool's population lacks. This diversity may mean that the first population survives a disease or other threat, which kills the population that does not have the needed gene. The genes of different shrimp populations can be mixed when eggs are moved from one pool to another via wind, water, or in the stomachs of migrating birds. Small, isolated populations of shrimp are more likely to become extinct because they lack the genetic diversity to withstand threats.

The vernal pool fairy shrimp is found scattered throughout the Central Valley from Shasta County to Tulare County, along the Coast Range from Solano County to San Luis Obispo and Santa Barbara Counties, and in southern California in Riverside and San Diego Counties.

A recently proposed expansion of critical habitat for the federally endangered California red-legged frog in San Luis Obispo County, if adopted, would involve another portion of the Diablo-Gates 500-kV transmission line located north of Highway 101 and east of Highway 41 (Reference 49).

2.5.3 ESSENTIAL FISH HABITATS

In 1976, the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson Act) established a management system to more effectively utilize the marine fishery resources of the United States. It established eight Regional Fishery Management Councils (Councils), consisting of representatives with expertise in marine or anadromous fisheries from the constituent states. The Pacific Fishery Management Council (PFMC) is responsible for managing certain groundfish, coastal pelagic species, highly migratory species, and salmon from 3 to 200 miles off Washington, Oregon, and California. As amended in 1986, the Magnuson Act required Councils to evaluate the effects of habitat loss or degradation on their fishery stocks and take actions to mitigate such damage. In 1996, this responsibility was expanded to ensure additional habitat protection.

Essential fish habitat (EFH) is defined in the Magnuson-Stevens Fishery Conservation and Management Act as "…those waters and substrate necessary for spawning, breeding, feeding or growth to maturity". For the purpose of interpreting the definition of EFH, the term "waters" includes aquatic areas historically used by fish. Where appropriate this can include such environs as open waters, wetlands, estuarine, and riverine habitats. The term "substrate" includes sediment, hard bottom, structures underlying the waters, and the biological communities associated with the substrate. "Necessary" means the habitat is required to support a sustainable fishery and a healthy ecosystem; and "spawning, breeding, feeding or growth to maturity" covers a species' full life cycle.

In accordance with these definitions and descriptions, EFH would include a variety of elements found within, but not exclusive to, the coastal waters surrounding DCPP including the waters of Diablo Cove and the Intake Cove. The variety of substrates within these waters ranges from flat bottom areas covered with fine silt, sand, or shell fragments to high-relief areas comprised of large boulders and upthrust bedrock. Many areas are also covered with rocky cobble and gravel, and the varied substrates extend from the continuously submerged subtidal areas up through the intertidal shoreline. Manmade structures or components make up a portion of the substrate and include the intake and discharge structures, and the two large breakwaters that enclose the Intake Cove. Associated with the wide variety of substrates is an equally varied marine flora that grows upon it and constitutes part of the EFH. The subtidal and intertidal flora includes beds of giant kelp (*Macrocystis pyrifera*) and bull kelp (*Nereocystis luetkeana*), a wide variety of smaller, understory algal species, and surf grass beds. Different combinations of substrate and flora provide habitat for an equally varied collection of fish species. For example, several species of rockfishes (*Sebastes* spp.) can be found swimming in the midwater, beneath the kelp canopy, while gobies and sculpins utilize the rocky substrate below and shelter beneath smaller species of red and brown algae.

The marine environment in the vicinity of DCPP has been the object of intense environmental monitoring since the mid-1970s. These studies were initiated during the construction of DCPP and have continued, uninterrupted, through more than 20 years of plant operation. Various analysis reports have been consistent in their conclusions that biological effects of the discharge are mainly confined to Diablo Cove and diminished with both depth and distance from the point of discharge. A bibliography of various studies at DCPP that have addressed environmental impacts on EFH and other aspects of the marine environment in the vicinity of the plant are listed in the Essential Fish Habitat Technical Data Report (Reference 71).

EFH guidelines identify habitat areas of particular concern (HAPC) as types or areas of habitat that are identified based on one or more of the following considerations:

- The importance of the ecological function provided by the habitat.
- The extent to which the habitat is sensitive to human-induced environmental degradation.
- Whether, and to what extent, development activities are or will be stressing the habitat type.
- The rarity of the habitat type.

Three of the HAPC identified in the federal regulations are directly influenced by DCPP. They include rocky reefs, canopy kelp, and seagrass. The following descriptions include an overview of these habitat types and how they have been affected by power plant operation.

Rocky Reefs

Rocky habitats are generally categorized as either nearshore or offshore in reference to the proximity of the habitat to the coastline. Rocky habitat may be composed of bedrock, boulders, or smaller rocks, such as cobble and gravel. Hard substrates are one of the least abundant benthic habitats, yet they are among the most important habitats for groundfish. The rocky reefs HAPC includes those waters, substrates and other biogenic features associated with hard substrate (bedrock, boulders, cobble, gravel, etc.) to mean higher high water.

As mentioned earlier, construction of the breakwaters, intake, and discharge structures at DCPP affected the quantity and quality of rocky reef substrates in the Intake Cove and Diablo (Discharge) Cove. The net result, however, was that despite early disruption of habitat during the construction phase, subsequent re-colonization by native marine species of kelp, other algae, and invertebrates provided stable rock habitat that has supported indigenous nearshore fish assemblages. The habitat supported sport and commercial nearshore fisheries until it was protected from fishing by a security exclusion zone around DCPP in 2001.

Canopy Kelps

Of the habitats associated with the rocky substrate on the continental shelf, kelp forests are of primary importance to the ecosystem and serve as important groundfish habitat. Kelp forest communities are found relatively close to shore along the open coast. These subtidal communities provide vertically-structured habitat throughout the water column: a canopy of tangled blades from the surface to a depth of ten feet, a midwater, stipe region, and the holdfast region at the seafloor. Kelp stands provide nurseries, feeding grounds, and shelter to a variety of fish species and their prey. Giant kelp communities are highly productive relative to other habitats, including wetlands, shallow and deep sand bottoms, and rock-bottom artificial reefs. The net primary production of seaweeds in a kelp forest is available to consumers as living tissue on attached plants, as drift in the form of whole plants or detached pieces, and as dissolved organic matter exuded by attached and drifting plants.

Kelp canopies are widespread along the 11 mile coastline in the vicinity of DCPP, reaching maximum extent in fall months and occupying most rock reefs shallower than approximately 33 ft. Coastal aerial photographs spanning a 30-year period (1969–1998) were analyzed to determine potential effects of the DCPP discharge on kelp surface canopies in Diablo Cove and adjoining nearshore areas north of Diablo Cove. This study area represented a segment of about 1.2 mi of the greater DCPP coastline. Both bull kelp (*Nereocystis luetkeana*) and giant kelp (*Macrocystis pyrifera*) occurred in the study area. Areas contacted by the discharge were tested for long-term changes relative to controls using a before-after-control-impact statistical model.

Bull kelp declined significantly in Diablo Cove after power plant start-up due to its inability to grow and reproduce in the warm water. It remained, however, at low levels of abundance in some of the marginal areas of the cove where cooler offshore water was entrained by the discharge circulation. Test results were inconclusive for bull kelp declines outside of Diablo Cove, possibly due to the mixed canopy composed of bull kelp and giant kelp.

Giant kelp was more tolerant of the warmer conditions, and the combined coverage of bull kelp and giant kelp (total kelp cover) for the study area increased from about 7.5 acres to about 49.9 acres between the pre-operation and operation study periods. However, this absolute increase actually represented a statistically significant decline relative to control areas where total kelp cover increased by larger amounts over time. The differing rates of increase could have been related to natural variation associated with the mixed canopies, substrate availability, competition, and power plant effects.

The estimate of the annual average amount of bull kelp canopy lost in Diablo Cove during plant operation was 0.4 acres. A replacement canopy of giant kelp increased in Diablo Cove starting in the early 1990s from near-zero abundance to an annual average of about 1.3 acres. Giant kelp was greatest in abundance in 1998 (13.2 acres). The shift confirmed earlier predictions that bull kelp would decline near the discharge while giant kelp would increase.

The increased abundance of giant kelp habitat in Diablo Cove after plant start-up coincided with increased abundances of some kelp-associated fish species, such as kelp bass, and provided shelter for some juvenile rockfish species (e.g., kelp, gopher, black-and-yellow) that use kelp habitat for successful settlement in the nearshore zone. The increased diversity and numbers of midwater fishes during operation, and the continued increases of benthic fishes in north Diablo Cove may also have been related to the added structural complexity provided by giant kelp.

Seagrasses

Two important seagrass species found on the West Coast of the U.S. are eelgrass (*Zostera* spp.) and surfgrass (*Phyllospadix* spp.). These grasses are vascular plants, not seaweeds, forming dense beds of leafy shoots year-round in the lower intertidal and subtidal areas. Eelgrass is found on soft-bottom substrates in intertidal and shallow subtidal areas of estuaries and occasionally in other nearshore areas, such as the Channel Islands. Surfgrass occurs on hard-bottom substrates along higher energy coastlines. Studies have shown seagrass beds to be among the areas of highest primary productivity in the world.

Analysis of long-term monitoring data showed that the DCPP thermal discharge caused surfgrass to become less abundant in Diablo Cove after plant start-up. Based on earlier observations, prior to power plant start-up, surfgrass once formed a nearly continuous band around the shoreline of Diablo Cove, covering an estimated area of about 5 acres. Severe storm waves in winter 1982/83, before power plant start up, subsequently reduced surfgrass cover in Diablo Cove to about 1 acre. Surveys in summer/fall 1997 showed that surfgrass cover in Diablo Cove was about 0.25 acres. Based on these qualitative estimates, the operation of the DCPP discharge reduced the cover of surfgrass in Diablo Cove by about 0.75 acres. Lack of recovery to pre-storm abundances represented a potential loss of approximately 4.75 acres of surfgrass in Diablo Cove. Areas in Diablo Cove that lacked surfgrass were generally suitable for its establishment in terms of substratum composition and depth, but the areas were covered with algae instead. The specific causes for the declines and the lack of recovery are unexplained. Healthy patches of surfgrass remained in certain portions of north and south Diablo Cove long after plant start-up despite chronic exposure to warmer water temperature regimes.