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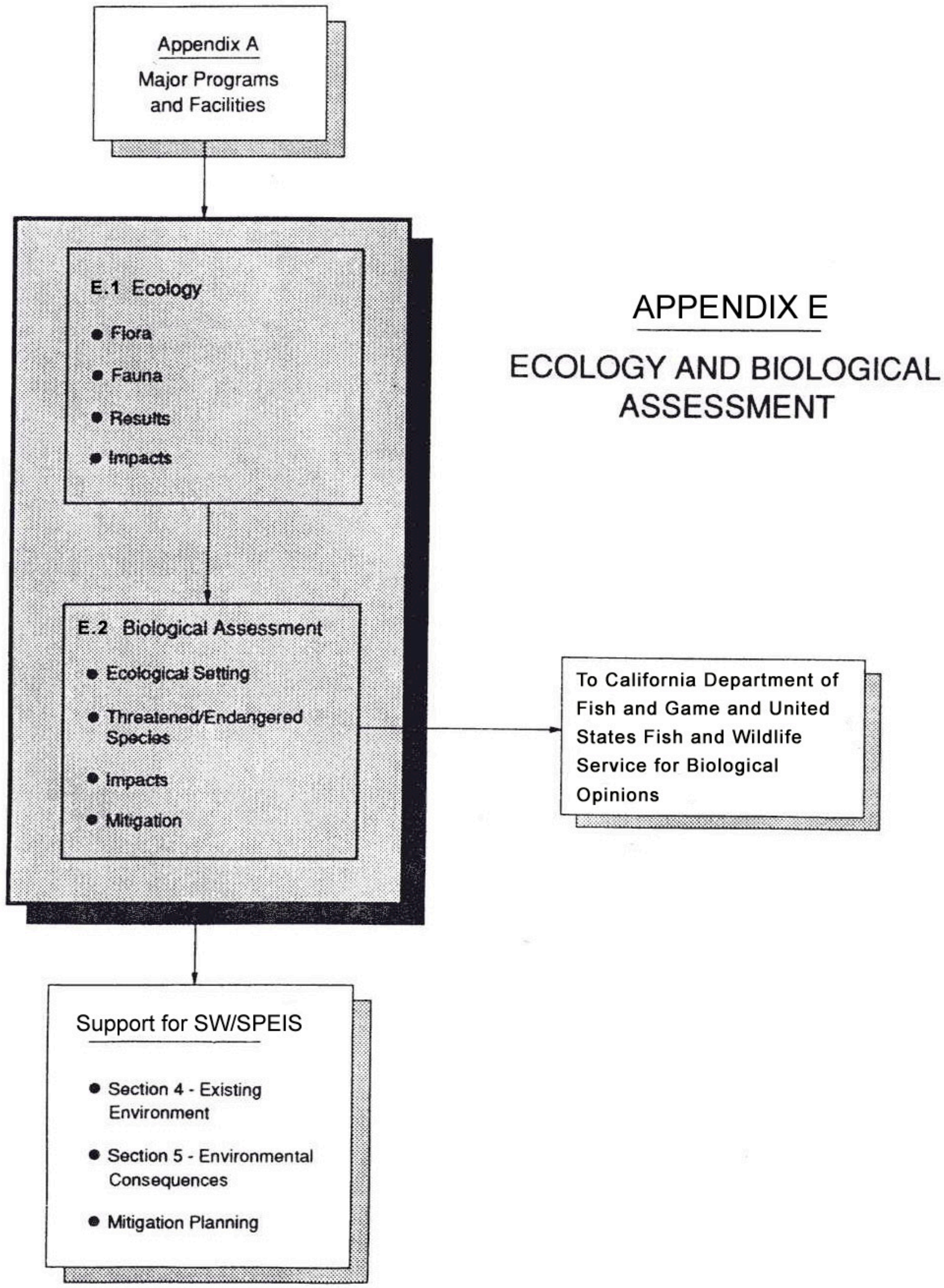
APPENDIX E: ECOLOGY AND BIOLOGICAL ASSESSMENT

This appendix contains two major sections. Section E.1 is a discussion of the ecological characteristics at the Livermore Site and Site 300, referred to collectively as the study sites and presents information on the flora and fauna in the upland areas (see Appendix F for a detailed analysis of wetlands at the study sites). This section focuses largely on the biological features of Site 300, because this approximately 7,000-acre site is largely undeveloped and represents the most biologically diverse area under study. In contrast, the Livermore Site is a developed area that provides marginal wildlife habitat for most species because of the high degree of human activity and the few areas of undisturbed vegetation.

Section E.2, a biological assessment, complies with the U.S. Department of Energy (DOE) guidelines requiring that a biological assessment be prepared in conjunction with a site-wide environmental impact statement (SWEIS). Prepared pursuant to Section 7(c) of the *Endangered Species Act* and to the *California Endangered Species Act*, this biological assessment includes a description of existing biological conditions; the status of threatened and endangered species and other species of concern at the study sites; the impacts, if any, of operations on these species; a determination if effects would occur to species of concern; and mitigation measures where appropriate.

The relationship of Appendix E to other appendices and to Chapters 4 and 5 of the *Site-wide Environmental Impact Statement for Continued Operation of Lawrence Livermore National Laboratory and Supplemental Stockpile Stewardship and Management Programmatic Environmental Impact Statement* (LLNL SW/SPEIS) is illustrated in Figure E–1. The analyses prepared for the biological assessment provide the basis for the discussion of impacts of the Proposed Action as described in the LLNL SW/SPEIS, Section 5.3.7. The analysis of the biological impacts of existing operations is complaint with DOE/NNSA requirements as well as to state and Federal endangered species acts.



Source: LLNL 1992a.

FIGURE E–1.—*Appendix E Interface with Other Site-wide Environmental Impact Statement Sections, Appendices, and Regulatory Reviews*

E.1 Ecology

E.1.1 Flora

The flora and vegetation at the Livermore Site and Site 300 have been described in several extensive surveys (BioSystems 1986a, 1986b, Jones and Stokes 1997, 2002a).

E.1.1.1 *Methods*

A plant species list for Site 300 was generated during the 1986 rare plant surveys, which were conducted on foot beginning on March 30, 1986, and continuing at biweekly intervals through mid-May 1986 (BioSystems 1986b). Sampling to typify vegetation composition was conducted in 1986 using a rapid descriptive technique generally termed as "the relevé method." More details on the relevé methodology may be found in the 1986 survey report (BioSystems 1986a, LLNL 1992a).

More recent plant species lists for Site 300 were generated from on-foot surveys conducted in 1997 and 2002, using California Department of Fish and Game (CDFG) guidelines to sample vegetation along meandering transects that paralleled roads and fire breaks. The 1997 survey was conducted between April 30 and May 12 and on September 23. The 2002 survey was conducted between March 27 and April 3 (Jones and Stokes 2002a).

E.1.1.2 *Results*

Flora

In 1997, 281 plant species were identified at Site 300; an additional 84 plant species were identified in 2002 (Jones and Stokes 2002a). A checklist of 406 plant species is provided in Attachment 2 combining the results of these 2 surveys with an earlier survey done in 1986 (BioSystems 1986b). Attachment 2, also provides a list of species for the Livermore Site. Table E.1.1.2–1 provides the results of the 1986 survey by analyzing the constancy and importance of plant species. Constancy is the percentage of all relevés (descriptive technique for sampling vegetation) in which a given species is encountered. Importance values are the sum of constancy and mean cover. As such, the importance value is a parameter that represents the frequency at which a species is observed added to the percent of groundcover of this particular species (BioSystems 1986a, LLNL 1992a).

The 1986 survey found that the nonnative grass species, *Avena barbata,* was the most frequently encountered plant at Site 300. Other frequently encountered species were *Bromus hordeaceus (B. mollis), B. diandrus, Erodium cicutarium, B. madritensis rubens*, and *Vulpia myuros*, all nonnative annuals introduced from Europe (Robbins 1940). Collectively, these six species are dominant in annual grasslands over much of lowland California (Heady 1977, BioSystems 1986a). The most commonly encountered plants at Site 300 are provided in Table E.1.1.2–1.

TABLE E.1.1.2–1.—*Constancy, Cover, and Importance Values for the More Important Plant Species at Site 300 from the 1986 Survey (continued)*

Species	Constancy	Cover		Importance Value
		Mean	Standard Error	
Trifolium oliganthum	6.42	0.13	0.05	6.55
Stylocfine gnaphalioides	6.42	0.07	0.03	6.49
Typha latifolia	5.05	1.26	0.48	6.30
Microseris lindleyi	5.96	0.01	0.01	5.98
Elymus elymoides	5.51	0.34	0.14	5.84
Salvia mellifera	5.05	0.68	0.26	5.72
Mimulus guttatus	5.51	0.20	0.12	5.70
Microseris douglasii	5.51	0.15	0.08	5.66
Linanthus bicolor	5.51	0.16	0.09	5.66
Claytonia parviflora	5.51	0.05	0.03	5.56
Quercus douglasii	5.05	0.50	0.20	5.55
Logfia gallica	5.51	0.04	0.02	5.55
Calochortus invenustus	5.51	0.02	0.01	5.52
Hordeum murinum leporinum	5.05	0.12	0.06	5.16
Amsinckia menziesii	5.05	0.03	0.02	5.08
Delphinium patens	5.05	0.03	0.02	5.08
Stylocline filaginea	5.05	0.03	0.01	5.07
Microsteris gracilis	5.05	0.02	0.01	5.07
Achyrachoena mollis	4.59	0.22	0.21	4.81
Silene gaffica	4.59	0.08	0.05	4.67
Schismus arabicus	4.59	0.07	0.03	4.65

Source: BioSystems 1986a.

The proportion and relative importance of native versus introduced species in the vegetation on Site 300 are similar to patterns documented in other cismontane annual grassland communities, where a handful of introduced species dominate and native species are less common (Heady 1958, Pitt 1975, Talbot et al. 1939).

Poa secunda (scabrella) was the most important native grass identified, occurring on nearly 39 percent of all relevés with an average cover of about 8 percent. Other important native species included the annual herbs *Trifolium tridentatum, Orthocarpus purpurascens, Lotus subpinnatus,* and *Amsinckia intermedia* (BioSystems 1986b).

Community Type Classification

In 1986, a survey delineated 14 plant community types at Site 300 that were combined to form five major types: (1) coastal sage scrub, (2) oak woodland, (3) introduced grasslands, (4) native grasslands, and (5) seeps and springs. In addition to those recognized, six relevés could not be placed in the classification scheme. Two were from the vernal pool and the remaining four were in other unique habitats; i.e., in a clay scald, a *Quercus lobata* stand, an unusual landslide deposit dominated by *Grindelia camporum*, and a *Melica californica* sward, for which no replicate samples could be obtained.

An alternative plant community classification and map have been recently completed. Community types used by Jones and Stokes generally follow the List of California Terrestrial Natural Communities recognized by the California Natural Diversity Data Base (CNDDB). The community types provided in the newer classification are numerically coded and are hierarchical. For example, the general category of Coastal Scrub is coded 32.000.00. California Sagebrush Scrub, a type of Coastal Scrub, is coded 32.010.00 (Jones and Stokes 2002a).

Maps showing the plant habitat types were prepared in 1992 and 2002, based on data collected from the 1986, 1997, and 2002 surveys (LLNL 1992a, Jones and Stokes 2002a). Figure E.1.1.2–1 provides a map of these plant communities at Site 300. A comparison of the two classifications is provided in Table E.1.1.2–2.

TABLE E.1.1.2–2.—*Comparison of Two Classifications Systems of Plant Community Types at Site 300*

Jones & Stokes (2002a) (Natural Community Code/Community Name)	BioSystems (1986)
30.000.00 Scrub and chaparral	
32.000.00 Coastal scrub	Coastal sage scrub
37.000.00 Undifferentiated chaparral scrubs	N/A
40.000.00 Grass and herb dominated communities	
41.000.00 Native grassland	Cismontane native grassland
41.180.00 One-sided bluegrass	Cismontane native grassland
42.000.00 Nonnative grassland	Cismontane annual grassland
44.100.00 Northern vernal pools	Vernal pools
45.700.00 Freshwater seeps	Freshwater seep
50.000.00 Bog and marsh	
52.130.00 Cattail wetland	Freshwater seep
60.000.00 Riparian and bottomland habitat	
61.000.00 Riparian forest and woodland	Northern riparian woodland
63.000.00 Low to high elevation riparian forests and woodlands	N/A
70.000.00 Broad leafed upland tree dominated	
71.000.00 Oak woodlands and forests	Blue oak woodland
80.000.00 Coniferous upland forest and woodland	
89.000.00 Juniper woodlands	Cismontane annual grassland

Sources: BioSystems 1986a, Jones and Stokes 2002a.
N/A = not applicable.

Coastal Sage Scrub Community (32.000.00)

Coastal scrub is a shrub-dominated community occurring in the Coast Ranges within the area where the climate has a maritime influence. Although the BioSystems report recognized three types of coastal scrub at Site 300, its vegetation map did not differentiate between the types. In the present vegetation map, most of the areas designated as Coastal Scrub are dominated by a combination of species including California matchweed (*Gutierrezia californica*), *Artemesia californica, Salvia mellifera*, and *Eriogonum fasiculatum*. This general community type also includes stands dominated by other species, such as bush lupine (*Lupinus albifrons*), for which there is currently no equivalent CNDDB community type (Jones and Stokes 2002a).

The coastal scrub general community type occurs in the southwestern part of Site 300 (Figure E.1.1.2–1) and was estimated to cover approximately 108 acres (BioSystems 1986a, LLNL 1992a).

The newer classification further divided the coastal scrub general community into two specific community types: California sagebrush scrub (32.010.00) and California sagebrush-black sage scrub (32.120.00). California sagebrush scrub is a category of coastal scrub with California sagebrush (*Artemisia californica*) the dominant species. California sagebrush-black sage scrub is a category of coastal scrub with California sagebrush and black sage (*Salvia mellifera*) both being dominant species (Jones and Stokes 2002a).

Poison-Oak Scrub (37.000.00)

Poison-oak scrub is a scrub community dominated by poison oak (*Toxicodendron diversilobum*) and occurs in only two locations at Site 300. BioSystems neither classified this habitat type nor is it currently included in the CNDDB classification (Jones and Stokes 2002a).

Native Grassland (41.000.00)

Native grassland is a community dominated by native grasses, primarily one-sided bluegrass (*Poa secunda*) and needlegrass (*Nassella pulchra* and *N. cernua*). This community type is equivalent to BioSystems' Cismontane Native Grassland habitat type. Because many areas of native grassland are managed by controlled burns, the 2002 survey team was unable to assign more specific categories within this general community type (Jones and Stokes 2002a).

The native grass-dominated communities on Site 300 represent a unique resource. The plant species composition of this community type suggests two patterns of variation that may illuminate the structure of pristine California grasslands: (1) most investigators such as Heady (1977) and Barry (1972) agree with Clements (1920) that *Nassella* (*Stipa) pulchra* should dominate native grassland communities, as it often does on very sandy soils (Hull and Muller 1977); however, as discussed by Bartolome and Gemmil (1981), this conclusion may not be accurate. Dominance by *Poa secunda (P. scabrella)* of Site 300 native grasslands specifically contradicts the notion that *Stipa* would dominate California grasslands in the absence of grazing and introduced annuals; and (2) the role of native forbs in native grassland communities has not received much study (Heady 1977). Data from Site 300 suggest that both native annual and perennial forbs can assume an important role under the conditions of frequent burning and no grazing and thus may once have been important dominants or codominants of California grassland communities (BioSystems 1986a).

Stands of native grasslands on Site 300 cover approximately 723 acres and are confined mainly to the northern half of the site (Figure E.1.1.2–1) (BioSystems 1986a). Occurrence of native grass-dominated vegetation correlates with annual prescribed burning.

California Annual Grassland (42.040.00)

California annual grassland is a community dominated by annual grasses that were introduced from Mediterranean Europe during the Spanish colonial era. BioSystems mapped two habitat types corresponding to this map unit, xeric cismontane annual grassland and mesic cismontane annual grassland. The 2002 survey team did not attempt to differentiate xeric and mesic grassland map units because of the drought conditions and because many of these areas had been burned (Jones and Stokes 2002a).

California annual grassland is the largest community type at Site 300, covering approximately 5,647 acres. The most important species are *Avena barbata*, *Bromus diandrus*, *B. hordeaceus (B. mollis)*, and *B. madritensis rubens* (BioSystems 1986a).

Northern Vernal Pool (44.100.00)

Vernal pools at Site 300 are not typical and do not correspond to any of the vernal pool categories in the CNDDB classification. Therefore, they were assigned to the general category of northern vernal pool. Unlike typical vernal pools containing species endemic to vernal pool habitat, the three vernal pools at Site 300 have vegetation composed mostly of wetland generalists that are often found in, but not restricted to, vernal pools. Species observed included stipitate-popcorn flower (*Plagiobothrys stipitatus*), annual hair grass (*Deschampsia danthonioides*), cleistogamous spike-primrose (*Epilobium cleistogamum*), and creeping spikerush (*Eleocharis macrostachya*) (Jones and Stokes 2002a, 2002c).

Freshwater Seep (45.700.00)

Vegetation in the Site 300 freshwater seeps is generally dominated by herbaceous perennial hydrophytes, although riparian scrub is also associated with seeps at several locations. Where perennial soil moisture is present, the dominant species is usually narrow-leaved cattail (*T. angustifolia)*, although broad-leaved cattail (*T. latifolia*) is also present. Other common species in the seeps include creeping wild rye (*Leymus triticoides*), hoary nettle (*Urtica dioica*), saltgrass (*Distichlis spicata)*, Baltic rush (*Juncus balticus*), white hedgenettle (*Stachys albens*), and annual rabbit's-foot grass (*Polypogon monspeliensis*). Woody vegetation is associated with freshwater seeps in some areas. Mulefat (*Baccharis salicifolius*) is present at scattered locations in seeps that occur along the bottoms of drainages (Jones and Stokes 2002c). Freshwater seep corresponds to BioSystems' seeps and springs habitat type (Jones and Stokes 2002a).

Cattail Wetland (52.130.00)

The BioSystems report included cattail wetland in the seeps and springs habitat type. This community is dominated by cattails (*Typha latifolia* and *T. angustifolia*) (Jones and Stokes 2002a).

Seasonal Pond

Seasonal pond designates areas that are seasonally inundated, but that do not have native wetland or vernal pool vegetation. The vegetation is sparse and consists of weedy wetland or ruderal species. Seasonal pond does not have a corresponding CNDDB classification, and the BioSystems report did not identify this habitat (Jones and Stokes 2002a).

Mexican Elderberry Scrub (63.410.00)

Mexican elderberry scrub is a general category of scrub dominated by Mexican elderberry (*Sambucus mexicanus*). The BioSystems report mapped this area as northern riparian woodland at Site 300. This vegetation unit does not correspond closely to any of the CNDDB community types (Jones and Stokes 2002a).

Mulefat Scrub (63.510.00)

Sections of stream channel dominated by mulefat (*Baccharis salicifolius*) were classified as mulefat scrub. The BioSystems report included this vegetation unit with seeps and springs (Jones and Stokes 2002a).

Great Valley Willow Scrub (63.140.00)

Sections of stream channel along Elk Ravine dominated by willows (*Salix* species) were classified as Great Valley willow scrub. This community is an open to dense shrubby streamside thicket dominated by willows, occurring along the major rivers and tributaries throughout the Great Valley watershed. The BioSystems report did not include this habitat type (Jones and Stokes 2002a).

Blue Oak/Grass Woodland (71.020.05)

Blue oak/grass woodland corresponds, in part, to the blue oak woodland of the BioSystems report. The dominant species is blue oak (*Quercus douglasii*), with an understory dominated by annual grasses (Jones and Stokes 2002a).

Valley Oak Forests and Woodlands (71.040.00)

Valley oak forests and woodlands are dense to open tree-dominated communities in which valley oak (*Quercus lobata*) is a dominant species. Fremont cottonwood and willows are also present in the woody overstory in this map unit at Site 300. The BioSystems report discussed, but did not map, valley oaks at Site 300 (Jones and Stokes 2002a).

California Juniper Woodland and Scrub (89.100.00)

California juniper woodland and scrub is an open woody plant community dominated by California juniper (*Juniperus californicus*) with a shrubby understory of coastal scrub species. The BioSystems report did not differentiate this habitat type from coastal sage scrub (Jones and Stokes 2002a).

Juniper-Oak Cismontane Woodland (89.100.01)

Juniper-oak cismontane woodland is an open woody plant community dominated by California juniper and blue oak. The BioSystems report did not differentiate this habitat type from blue oak woodland (Jones and Stokes 2002a).

Disturbed

Areas that are paved, occupied by buildings, or otherwise cleared of vegetation were classified as Disturbed. Disturbed areas do not have a corresponding CNDDB classification. In the BioSystems report, this habitat type was only mapped for developed site facilities and was not applied to other areas, such as fire breaks (Jones and Stokes 2002a).

Urban Habitat

Areas landscaped with ornamental trees and shrubs were classified as urban habitat. Urban habitat does not have a corresponding CNDDB classification. In the BioSystems report, this habitat type was not differentiated from disturbed areas (Jones and Stokes 2002a).

E.1.1.3 *Impacts of Current Operations*

Disturbances to vegetation on Site 300 from current operations are much less than the impacts of land use practices on private lands nearby, where upland and riparian plant communities have been altered by grazing and other agricultural activities. Impacts at Site 300, however, do include the direct loss of vegetation by construction of facilities such as testing sites, firing tables, closed landfills, wastewater facilities, maintenance buildings, security facilities, fences, and roads. These disturbed areas, totaling less than 5 percent of total site acreage, are almost devoid of vegetation. Facilities in the southern half of the site have disturbed mostly introduced grassland plant communities. The generally small facilities in the northern half of the site have not significantly disturbed large areas of land even when adjacent to native grassland habitats.

Other operational practices on Site 300 include the exclusion of grazing and other agricultural practices; construction and maintenance of fire roads and breaks; vegetation management using prescribed burning, herbicides, and disking for fire control; weed control along roads, power poles, and security fence perimeters; and minor construction in or adjacent to existing facilities (BioSystems 1986a, Jones and Stokes 2001).

Lack of Livestock Grazing

Baseline comparisons of the flora on Site 300 with that of neighboring, grazed parcels show a greater complement of native grasses and herbs on Site 300, because no livestock grazing has been permitted since 1953. Slopes and substrates show less instability and erosion, probably the result of a more stable plant cover and the retention of soil-binding native plant species (BioSystems 1986a).

Disking and Applying Herbicides to Contain Fires

Most of the property has not been disked or dry-farmed since it was acquired. The limited disking for fire control has had a minor impact on the overall vegetation of Site 300. Infrequently, a narrow swath of land is disked along the northern, and part of the northeastern and eastern boundaries of the site. This perimeter disking, when done, is performed in May, providing added protection during prescribed burning against the possible escape of fire to offsite properties. The disked areas favor establishment and maintenance of introduced grasses and moderate cover of tarweeds (*Holocarpha obconica*, *Hemizonia kelloggii*, *H. lobbii*) (BioSystems 1986a). Although disking remains an option, depending on seasonal conditions, prescribed burning is preferred for wildfire control (LLNL 2003ah). For general weed and fire control, herbicides such as Krovar®, Oust®, and Roundup Pro® are applied in the fall and winter to the road shoulders, around buildings, and around power poles in the firing areas. In the General Services Area (GSA) and around landscaped areas, road shoulders, and power poles, herbicides such as Roundup Pro®, Ronstar®, and Pendulum®, are applied in the fall and winter months, avoiding areas where sensitive plant species exist. Environmental Restoration Division (ERD) test wells are sprayed whenever necessary with Roundup Pro® (LLNL 2003ah). Herbicides have favored the introduction and maintenance of ruderal type vegetation in these areas (Frenkel 1970).

Prescribed Burn

Prescribed burning is conducted annually as a means of wildfire control. Site 300 began a burning program in the northeastern half of the site in the 1950s and has continued the program annually since 1960. The prescribed burn area includes approximately 2,000 acres, which is divided into 24 plots. Burning typically begins at the end of May and lasts several weeks, though this schedule depends on the length of the growing season and amount of rainfall (LLNL 1992a, 2003).

Fire limits the development of coastal sage scrub vegetation in burn areas on Site 300 to rocky sites and influences the composition and distribution of native grasslands. Restriction of coastal sage scrub to rocky sites is associated with reduced dry grass fuel levels and increased patchiness of all fuels. Although vegetation in rocky areas is subject to local fires, the rocks offer some protection and the vegetation may not be burned in every fire. Shrubs that would otherwise be eliminated then increase in importance. Native grassland communities on Site 300 occur almost exclusively in areas with annual prescribed burning (BioSystems 1986a).

Dyer (2002) notes that prescribed burns can play an important role in establishing and restoring native grassland communities in California. Barry (1972) indicated that frequent fire is required to establish and maintain grasslands dominated by native grasses in lowland California. This conclusion is borne out by grassland vegetation found at Site 300. Figure E.1.1.3–1 shows the distribution of native grassland vegetation in relation to the limits of prescribed fires in 1986, with a high correspondence between them. Not all plant communities within the perimeter of annual prescribed fire on Site 300 are native grass-dominated, but the lack of introduced grasses on some habitats strongly correlates with the pattern and frequency of fires (BioSystems 1986a). A comprehensive inventory of native grasslands has not been conducted for California. Notably, Barry (1972) did not mention the presence of native grasslands in the vicinity of Site 300. An estimated 723 acres of native grassland communities occur on Site 300. Using the evaluation criteria established by Barry (1972), Site 300 could be judged one of the largest native grasslands of this kind currently known in California.

Lawrence Livermore National Laboratory (LLNL) biologists have been investigating the effect of prescribed burns on the distribution of *Amsinckia grandiflora* and *Blepharizonia plumosa*, while also developing techniques to restore native perennial grasslands. Birds may be responsible for high levels of granivory in burned, open plots of *Amsinckia grandiflora.* Fire germination experiments suggest that fire may stimulate germination of *Blepharizonia plumosa* ray seeds and older seeds, but inhibit germination of recent-year disc seeds. One of the goals of ongoing research is to demonstrate that burn frequency affects the spread of *P. secunda* (LLNL 2002dj).

The diamond-petaled poppy (*Eschscholzia rhombipetala)*, a plant thought to be extinct until rediscovered in 1993 and thus on the California Native Plant Society (CNPS) 1A List, is present at two locations at Site 300. A small population consisting of 10 individual plants was identified in 1997 in the southwest corner of the site, and a second larger population of 300 individuals was identified in 2002 in the central western part of Site 300. Both populations are not in locations where they are being adversely affected by site operations. The diamond-petaled poppy is not listed by the U.S. Fish and Wildlife Service (USFWS) or CDFG. However, USFWS has designated the diamond-petaled poppy as a target for long-term conservation, and its extreme rarity suggests that it should be considered for listing as endangered (Jones and Stokes 2002a). LLNL biologists have been monitoring the status of these populations and evaluating proposed activity impacts for potential impacts to this species. The latest population studies are provided in *Rare Plant Restoration and Monitoring at Lawrence Livermore National Laboratory Site 300 Project Progress Report, Fiscal Year 2000, October 1999–September 2000* (LLNL 2002dj) and *Population Characteristics of Eschscholzia Rhombipetala, Lawrence Livermore National Laboratory, Livermore, CA* (LLNL 2003ap).

The big tarplant (*Blepharizonia plumosa)*, listed on the CNPS Rare Plant 1B List, is widespread and common at Site 300. This was observed at 26 localities on Site 300 in 1997, with the largest stand occupying more than 84 acres. The number of individual big tarplants present at Site 300 in 1997 was estimated to be 145,468. The big tarplant was observed at a number of locations at Site 300 in 1997, with most found in the northern half of the site. The abundance of big tarplant on Site 300 and its common occurrence in disturbed places suggest that site management practices have not adversely affected the populations at Site 300. The controlled burning does not appear to have an adverse long-term effect on the populations, as high plant densities were observed in 1997 in areas that are burned annually (Jones and Stokes 2002a). LLNL biologists have conducted an extended monitoring program to monitor the status of the big tarplant at Site 300 and evaluate the impact of prescribed burns and other disturbances on the ecology of this species.

The round-leaved filaree (*Erodium macrophyllum)*, listed on the CNPS Rare Plant 2 List, was identified at one location at Site 300. Round-leaved filaree is not listed by USFWS or CDFG. List 2 species also meet the definition of rare or endangered species under Section 15380(d) of CNPS the CEQA guidelines, but they are more common outside of California. The Site 300 population of round-leaved filaree is located in the central western portion of Site 300, approximately 525 feet northeast of the larger diamond-petaled poppy population. The population consists of about 200 individuals in an area of about 3.5 acres. All but two of the plants were observed in fire trails (Jones and Stokes 2002a).

The presence of round-leaved filaree primarily in the fire trails suggests that this disturbance has provided a benefit to the population at Site 300. The nature of this benefit is not clear, but it could range from uncovering buried, dormant seeds to providing a microsite free from competing nonnative grasses (Jones and Stokes 2002a). The round-leaved filaree was included in the 2002 - 2003 rare plant monitoring program to obtain more information on its ecological requirements.

The gypsum-loving larkspur (*Delphinium gypsophilum* ssp. *gypsophilum*), listed on the CNPS Rare Plant 4 List, occurs at six locations with most being on upper slopes in perennial grassland at Site 300. Gypsum-loving larkspur is not listed by USFWS or CDFG. It was placed on List 4 by the CNPS. List 4 species are not considered to be rare or endangered but are uncommon enough to warrant monitoring. However, local public ordinances or resource agencies may define List 4 species as important biological resources, setting a threshold of significance that encompasses impacts on these species. It does not appear that the gypsum-loving larkspur would be adversely affected if fire roads are maintained in their present positions through the existing population(s) and if no new fire roads were constructed through them (Jones and Stokes 2002a).

The California androsace, or California rock jasmine (*Androsace elongata* ssp. *acuta*), a CNPS Rare Plant 4 List species, is widespread and common at Site 300. California androsace is not listed by USFWS or CDFG. The occurrences of California androsace on Site 300 appear to have been relatively unaffected by construction of Site 300 facilities and fire trails, because this species occurs on rock outcrops and relatively steep slopes. Burns are not likely to have a substantial adverse effect on the occurrences, because the plants bloom and set seed in early spring before most fires occur, and because the low vegetation cover where the plants occur would support only a low-intensity fire that would be unlikely to destroy the seed bank (Jones and Stokes 2002a).

Stinkbells (*Fritillaria agrestis*), a CNPS Rare Plant 4 List species, are found at several locations at Site 300. This species is not listed by USFWS or CDFG. The stinkbells occurrences at Site 300 are in a remote location that has not been affected by construction of Site 300 facilities. A fire trail cuts through the habitat and may have removed a portion of the largest stand. The stands are outside of the area that receives regular burns. However, burns would not likely have a substantial adverse effect on the occurrences because the plants bloom and set seed in early spring, before most fires occur, and because the lower vegetation cover where the plants occur would support only a low-intensity fire that would be unlikely to destroy the seed bank (Jones and Stokes 2002a).

The hogwallow starfish (*Hesperevax caulescens)*, a CNPS Rare Plant 4 List species, is found at one location west of Building 851 at Site 300. The location of Building 851 and other structures at Site 300 discussed in Appendix E are shown on maps in Appendix A of this LLNL SW/SPEIS. This species is not listed by USFWS or CDFG. The hogwallow starfish occurrence at Site 300 is at a remote location that does not appear to have been affected by construction of Site 300 facilities. A fire trail cuts through the habitat and is likely to have removed portion of the population. Burns are not likely to have a substantial adverse effect on the occurrence because the plants bloom and set seed in early spring, before most fires occur, and because the low vegetation cover where the plants occur would support only a low-intensity fire that would be unlikely to destroy the seed bank (Jones and Stokes 2002a).

With more attention being focused on the control of invasive plant species, research is evaluating the effect of prescribed burns in managing certain invasive plants. A series of prescribed burns, when annual grasses are dry but before *Centaurea solstitialis* (yellow starthistle) flowers open, have been used to prevent yellow starthistle seed production elsewhere in the Coast Range annual grasslands of California. Fire was used to burn the dry annual grass vegetation and seeds, and it scorched the yellow starthistle flowers enough to prevent seed development. After the third annual burn, perennial grass (purple needlegrass) was increased three-fold, when compared to unburned sites, and yellow starthistle was reduced 96 percent (Lass et al. 1999). This research suggests that annual burns at Site 300 could help reduce spread of certain invasive species on the property.

E.1.2 Fauna

A number of baseline faunal studies for the Livermore Site and Site 300 in 1986, 1991, 2001 and 2002 were prepared (BioSystems 1986a, DOE 1982a, ESA 1990, LLNL 1992a, UC 1987). These surveys assessed the status of threatened or endangered wildlife species, as well as the presence of other amphibians, reptiles, and mammals without special status species. Additional information on special status species may be found in the biological assessment (Section E.2). Many species of breeding birds were noted in the 1991 surveys because most of the fieldwork occurred during the nesting season. Observation of additional migrant and wintering species would be expected if surveys occurred during other seasons.

In 2002, specific surveys were conducted to determine the current status at Site 300 of the California linderiella fairy shrimp, the valley elderberry longhorn beetle, amphibians, reptiles, small mammals, mesocarnivores, bats, breeding raptors, and tricolored blackbirds (Arnold 2002, Bloom 2002, Condor Country Consulting 2002, CSUS 2003, Jones and Stokes 2002b, LLNL 2002di, LLNL 2003ab, LLNL 2003by, Swaim 2002a, Swaim 2002b).

E.1.2.1 *Methods*

Species of wildlife observed during fieldwork were recorded when possible. In addition, during threatened and endangered surveys, sensitive species surveys, and wetlands surveys, notes were kept on species of amphibians, reptiles, birds, and mammals observed. Notes on all wildlife species observed were also kept during night spotlighting, scent station maintenance, and small mammal trapping. More specific information on the field methodologies used is provided in the individual survey reports (Arnold 2002, Bloom 2002, Condor Country Consulting 2002, Jones and Stokes 2001, Jones and Stokes 2002b, LLNL 2002di, LLNL 2003ab, LLNL 2003by).

E.1.2.2 *Results*

Branchiopods

The California linderiella fairy shrimp (*Linderiella occidentalis*), a Federal species of concern, occurs at Site 300. During a 2001–2002 wet season survey, this branchiopod species was found in a vernal pool (FS-04) in the northwest part of the site. Another branchiopod, the California clam shrimp (*Cyzicus californicus*), which is not on Federal or California special status species lists, was also found in this vernal pool (Condor Country Consulting 2002).

Insects

The recent valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) survey at Site 300 is the only insect investigation that has been performed at LLNL (Arnold 2002). The results of this survey are provided in Section E.2.

Amphibians and Reptiles

Four amphibian and three reptile species were recorded at the Livermore Site in 2001 including the California red-legged frog (*Rana aurora draytonii*), western toad (*Bufo boreas*), Pacific treefrog (*Hyla regilla*), bullfrog (*Rana catesbeiana*), western fence lizard (*Sceloporus graciosus*), western yellow-bellied racer (*Coluber constrictor mormon*), and gopher snake (*Pituophis melanoleucus*). The California red-legged frog has been observed in the Arroyo Las Positas, western perimeter drainage ditch, and the Drainage Retention Basin (DRB). The bullfrog was reported in the DRB (LLNL 1992a, LLNL 2002bz).

Five amphibian and 19 reptiles species, including 3 subspecies of the whipsnake, were observed at Site 300 in 1986 (BioSystems 1986c), 1991, and 2002 (Swaim 2002a) (Table E.1.2.2–1). Ponds occur along the perimeter of Site 300, and some of the onsite drainages contain aquatic vegetation supported by underground springs and seeps. Two species of salamanders were observed at Site 300: the California slender salamander (*Batrachoseps attenuatus*) and the California tiger salamander (*Ambystoma californiense*) (BioSystems 1986c). However, the California slender salamander was not observed in the 2002 survey (LLNL 2003ab). The western toad (*Bufo boreas*), Pacific treefrog (*Hyla regilla*), red-legged frog (*Rana aurora draytonii*), and western spade foot toad (*Spea hammondii*) are species known to occur onsite (LLNL 2003ab).

Conditions are far more favorable for reptiles than amphibians at Site 300. Grassland provides ideal habitat for racers (*Coluber constrictor*) and gopher snakes (*Pituophis melanoleucus*). Rock sites provide suitable habitat for such species as the western fence lizard (*Sceloporus occidentalis*), western skink (*Eumeces skiltonianus*), common kingsnake (*Lampropeltis getulus*), and the western rattlesnake (*Crotalus viridis*). The western rattlesnake species has been observed to be widespread and abundant in all habitats on Site 300. Seeps and springs provide excellent habitat for the northern alligator lizard (*Gerrhonotus coeruleus*). Side-blotched lizards (*Uta stansburiana*) and California horned lizards (*Phrynosoma coronatum frontale*), more commonly found in southern California, frequent areas with more open vegetation and sandy oils. The CDFG Ecological Preserve, along the Corral Hollow drainage adjacent to Site 300 includes the glossy snake (*Arizona elegans*), long-nosed snake (*Rhinocheilus lecontei*), and San Joaquin whipsnake (*Masticophis flagellum ruddocki*).

The California red-legged frog, a federally listed threatened species and state species of special concern, was recorded at Site 300 in 1991. In a 2001 survey, the California red-legged frog and California tiger salamander (a federally listed proposed threatened species) were found at a number of breeding and nonbreeding locations at Site 300 (Jones and Stokes 2001). Details regarding the results of the 2001 survey for these species are provided in Section E.2. The western spadefoot toad is a Federal species of concern and State species of special concern. During wet years, this amphibian has been observed at Song Pond and the Overflow Pond located in the GSA of Site 300 (LLNL 2003ab). A State species of special concern, the California horned lizard, was observed in 1991 and occurs site-wide in sandy soil (LLNL 1992a). The San Joaquin whipsnake (*Masticophis flagellum ruddocki*), silvery legless lizard (*Anniella pulchra pulchra*), and California black-headed snake (*Tantilla planiceps*) were observed at Site 300 during a special status reptile survey in 2002 (Swaim 2002a). The silvery legless lizard and San Joaquin whipsnake are Federal species of concern and State species of special concern.

Birds

In 1991, 75 species of birds were observed at the study sites; this includes 70 species observed at Site 300, and 31 species at the Livermore Site (Table E.1.2.2–2). These species were recorded in 1986 during springtime surveys for threatened and endangered species (BioSystems 1986a, BioSystems 1991, LLNL 1992a). In 2002, an intensive avian survey and related supporting documentation identified the presence of 90 bird species at Site 300 (LLNL 2003by). Table E.1.2.2–2 shows 120 bird species at Site 300 based on identifications provided from the 1986, 1991, and 2002 surveys (BioSystems 1986c, LLNL 1992a, LLNL 2003by). In 2001, 52 bird species were observed during spring and fall surveys at the Livermore Site (LLNL 2003bz).

Site 300, with its interspersion of several different habitats and its abundance of seeds and insects, supports a variety of birds. The western meadowlark (*Sturnella neglecta*), horned larks (*Eremophila alpestris*), and savannah sparrow (*Passerculus sandwichensis*) were the most common small birds seen throughout the open grassland areas. Vegetation at springs and seeps provides nesting habitat for red-winged blackbirds (*Agelaius phoeniceus*) and tricolored blackbirds (*A. tricolor*). These water sources attract a greater number of birds than normally found in the adjacent grasslands. For example, the mourning dove (*Zenaida macroura*), cliff and barn swallow (*Hirundo pyrrhonota* and *H. rustica*), and California quail (*Callipepla californica*) all require water daily.

The number of tricolored blackbirds can vary greatly among survey years. For example, tricolored blackbirds were observed onsite in 1986 but not in 1991 (LLNL 1992a). However, 835 nests were found in Elk Ravine over 3-day surveys in August and September 2002. Nest location analysis determined that 91.7 percent of nests were located in stinging nettle (*Urtica dioca*), 6.8 percent in cattail (*Typha latifolia*), 1 percent in Russian thistle (*Salsola tragus*), and 0.5 percent in horehound (*Marrubium vulgare*) (LLNL 2002di).

TABLE E.1.2.2–2.—*Bird Species Observed at the Livermore Site and Site 300 in 1986, 2001, and 2002 Surveys (continued)*

Species		Study Site	
Scientific Name	**Common Name**	**Site 300**	**Livermore Site**
Passer domesticus[b]	House sparrow	X	X
Psaltriparus minimus[a]	Bushtit	X	X
Bombycilla garrulus[a]	Cedar waxwing	X	X
Phalaenoptilus nuttallii[a]	Common poorwill	X	
Baeolphus inornatus[a]	Oak titmouse	X	
Meleagris gallopavo[a]	Wild turkey	X	
Phainopepla nitens	Phainopepla	X	
Ceryle alcyon	Belted kingfisher		X
Regulus calendula	Ruby-crowned kinglet	X	X

Sources: BioSystems 1986a; LLNL 2003by, LLNL 2003bz.
[a] Not recorded in 2002 survey at Site 300 or found in related documentation.
[b] New record in 2002 survey or related documentation.
[c] The burrowing owl was observed at the Livermore Site from 1994 through 1998 (LLNL 2003ai).
[d] The willow flycatcher was observed at Site 300 in 2003 (LLNL 2003cc).

Oak woodlands and a few cottonwoods provide nesting habitat for the western kingbird (*Tyrannus verticalis*), northern oriole (*Icterus galbula*), loggerhead shrike (*Lanius ludovicianus*), and American goldfinch (*Carduelis tristis*). Coastal sage scrub supports the scrub jay (*Aphelocoma coerulescens*), California thrasher (*Toxostoma redivivum*), Bell's sage sparrow (*Amphispiza belli*), Anna's hummingbird (*Calypte anna*), rufous-crowned sparrow (*Aimophila ruficeps*), and white-crowned sparrow (*Zonotrichia leucophrys*). Ecotones of sage scrub and grassland provide ideal habitat for the mourning dove, California quail, lazuli bunting (*Passerino amoena*), and lark sparrow (*Chondestes grammacus*). Rocky outcrops and cliffs provide breeding sites for white-throated swift (*Aeronautes saxatalis*), cliff swallow, Say's phoebe (*Sayornis saya*), and rock wren (*Salpinctes obsoletus*).

Site 300 also supports a population of nesting raptors. A breeding raptor survey, conducted at Site 300 in April and July 2002, identified four species of diurnal raptors and four species of owls. The raptors included the turkey vulture (*Cathartes aura*), red-tailed hawk (*Buteo jamaicensis*), golden eagle (*Aquila chrysaetos*), and American kestrel (*Falco sparverius*), the most frequently observed raptor on Site 300. Owls observed included the barn owl (*Tyto alba*), western screech owl (*Otus kennicottii*), great horned owl (*Bubo virginianus*), and western burrowing owl (*Athene cunicularia*). The survey detected the presence of four active red-tailed hawk, four great horned owl, and three burrowing owl nests, although LLNL biologists have observed as many as 18 nesting pairs of burrowing owls in previous years. One inactive barn owl nest was found on the exterior of the Advanced Test Accelerator (ATA) Building. Also, numerous recently fledged American kestrels and one young western screech owl were observed. Blue oaks and conglomerate cliffs were the most frequently used nest structures. The numbers of breeding pairs and diversity of these birds of prey were relatively low compared to those identified on other large land units in the State of California. A pair of turkey vultures was observed, although no nest was found (Bloom 2002). Although no golden eagle or white-tailed kite nests were found, both species have occasionally nested onsite in the past. The golden eagle nested at Site 300 in 1996, and the white-tailed kite (*Elanus leucurus*) nested in a valley oak at Site 300 in 1997 and 1998 (LLNL 1997o, Bloom 2002). In addition to these species, the northern harrier (*Circus cyaneus*), and prairie falcon (*Falco mexicanus*) were identified in 1986 and 1991 surveys (BioSystems 1986c, LLNL 1992a). Ferruginous hawks, pergrine falcons, broad-winged hawks, osprey, and Swainson's hawk have also been detected at Site 300 during season surveys. Breeding pairs are not anticipated to occur on the property.

A relatively large population of loggerhead shrikes (*Lanius ludovicianus*) was present at Site 300 in 2002. A total of 18 pairs of loggerhead shrike were identified during the 2002 surveys with 9 of the 18 pairs actively nesting. Six of the nests were in junipers and three were in oaks (Bloom 2002). Figure E.1.2.2–1 shows the nest locations of loggerhead shrike in 2002.

Bird species nesting at the Livermore Site include those recorded in the building areas, the security zone, and Arroyo Seco. Species nesting in the built-up area are those typical of suburban areas, including the killdeer (*Charadrius vociferus*), rock dove (*Columbia livia*), scrub jay, American crow (*Corvus brachyrhynchos*), American robin (*Turdus migratorius*), European starling (*Sturnus vulgaris*), house finch (*Carpodacus mexicanus*), and house sparrow (*Passer domesticus*). Species observed in the grass-dominated security zones include the western kingbird (*Tyrannus verticalis*), horned lark, and western meadowlark (LLNL 1992a).

Raptors observed at the Livermore Site include the turkey vulture (*Cathartes aura*), red-tailed hawk, Cooper's hawk (*Accipter cooperii*), barn owl, golden eagle, osprey, and white-tailed kite (LLNL 1992a, LLNL 2003bz). Numerous pairs of white-tailed kites (*Elanus lecurus*), a state-protected raptor, have successfully nested and fledged young at the Livermore Site since 1994. During 1999, three pairs of white-tailed kites *(Elanus lecurus)* successfully fledged 18 young. The kites were marked with aluminum leg bands to initiate long-term studies of the species in a semiurban edge habitat (LLNL 2001v).

Twenty-four species of birds at Site 300 are either Federal species of concern or State species of special concern. The Swainson's hawk (*Buteo swainsoni*) is listed as threatened by the CDFG. This hawk was observed in 1994 on the southeastern perimeter of Site 300 and on the adjacent CDFG Ecological Reserve. The Swainson's hawk nests within riparian habitats and is often associated with alfalfa crops and other forms of agriculture. This species was observed within close proximity to Site 300, but may forage occasionally within the site boundaries (LLNL 2003by).

The ferruginous hawk (*Buteo regalis)* is a Federal species of concern and State species of special concern. Ferruginous hawks are relatively common in the winter at Site 300, routinely observed in association with open grassland habitats (LLNL 2003by).

The Cooper's hawk (*Accipiter cooperii)* is a State of California species of special concern. This hawk has been observed associated with cottonwood or willow trees at the Elk Ravine Constant Effort Banding Station and along Corral Hollow Road (LLNL 2003by).

The sharp-shinned hawk (*Accipiter striatus*) is a State species of special concern. This species was detected during the 2002 avian monitoring program at Site 300 (LLNL 2003by).

The golden eagle (*Aquila chrysaetos*) is a State species of special concern. The golden eagle is found at Site 300 and is known to have nested within the site boundaries and dependably nests within close proximity to Site 300 along Corral Hollow Road. This eagle has often been observed foraging on California ground squirrels (*Spermophilus beecheii*) at Site 300.

The northern harrier (*Circus cyaneus)* is a State species of special concern. The northern harrier is relatively common in the winter at Site 300, routinely observed in association with open grassland habitats. Breeding has been documented at Site 300 (LLNL 2003by).

The osprey (*Pandion haliaetus)* is a State species of special concern. A single sub-adult Osprey was observed flying over Corral Hollow in 2000, likely a dispersing juvenile or early migrant (LLNL 2003by).

The white-tailed kite (*Elanus leucurus)* is a State of California fully protected species. The white-tailed kite was not observed in 2002, but is known to breed occasionally at Site 300. This species has been declining noticeably within the Tri-valley region for the past 3 years and also in southern California where long-term monitoring of this species has occurred (LLNL 2003by).

The horned lark (*Eremophila alpestris)* is a State species of special concern. This species is very common at Site 300 and has been detected at many of the variable circular plot point count stations in 2002. No horned larks were banded, implying that this species probably spends little time within riparian habitats at Site 300 (LLNL 2003by).

The grasshopper sparrow (*Ammodramus savannarum)* is a Federal species of concern. This species was observed in localized groups within the northern third of Site 300 (LLNL 2003by).

Bell's sage sparrow (*Amphispiza belli)* is a Federal species of concern. Bell's sage sparrow was only detected west of Building 854 in coastal sage scrub habitat. This species is likely to only be found within the sage scrub community and is a likely breeder for Site 300 (LLNL 2003by).

The prairie falcon (*Falco mexicanus)* is a State species of special concern. A single prairie falcon was observed at the northeast corner of Site 300 in 2000 (LLNL 2003by).

The tricolored blackbird (*Agelaius tricolor)* is a Federal species of concern and State species of special concern. A regionally important breeding colony of tricolored blackbirds is located in Elk Ravine, near Building 812. This species has also been observed foraging within the grasslands of Site 300 in the nonbreeding season. A total of 835 nests were located in 2002 within Elk Ravine (LLNL 2003by).

The loggerhead shrike (*Lanius ludovicianus)* is a Federal species of concern and State species of special concern. This species is common at Site 300 in both the breeding and nonbreeding season. This species is likely distributed in nearly all habitats, including urban areas of Site 300 (LLNL 2003by, Bloom 2002).

The California thrasher (*Toxostoma redivivum)* is a Federal species of concern. Nesting has been observed in coastal sage scrub habitat near Building 858 and observed in coastal sage scrub habitat east of Building 854 (LLNL 2003by).

The oak titmouse (*Baeolphus inornatus*) is a Federal species of concern. Nesting has only been observed in an oak snag in the southwest corner of Site 300, characteristic of its close association with oak habitat (LLNL 2003by).

The yellow warbler (*Dendroica petechia)* is a State species of special concern. It was banded at an Elk Ravine Constant Effort Mist Netting Station and only observed at that location, which is associated with a riparian habitat (LLNL 2003by).

Almost all of the bird species listed in Table E.1.2.2–2 also receive protection under the *Migratory Bird Treaty Act* (16 *United States Code* [U.S.C.] §703 et seq.). This law governs the taking, killing, possessing, transporting, and importation of migratory birds, their eggs, parts and nests. Executive Order 13186, Responsibilities of Federal agencies to Protect Migratory Birds, issued on January 10, 2001, provides additional guidance on the responsibilities of Federal agencies to protect migratory birds on property under their jurisdiction.

Mammals

Twenty-six species of mammals were recorded during threatened and endangered species surveys in 1986 and 1991 (BioSystems 1986c, LLNL 1992a). Additional surveys have been conducted at Site 300 during which four additional species were observed (Jones and Stokes 2002b, CSUS 2003, LLNL 2003bh) and at the Livermore Site (LLNL 2003bz). All the species were seen at Site 300, and 12 species were observed at the Livermore Site (Table E.1.2.2–3). The investigation included conducting ground surveys in open areas, night spotlighting, establishing scent stations, and trapping small mammals.

Productive and diverse grasslands on Site 300 support an abundance of rodents and lagomorphs (rabbits and hares). Conditions are ideal for California ground squirrels (*Spermophilus beecheyi)* in the northern portion of Site 300 where the terrain is less rugged. Other common rodents include the house mouse (*Mus musculus*), deer mouse (*Peromyscus maniculatus*), Heermann’s kangaroo rat (*Dipodomys heermanni*), valley pocket gopher (*Thomomys bottae*), and, in the higher grass cover, the California vole (*Microtus californicus*) and western harvest mouse (*Reithrodontomys megalotis*). Lagomorphs such as black-tailed hares (*Lepus californicus*) and desert cottontails (*Sylvilagus audubonii*) are also widespread and abundant, with the latter tending to occupy areas with more cover (LLNL 1992a, Jones and Stokes 2002b).

TABLE E.1.2.2–3.—*Mammal Species Observed at the Livermore Site and Site 300 in 1986 and 2002 Surveys*

Species		Study Site	
Scientific Name	**Common Name**	**Site 300**	**Livermore Site**
Didelphis virginiana	Virginia opossum	X	X
Sylvilagus audubonii	Desert cottontail	X	X
Lepus californicus	Black-tailed hare	X	X
Spermophilus beecheyi	California ground squirrel	X	X
Thomomys bottae	Valley pocket gopher	X	
Perognathus californicus	California pocket mouse	X	
Perognathus inornatus	San Joaquin pocket mouse	x	
Dipodomys heermanni	Heermann's kangaroo rat	X	
Reithrodontomys megalolis	Western harvest mouse	X	
Peromyscus maniculatus	Deer mouse	X	
Neotoma lepida	Desert woodrat	X	
Microtus californicus	California vole	X	X
Mus musculus	House mouse	X	X
Sus scrofa	Feral swine	X	
Canis latrans	Coyote	X	X
Vulpes vulpes	Red fox	X	X
Urocyon cinereoargenteus	Gray fox	X	X
Procyon lotor	Raccoon	X	X
Mustela frenata	Long-tailed weasel	X	
Taxidea taxus	Badger	X	
Spilogale gracilis	Western spotted skunk	X	
Mephitis mephitis	Striped skunk	X	X
Felis concolor	Mountain lion	X	
Felis domesticus	Feral house cat	X	X
Lynx rufus	Bobcat	X	
Tadarida brasiliensis	Mexican free-tailed bat	X	
Antrozous pallidus	Pallid bat	X	
Myotis volans	Long-legged myotis	X	
Myotis yumanensis	Yuma myotis	X	
Odocoileus hemionus	Black tailed deer	X	

Sources: LLNL 1992a, LLNL 2003bh, CSUS 2003, Jones and Stokes 2002b.

Many mammalian predators are supported by the rich prey base. Grassland predators include the long-tailed weasel (*Mustela frenata*), western spotted skunk (*Spilogale gracilis*), striped skunk (*Mephitis mephitis*), coyote (*Canis latrans*), badger (*Taxidea taxus*), and bobcat (*Lynx rufus*). Red foxes (*Vulpes vulpes*), which have been reported from nearby areas to the east and north of the site, have greatly expanded their range in the Central Valley (BioSystems 1986c). They show a preference for more disturbed areas, often denning in roadside culverts, and were observed near

Site 300 in 1991. Sage scrub, wooded, and riparian habitats attract other mammalian predators not normally found in grasslands including bobcat, gray fox (*Urocyon cinereoargenteus*), raccoon (*Procyon lotor*), and mountain lion (*Felis concolor*). Although these habitats are preferred, they are relatively limited on Site 300; consequently, grassland areas are used as well. Only minor areas of riparian vegetation are associated with the seeps and springs that occur along the canyon bottoms. Black-tailed deer (*Odocoileus hemionus*) prefer these habitats, but are frequently seen in the open grasslands (LLNL 1992a).

A mesocarnivore survey was conducted from mid-September through mid-October 2002, involving eight spotlighting sessions. An average of 19.8 miles (range of 14 to 28 miles) was driven for each session. Table E.1.2.2–4 summarizes the spotlighting results for the following three mesocarnivores: badger (*Taxidea taxus*), bobcat (*Lynx rufus*), and coyote (*Canis latrans*). Other species observed included burrowing owl (*Athene cunicularia*), great-homed owl (*Bubo virginianus*), barn owl (*Tyto alba*), lesser nighthawk (*Chordeiles acutipennis*), western meadowlark (*Sturnella neglecta*), red-tailed hawk (*Buteo jamaicensis*), kangaroo rat (genus *Dipodomys*), deer mouse (*Peromyscus maniculatus*), black-tailed hare (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), western toad (*Bufo boreas*), California red-legged frog (*Rana aurora draytonii*), feral swine (*Sus scrofa*), and black-tailed deer (*Odocoileus hemionus*) (CSUS 2003).

Table E.1.2.2–4 also includes the results of a camera-monitored scent station survey at 30 locations, with observations made for 14 days at the first 10 locations and for 7 days at the other locations. The camera stations and spotlight sessions were effective in detecting the presence of mesocarnivores. Both methods detected the presence of bobcat, a rather difficult predator to observe. Orloff (BioSystems 1986c) detected gray foxes on Site 300, while no foxes were detected in the 2002 survey. Additionally, raccoon (*Procyon lotor*), long-tailed weasel (*Mustela frenata*), striped skunk (*Mephitis mephitis*), and western spotted skunk (*Spilogale gracilis*) were detected in 1986, but not in 2002 (BioSystems 1986c, CSUS 2003).

TABLE E.1.2.2–4.—*Species and Numbers of Individual Mammals Recorded During Night Spotlighting and Predator Scent-Baited Camera Stations at Site 300 in 2002*

Species	Spotlighting [a]	Camera Stations [b]
Badger	10	1
Black-tailed deer	—	7
Feral swine	—	2
Bobcat	1	1
Coyote	14	3
Hare	—	7

Source: CSUS 2003.
[a] Spotlighting conducted on the nights of September 16, 17, and 30 and October 1, 8, 9, 14, and 15, 2002.
[b] Predator Scent-Baited Camera Stations were operated at 30 locations.

A small mammal survey was conducted May 14 to May 19, June 20 to June 22, and July 30 to August 1, 2002. Trapping was performed in six major communities: coastal scrub, annual grassland, native grassland, riparian, oak savanna, and spring/seep wetland. Additionally, trapping was performed on native grassland and seep communities before and after annual prescribed burns.

A total of 210 small mammals, representing 9 species in 3 families, were captured during 2,689 trap nights at Site 300. Species captured included the valley pocket gopher (*Thomomys bottae*), California pocket mouse (*Perognathus californicus*), San Joaquin pocket mouse (*Perognathus inornatus*), Heermann's kangaroo rat (*Dipodomys heermanni*), western harvest mouse (*Reithrodontomys megalotus*), deer mouse (*Peromyscus maniculatus*), brush mouse (*Peromyscus boylii*), California vole (*Microtus californicus*), dusky-footed woodrat (*Neotoma fuscipes*), and house mouse (*Mus musculus*). No state or federally listed threatened or endangered species were observed during the 2002 small mammal survey. However, the San Joaquin pocket mouse is a Federal species of concern (Jones and Stokes 2002b).

Table E.1.2.2–5 summarizes the total number of individuals of each species captured at each survey site during each trapping period of the small mammal survey. The number of species captured in descending order at Site 300 communities was: riparian (7), coastal scrub and annual grassland (5), native grassland and seep/spring wetland (3), and oak savannah (2). The number of individual mammals captured by community in descending order was riparian (65), coastal scrub (63), annual grassland (28), seep/spring wetland (17) communities, oak savanna (5), and native grassland (4) (Jones and Stokes 2002b).

Surveys were conducted in 1991 at the Livermore Site and Site 300, for one federally listed endangered species, the San Joaquin kit fox (*Vulpes macrotis mutica*), and at Site 300 for two federally listed candidate species, the San Joaquin pocket mouse (*Perognathus inornatus*) and the riparian woodrat (*Neotoma fuscipes riparia*). Of the three species only the San Joaquin pocket mouse was observed; the San Joaquin kit fox was not observed onsite (LLNL 1992a).

Surveys were conducted for the San Joaquin kit fox in 1991, and hundreds of project-specific surveys have been conducted at the site since 1993. No kit fox were recorded at Site 300 in 1991, and none have been detected there in subsequent surveys including one in 2002 (CSUS 2003). However, this species has been observed in close proximity to Site 300 (Orloff et al. 1986, Sproul and Fleet 1993). A comprehensive mitigation and monitoring plan was developed for this species in the *Final Environmental Impact Statement and Environmental Impact Report for Continued Operation of Lawrence Livermore National Laboratory and Sandia National Laboratories* (1992 LLNL EIS/EIR) (LLNL 1992a, Jones and Stokes 2001).

A report is being prepared of a bat survey at Site 300. Preliminary information indicates that the following special status species were observed: Pallid bat (*Antrozous pallidus*), a State species of special concern; the long-legged myotis (*Myotis volans*), a Federal species of concern; and the Yuma myotis (*Myotis yumanensis*), a Federal species of concern (LLNL 2003bh).

Ten species of mammals were recorded at the Livermore Site (Table E.1.2.2–3). Common species recorded during night spotlighting and at scent stations were the feral house cat, desert cottontail, black-tailed hare, red fox, and gray fox. In addition, the Virginia opossum (*Didelphis virginiana*) was recorded frequently at the scent stations (Table E.1.2.2–4).

E.1.2.3 *Impacts of Current Operations*

Program activities for Site 300 are discussed in Chapter 3 and Appendix A of the LLNL SW/SPEIS. The activities discussed in Section E.1.1 for vegetation would also affect wildlife at Site 300, as would vehicle traffic, fencing of facilities, explosives testing, surface impoundments, and the sewage lagoon.

Prescribed Burn

Prescribed burns may have a positive, neutral, or negative effect on wildlife depending on the species and time of year. Animals living underground, such as ground squirrels, burrowing owls, and pocket mice or animals, such as lizards, that escape into crevices and holes, are unlikely to be directly affected by fast-moving grass fires (BioSystems 1986c). Rodents inhabiting this region are adapted to periodic grass fires, so burning should not have an adverse impact on them. Burns stimulate new vegetative growth and create range conditions that probably support a greater diversity of wildlife than if the area were not burned. These newly burned areas provide excellent foraging habitat for open-country raptors. Annual burning provides a diversity of habitat for ground-nesting bird species, including raptors, but also may result in mortality for the young before they have fledged and habitat reduction for some grassland nesting passerines.

A research proposal has recently been coordinated with the USFWS to evaluate the effects of prescribed burning on the Alameda whipsnake at Site 300 and several other locations (Swaim 2002c). The research proposal received a favorable biological opinion by the USFWS (USFWS 2002a). No Alameda whipsnake mortality due to fire has been observed at Site 300 to date (LLNL 2001c).

Lack of Livestock Grazing

Site 300, which is surrounded on three sides by heavily grazed lands, has not been grazed for almost 50 years. Studies have suggested that grazing may increase habitat stability for rodent species including the California ground squirrel (Balestreri 1981, Laughrin 1970). Other studies have indicated that heavy grazing lowers the density of some rodent species such as kangaroo rats and pocket mice (O’Farrell and McCue 1981, O’Farrell et al. 1981). The exclusion of grazing on Site 300 appears to have resulted in an abundance of several granivorous rodents (e.g., kangaroo rats and pocket mice) that no longer need to compete with livestock for food. Despite the lack of grazing, however, ground squirrel populations have overall remained more plentiful in the flatter, northern half of Site 300. Many herbivorous animals generally prefer perennial grasses to the less nutritious annuals. These perennial grasslands have developed in areas where grazing has been excluded and where annual prescribed burns occur.

The exclusion of livestock grazing may have a mixed effect on the bird population. Ground-nesting species, including raptors, probably benefit from the resultant tall grass. Foraging suitability for other open-country raptors, such as golden eagles, is enhanced by the presence of low cover perennial grasslands; in other areas, foraging suitability is reduced where tall annuals obscure ground visibility. Overall, however, raptor habitat potential is excellent onsite (BioSystems 1986c).

The exclusion of livestock grazing also has a positive impact because springs and associated wetlands that are important to many species of wildlife have not been degraded or destroyed by livestock.

Ground Squirrel Control

Presently, there is no active ground squirrel control program anywhere at Site 300. Control is done, on an as needed basis, around the surface impoundment, using Fumitoxin (aluminum phosphide) fumigant, traps, or zinc phosphide treated grain bait stations (LLNL 2003ah). The impact from the application of these rodenticides is anticipated to be negligible when used in accordance with their U.S. Environmental Protection Agency (EPA) pesticide label instructions.

Disking, Grading Fire Trails, and Applying Herbicides to Contain Fires

Site 300 maintenance staff annually receives training on special status species identification and distribution, and preactivity surveys for the presence of sensitive natural resources are performed prior to disking. The perimeter-disking project proceeds only after consultation with the LLNL wildlife biologist. The Site 300 maintenance staff follows mitigation measures provided by the wildlife biologist to protect sensitive wildlife and habitats such as American badger dens from the potential effects of disking. No known mortality of special status wildlife has occurred as a result of the disking activity during the past 8 years (LLNL 2001c).

Approximately 85 miles of fire trails are graded every spring along existing routes (BioSystems 1986c). Some ground-dwelling species such as California horned lizard and silvery legless lizard may be adversely affected if present during grading operations (Stebbins 2003).

Herbicide applications discussed earlier for vegetation would be anticipated to have minimal impact on wildlife species when used in accordance with their EPA pesticide label instructions. At no time are herbicides sprayed on habitat suitable for the Alameda whipsnake or California red-legged frog. Prior to late-Fall application, ground areas subject to spraying are assessed by a LLNL wildlife biologist. Also, herbicide projects proceed only after consultation with a LLNL wildlife biologist (LLNL 2001c).

Vehicle Traffic

Vehicles traveling along the paved roads and the better fire trails could cause wildlife mortality. This cause of wildlife mortality, however, would be minimal along the dirt roads and fire trails in the more remote and biologically diverse areas.

The nocturnal seasonal migrations of amphibians such as the California tiger salamander and California red-legged frog could result in mortality along roads. But again, impacts should be minimal as nighttime vehicle traffic is sparse and migrations are infrequent.

Fencing of Facilities

The perimeter of Site 300 includes approximately 0.5 mile of chain-link and 13.4 miles of barbed wire fencing (LLNL 2003bi). Large mammals generally cannot enter areas equipped with gates and chain-link fences.

Fencing around the surface impoundments mentioned below only exclude some of the larger species of wildlife. However, fences also provide perches for many species of birds, including burrowing owls and loggerhead shrikes.

Explosives Testing

All three primary outdoor explosives testing facilities at Site 300 are approximately 1 mile from the site's northern border; explosives testing is conducted almost entirely during the day. The explosions are weekly to daily, and wildlife exists near these facilities with relatively minimal impact.

Diurnal raptors that forage directly over the facilities are the species most vulnerable to flying debris and shock overpressure; these include the golden eagle, prairie falcon, northern harrier, black-shouldered kite, ferruginous hawk, and red-tailed hawk. Smaller birds may also be affected.

Explosive Process Water Surface Impoundments and Sewage Oxidation Pond

Visual inspection of the explosive process water surface impoundments revealed few wildlife species existing within the waters. The impoundments are lined with a high density polyethylene liner. A few scattered cattail were observed in one small area; the remainder of the shoreline is devoid of vegetation. Shorebirds have been seen foraging along the edge. The California tiger salamander and western toad are known to use these impoundments, but they are considered suboptimal habitats because they lack submergent and emergent vegetation. Amphibian use of the impoundments would likely be strictly transitory with accompanying minimal impacts.

The highly eutrophic sewage oxidation pond supports many aquatic species, including a nesting pair of mallards. Wading birds such as the green heron have been observed at this location. The California red-legged frog and California tiger salamander have also been observed at the overflow pond (also referred to as the percolation pond) only and not at the oxidation pond. Breeding has been reported for these two amphibian species at a number of locations at Site 300 (Jones and Stokes 2001, LLNL 2003ab).

E.2 BIOLOGICAL ASSESSMENT

This biological assessment addresses the status of threatened, endangered, and other species of concern (referred to as sensitive species) that are known to occur at the Livermore Site and Site 300. This assessment was prepared pursuant to the *Endangered Species Act* and the *California Endangered Species Act*.

The original version of Section E.2.1, Livermore Site, was prepared by Jim Woollett (LLNL) as a separate biological assessment in September 1997 and amended in August 1998 (LLNL 1998a). An additional amendment to this part of the biological assessment was made in 2002 by Michael van Hattem (LLNL) to address the Bullfrog Management Program. Preparation of this part of the biological assessment involved contact and coordination with members of the staff of the USFWS Sacramento office (USFWS 1997, USFWS 1998, USFWS 2002e). There has been minimal change in the biological and operational conditions at the Livermore Site since the USFWS approved the 1998 and 2002 amendments. To facilitate review of the biological assessment by the USFWS, this part of the document has retained essentially the same format as provided in November 1997, but has incorporated the 1998 and 2002 amendments. Where needed, this biological assessment provides updates or new information on the mission and operations of the Livermore Site.

The original version of Section E.2.2, Site 300, was prepared as a separate biological assessment by Brook Vinnedge, Steven Avery, and Scott Frazier (Jones and Stokes 2001). Preparation of this part of the biological assessment involved contact with members of the USFWS Sacramento office staff. Contributions to the biological assessment were also made by Karen Swaim (Swaim Biological Consulting) and Jim Woollett (LLNL). There has been minimal change in the biological and operational conditions at Site 300 in the time since the assessment was approved (USFWS 2002b). Therefore, the document has been prepared in essentially the same format as provided in December 2001, to facilitate its review by USFWS. Where needed, this part of the biological assessment provides updates or new information on the mission and operations of Site 300 as described in this LLNL SW/SPEIS from special status plant surveys; valley elderberry longhorn beetle survey results; and from the schedule of Site 300 activities discussed previously.

Federal agencies are required by Section 7 (a)(2) of the *Endangered Species Act* (16 U.S.C. §1536) to ensure that their actions are "not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of the critical habitat of such species…"

The *California Endangered Species Act* (California Fish and Game Code Sections 2050 through 2098) includes provisions intended to protect threatened and endangered species that may be affected by development projects subject to the *California Environmental Quality Act* (CEQA). The *California Endangered Species Act* states that agencies should not approve projects that would jeopardize the continued existence of threatened or endangered species, or result in the destruction or adverse modification of habitat essential to the continued existence of those species if there are reasonable and prudent alternatives available that would conserve the species or its habitat.

This biological assessment presents the results of surveys conducted for Federal and state endangered and threatened species; Federal candidate plant and animal species; and state species of special concern. These surveys were conducted to determine what impacts, if any, the Proposed Action and the alternatives would have on these species and to ensure compliance with the *United States Endangered Species Act* and *California Endangered Species Act* for activities undertaken at the Livermore Site and Site 300.

For the LLNL SW/SPEIS, consultation under Section 7 of the *Endangered Species Act* was initiated with the USFWS on October 21, 2002, when a letter was sent to their office in Sacramento, California, requesting a list of endangered, threatened, and other species of concern that may occur or are known to occur at the Livermore Site and Site 300. A response received on October 28, 2002, provided two lists, one for the Livermore Site and one for Site 300 (Attachment 1). This list has been used to update the status of listed species at these two LLNL sites (Table E.2–1). Species accounts for Federal and California species with endangered, threatened, or candidate status are provided in Attachment 3 at the end of this appendix.

Data for the Livermore Site and Site 300 are presented separately, in part, because they are separate geographic and biological locations. Additionally, the USFWS elected to provide separate biological opinions for these sites in the 1992 LLNL EIS/EIR, and separate consultation has been conducted with USFWS since then. Text from biological assessments submitted in 1992, 1997, 2001, and related amendments, has been incorporated into this document with little change to retain the nature of carefully coordinated and implemented agreements during the past decade made between LLNL, DOE, and USFWS regarding species protected by the *Endangered Species Act* (LLNL 1992a, LLNL 1998a, Jones and Stokes 2001). However, the biological assessment includes new information or changes in the regulatory status of species present at the Livermore Site and Site 300.

E.2.1 Livermore Site

E.2.1.1 *Introduction*

LLNL is a multiprogram national laboratory operated by University of California for NNSA. It undertakes multidisciplinary fundamental and applied research and development activities in a broad range of scientific and technical fields and maintains close interaction with scientific and technical personnel within universities and industry. LLNL's primary mission is to ensure that the nation's nuclear weapons are safe and secure and reliable and to prevent the spread and use of weapons of mass destruction worldwide. Major research programs include defense technologies, energy, biomedical and environmental research, environmental restoration, and waste management (LLNL 2002d).

The Livermore Site is located about 40 miles east of San Francisco at the southeastern end of the Livermore Valley in southern Alameda County, California. The central business district of the city of Livermore is about 3 miles to the west. The Livermore Site occupies essentially all of Section 12, Township 3 South, Range 3 East of the U.S. Geological Survey (USGS) Altamont Quadrangle, California, and a portion of Sections 1, 2, and 11, for a total area of 1.3 square miles (821 acres). Lands to the north are zoned industrial. Lands to the east and south are zoned agricultural and lands to the west are zoned residential.

Before World War II, the present-day Livermore Site was part of the Wagoner Ranch; cattle grazing was the dominant land use. The Navy purchased the site in 1942 and established the Livermore Naval Air Station as a flight-training base. Runways were constructed near the center of the site with a rectangular grid street system along the southern portion of the site.

The transition from Navy operations to a research facility began in 1950 when the California Research and Development Corporation (a subsidiary of Standard Oil, Inc.) began construction of the Materials Test Accelerator Facility as authorized by the Atomic Energy Commission. In 1951, the University of California Radiation Laboratory in Berkeley began using some of the Livermore facilities in support of nuclear weapons research being conducted by the Los Alamos Scientific Laboratory in New Mexico.

In 1952, the University of California established a second laboratory dedicated to nuclear weapons research. The University of California operated what is now called LLNL for the Atomic Energy Commission from 1952 to 1975, then for the Energy Research and Development Agency (DOE's predecessor) until 1977, and for DOE/NNSA since then.

E.2.1.2 *Affected Species*

The species considered in the biological assessment for the Livermore Site is the California red-legged frog (*Rana aurora draytonii*), a federally listed threatened species (61 FR 25813 et seq.).

Critical Habitat

Although critical habitat for the California red-legged frog was established by USFWS on March 13, 2001, most of that critical habitat was rescinded by a court order (USDCDC 2002). Livermore Site areas formerly designated as California red-legged frog critical habitat are shown in Figure 4.9.3–1 of this LLNL SW/SPEIS. However, it is possible that during the next few years the critical habitat for this species may be reinstated again at the Livermore Site when the USFWS publishes a new critical habitat proposal (USFWS 2003).

E.2.1.3 *Unaffected Species*

With the exception of the California red-legged frog noted above, none of the species included in the species list provided by USFWS for the Altamont Quadrangle have been detected on the Livermore Site (USFWS 2002d). A special status plant survey conducted in July 2002 did not detect any threatened, endangered, or candidate plant species at the Livermore Site (Jones and Stokes 2002a).

The California tiger salamander (*Ambystoma californiense*) is a federally listed proposed threatened species (68 FR 28649) that has not been observed at the Livermore Site, but has been detected in close proximity. The California tiger salamander has been detected at Sandia National Laboratories/California (SNL/CA) in two detention ponds that are within approximately 1,100 feet of the southern boundary of LLNL (NNSA 2003a).

E.2.1.4 *Consultations to Date*

- For the 1990-1991 EIS/EIR (Appendix F of the 1992 LLNL EIS/EIR) biological assessment consultations performed in 1990–1991.

- NNSA Livermore Site Office initiated formal consultation with the submittal of a biological assessment to USFWS in August 1997, regarding the originally proposed

Arroyo Maintenance Plan, and received a biological opinion in the latter part of October 1997 (USFWS 1997). Phase One of the Arroyo Project was completed in the first half of November 1997. No "take" of the California red-legged frog was detected before, during, or after this project.

- In June 1998, DOE submitted an amended biological assessment that LLNL prepared to address comments in the USFWS October 1997 biological opinion (1-1-97-F-173) on the proposed Arroyo Las Positas Maintenance Project (LLNL 1998a). The USFWS approved the amended biological assessment in October 1998 (USFWS 1998).
- In July 2002, NNSA submitted a Bullfrog Management Plan amendment for the biological opinion (1-1-97-F-173) on the Arroyo Las Positas Maintenance Project (DOE 2002j).
- In August 2002, USFWS approved the Bullfrog Management Plan amendment for the biological opinion (1-1-97-F-173) on the Arroyo Las Positas Maintenance Project (USFWS 2002e).
- In October 2002, USFWS provided a species list for both the Livermore Site and Site 300 for the LLNL SWEIS (USFWS 2002d).

E.2.1.5 *Proposed Action Project Activities*

Current projects at the Livermore Site with the potential to affect special status species include:

- The ongoing Arroyo Las Positas Maintenance Project
- Maintenance on other onsite drainage systems (i.e., DRB, B571 Wetland)
- Bullfrog management activities
- Construction-related activities for a number of LLNL SWEIS projects
- Maintenance of security buffers components located in critical habitat designated for the California red-legged frog
- Decontamination and demolition of facilities
- Maintenance of facilities, paved roads, and utilities
- Landscaping and grounds maintenance
- Herbicide application
- Invasive species control
- Vehicle traffic

Although formerly designated critical habitat for the California red-legged frog has been rescinded, the USFWS may redesignate critical habitat for this species over the 10-year period covered by the LLNL SWEIS (USDCDC 2002, USFWS 2003).

This biological assessment discusses the temporal and spatial effects that the Proposed Action project activities may have on federally listed threatened, endangered, and candidate species and their critical habitats, and outlines mitigation measures specific to those effects. Mitigation measures would be implemented over the next 10 years according to the Proposed Action schedule described in Section E.2.1.5.12, Schedule of Continuing Activities.

E.2.1.5.1 *The Arroyo Las Positas Maintenance Project*

The ongoing Arroyo Las Positas Maintenance Project, as approved by USFWS, consists of creating a vegetative mosaic of frog habitat in the Arroyo Las Positas with a cyclical 5-year maintenance plan, possibly affecting several wetland assemblages identified in the center of the site. Future curtailment of treated groundwater releases into the arroyo, potential mitigation values, and offsite compensation for loss of wetland habitat are also discussed (LLNL 1998a, USFWS 1998).

Five-year Arroyo Las Positas Maintenance

For identification purposes, Arroyo Las Positas was divided into three reaches: Reach 1 runs along the eastern boundary of the Livermore Site, adjacent to Greenville Road; Reach 2 follows the northern site boundary south of and parallel to Patterson Pass Road; and Reach 3 is a part the arroyo running northward to Patterson Pass Road as it leaves the site boundary.

It is believed that the flood capacity of the arroyo drainage can be returned to the 100-year storm event level by a recently constructed berm approximately 18 to 24 inches high, along the south side of Reach 2 (Figure E.2.1.5.1–1). A berm is not required in Reach 1, because an elevated embankment already exists approximately 100 feet to the west of the streambed, or Reach 3, because adequate capacity is already present in the channel.

The required capacity would be maintained by cyclically dredging (removing in-channel vegetation and associated pediments) pre-designated sections of the arroyo on a 5-year, rotating basis. This "checkerboard" maintenance design would continue to be conducted in late summer and executed using a backhoe operated from the upper bank and top of the side slope in 100- or 300-foot linear portions of the drainage (outlined in Figure E.2.1.5.1–2) to an approximate depth of 18 inches. The removed material would be immediately placed into a dump truck and transported to an appropriate disposal site, which may include reuse onsite or deposition at a landfill depending on the results of soil sampling from the project area. The net effect of this plan would be that no more than 20 percent of existing *Typha*-type wetland vegetation would be removed each year from the onsite drainage and that there would be sufficient habitat areas present for the frog throughout the channel to allow natural movements or connectivity between the offsite upstream and downstream portions of the arroyo (LLNL 1998a).

A survey in 2002 documented the presence of the California red-legged frog throughout the portion of Arroyo Las Positas within the boundaries of the Livermore Site (LLNL 2003ab). As a result, portions of the arroyo are maintained in shorter (100-foot) sections because of dense growth and proliferation of vegetation and/or presence of California red-legged frog habitat; these sections need to be expanded from the original areas in coordination with the USFWS. Any vegetative growth on concrete aprons in the arroyo would be removed with heavy equipment, as needed, without damaging adjacent habitat areas. Infrequently, erosion repair and stabilization measures would need to be performed; no heavy equipment would be operated in the stream bottom during this work (LLNL 1998a).

Annual Arroyo Las Positas Maintenance

Willow stands have gained a foothold at several locations along the arroyo in the streambed. To ensure woody growth does not occur in the stream bottom at these locations and in other areas, willows would be hand-cut at basal height prior to winter rains. All cuttings would be collected and placed in a truck for disposal. Removal of storm debris such as branches and trash would be accomplished on an as-needed basis. Some loading of cuttings and debris for removal would be executed using a front-end loader or other similar heavy equipment operated from the upper bank. In some areas of the arroyo, *Typha* patches could grow more quickly and densely than the 5-year maintenance program would accommodate. If a patch is too thick to allow winter flow passage, a trimming extension from a riding mower on the upper bank would be used in the late summer to cut the *Typha* to a height of no less then 48 inches. A rake extension from the mower would be used to collect the trimmings for removal (LLNL 1998a). The rake would have rounded tines spaced approximately 4 inches apart and could be drawn across the top of the *Typha* stands to collect the cuttings. Loose vegetation could also be retrieved up the side slope with this extension. These activities would be performed under the supervision of a qualified wildlife biologist. All trucks and heavy equipment would remain on the upper banks and top of side slopes of the arroyo.

Upper-bank mowing of the arroyo would be accomplished using a tractor with a mowing hook-up set at a height of 6 inches or greater. Upland mowing is scheduled to occur once a year (June) to minimize fire risk. The infall pool in Reach 1 and the two pools in Reach 3 (all currently with frog populations) would not be dredged if hydric conditions exist in the drainage, but would have vegetation trimmed as needed to a height of 24 inches by rotary-powered tools such as weed-whackers, within a 50-foot buffer of the pool and in the late fall. A qualified wildlife biologist would perform the entire vegetative cutting. The pelagic (open water) pioneer vegetation and marginal zone vegetation of the pool would be cut by hand. Vegetative growth such as *Typha* would be cut 6 inches above the water surface in the pelagic zone, and the encroaching vegetative growth from the margin of the pool would also be trimmed to maintain semi-marsh conditions. No wading in the pooled areas of the arroyo would be allowed. Initial winter rains would be allowed to flush sediments and remove the encroaching vegetation or rhizomes from the center of the pools and naturally maintain the depth and longevity of these breeding areas.

If dredging activities were required in Reach 2 or Reach 3, water from onsite treatment facilities would be diminished for the short time it would take to complete maintenance of the section. This would inhibit sedimentation or particulate transport to downstream locations during the activity (LLNL 1998a).

Hydrologic Conditions

Water velocity and volume measurements were collected at several points in the arroyo as part of a data collection effort requested by USFWS in 1998. This information was considered valuable in assessing the relative quantity of water discharged into the arroyo from the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) groundwater treatment facilities (TFs). The augmented flow contribution in the arroyo from TFC and TFD (Figure E.2.1.5.1–3) effluent might provide summertime inundation to the wetlands that, under natural regimes, would be unavailable. Additional information on flow contributions from these treatment facilities are found in the amended biological assessment (LLNL 1998a). TFA and TFB discharge to Arroyo Las Positas, approximately 100 gallons per minute, via a tributary along Vasco Road.

E.2.1.5.2 *Other Onsite Drainage Systems (DRB and the B571 Wetland)*

Vegetative growth in identified site-wide drainages would be removed periodically when the channels do not have free-flowing lotic conditions. Sediment deposits would be removed by backhoe to maintain channel capacity. This removal could include minor grading to reestablish flowlines. Areas graded or otherwise exposed would be seeded to prevent erosion. LLNL would also need to perform the following types of maintenance activities to keep the drainage systems functional:

- Erosion repairs and preventive measures including installation or repair of rip rap or gabion structures, fill, and installation of jute netting or other erosion control fabrics
- Removal of storm debris such as branches, silt, and trash
- Watershed upgrades with additional or relocated inlets
- Installation or removal of culverts

Vegetation and sediment removal would be accomplished prior to late-summer conditions. All frog-related mitigation measures would be implemented as stated in Section E.2.1.9 of this biological assessment.

California red-legged frogs have been observed in the DRB. If California red-legged frogs are discovered during maintenance activities in one of the alternative habitat areas (DRB and the B571 wetland) as displayed in Figure E.2.1.5.2–1, they could be relocated to the arroyo. Bullfrogs (*Rana catesbeiana*) have been found in the DRB, but have not been detected in the B571 wetland.

E.2.1.5.3 *Bullfrog Management Plan Activities*

History and Response to Bullfrogs at the Livermore Site

Bullfrogs were originally discovered at the Livermore Site in 1997 in the southern sediment basin, a sediment trap south of the DRB. For several years, bullfrogs were controlled as observed. In 2000, a series of control measures were implemented in the DRB: (1) a 0.25 inch mesh aluminum containment screen was installed on the DRB effluent culvert to prevent movement of frogs and larger larvae between the DRB and the Arroyo Las Positas; (2) gigging was started and soon after replaced by high-powered air rifles with scope-mounted halogen lights; (3) education of the LLNL community was implemented through briefings, news releases, and Earth Day presentations; (4) dewatering of the DRB occurred in December 2000/January 2001; and (5) May through October weekly boat surveys were conducted to remove egg masses (DOE 2002j).

The 2000/2001 DRB dewatering effort was a substantial task for many reasons, but especially because of the size (12.5 million gallons/5.5 acres) and design of the basin, which cannot be drained without mechanical pumping. A diesel powered 6-inch pump ran continuously for 10 to 12 hours a day for almost a month to accomplish draining after the basin had already been drained to its lowest point without pumping. The dewatering was also costly (approximately $40,000), unsightly, and subject to intense public scrutiny. One of three LLNL cafeterias is on the western border of the DRB (DOE 2002j). This cafeteria is being replaced in 2004 with a new cafeteria located just north of the DRB.

Project Description/Control Techniques

Dewatering

As previously discussed, dewatering has been successfully implemented in the DRB. The overall success of the previous dewatering project was high, with nearly all bullfrog larvae being removed, in addition to several thousand channel catfish (*Ictalurus punctatus*). Although dewatering is a valuable management technique for bullfrog larvae removal, it is not a sustainable technique for annual or biennial use in the DRB. The size, capacity, design, cost, and scrutiny make dewatering the DRB a less desirable management technique.

The intent is to retain dewatering as a potential option for invasive species management in the DRB, but to implement other control techniques such as Rotenone treatments, which are more economically feasible in the long-term and considerably easier to implement.

Although bullfrogs are primarily confined to the DRB at this time, it is conceivable that they will ultimately colonize the Arroyo Las Positas. If bullfrog breeding occurs in the Arroyo Las Positas it will be necessary for LLNL wildlife biologists to temporarily terminate CERCLA surface releases, thus stranding and desiccating the bullfrog larvae. Rotenone may also be needed, but will only be used as a secondary technique due to the inherent challenges involved in treating a lotic system (DOE 2002j).

Rotenone

Rotenone is a naturally occurring compound derived from the roots of tropical plants in the bean family *Leguminosae,* including jewel vine (*Derris* spp.) and lacepod (*Lonchocarpus* spp.) (Finlayson et al. 2000). Response to rotenone is species-specific, although animals using a high degree of aquatic respiration are probably most susceptible (Wilson and McCranie 1994). Rotenone works by inhibiting the biochemical process at the cellular level making it impossible for fish, amphibians, and aquatic insects to use the oxygen absorbed in the blood and needed in the release of energy during absorption (Finlayson et al. 2000). Rotenone is a commonly used pesticide in North America and has been used in fisheries management since 1934. Rotenone is applied as a wettable paste/powder or as an emulsifiable spray concentrate containing approximately 5 percent rotenone (Wilson and McCranie 1994). Common application methods include using drip stations or sprayers and pumping through hoses into the propeller wash of powerboats. Treatments with 5 percent rotenone usually range from 0.5 pound per minute to 5.0 pounds per minute, with a typical treatment rate of 2 pounds per minute (Finlayson et al. 2000).

The degradation of rotenone is affected by temperature, light, oxygen, pH, turbidity, and dilution by inlets and runoff. For example, the DRB can often exceed 80°F during summer months with no stratification, and under these conditions, the half-life of 5 percent rotenone is approximately 0.94 day (Wilson and McCranie 1994). Rotenone also is an unstable compound that is non-persistent and essentially does not bioaccumulate (Wilson and McCranie 1994, DOE 2002j). Both the DRB and the Arroyo Las Positas are ideal for rotenone treatments because none of the previously listed limnological parameters would be limiting. The total amount of rotenone used in the treatment would not exceed the maximum dosage on the label and would be performed by a licensed applicator.

E.2.1.5.4 *Construction Related Activities*

Under the Proposed Action, construction projects would result in the disturbance of 462,000 square feet (10.6 acres) of soil in undeveloped areas at the Livermore Site.

Included in the 462,000 square feet of soil disturbance are previously planned No Action Alternative projects including the East Avenue Closure, the Extension of 5th Street, the International Security Research Facility (ISRF), and a generic office building.

The East Avenue Closure involves disturbance of 172,000 square feet of soil and related vegetation. An environmental assessment prepared for this project was released in September 2002 (DOE 2002i). Groundbreaking for this project began in April 2003.

The 5th Street Extension Project involves disturbance of 132,000 square feet of soil and related vegetation. This project is located on the west side of the Livermore Site and involves extension of 5th Street from Avenue A to West Perimeter Drive.

Construction of the ISRF would involve disturbance of 64,000 square feet of soil and related vegetation for the facility and an additional 54,000 square feet for related parking. This project would be located on the southwest side of the Livermore Site near a developed area.

A generic office building would involve disturbance of 40,000 square feet of soil and related vegetation. The project would be located on the east side of the Livermore Site east of the DRB.

Proposed construction activities over the next 10 years at the Livermore Site in previously developed areas include the Office of Science (50,000 square feet) and the Consolidated Security Facility (50,000 square feet). A management plan for the Arroyo Seco proposes some restoration activities for that arroyo during the next 10 years. A separate biological assessment was prepared for that project and submitted to the USFWS in August 2003.

Potential impacts of these construction projects on the California red-legged frog are provided in Section E.2.6.4. Mitigation measures identified in Section E.2.1.9 would further reduce the potential for proposed construction activities to adversely affect this species.

E.2.1.5.5 *Maintenance of Security Buffer Areas Located in Formerly Designated Critical Habitat for the California Red-Legged Frog*

Proposed perimeter fence maintenance activities in the security buffer areas on the north and east side of the Livermore Site would not be in close proximity to the Arroyo Las Positas and DRB where the California red-legged frog is present, and critical habitat for the California red-legged frog in these security buffer zones has been rescinded. Security buffer maintenance activities would be anticipated to have minimal impact on the California red-legged frog. Mitigation measures are provided in Section E.2.1.9 to minimize any adverse impact.

E.2.1.5.6 *Decontamination and Demolition of Facilities*

Under the Proposed Action, the following three structures at the Livermore Site would be decontaminated and demolished: Buildings 171, 292, and 514. Afterwards, the areas where these structures were located would be landscaped for soil retention. More information on these activities can be found in Appendix A of the LLNL SWEIS.

E.2.1.5.7 *Maintenance of Facilities, Paved Roads, and Utilities*

LLNL must maintain facilities, paved roads, and utility systems at the Livermore Site in order for the site mission to be accomplished. Utilities maintained include water, electrical, fuel, and sewer systems. Larger road projects may involve separate NEPA analysis, such as the East Avenue Security Upgrade (DOE 2002i).

E.2.1.5.8 *Landscaping and Grounds Maintenance*

Landscaping and grounds maintenance operations are performed at the Livermore Site in support of the site mission. These activities involve mowing lawns; trimming shrubbery; planting and maintaining plant species at various locations on the installation; and providing site landscaping. These activities occur primarily during the months of March through October.

E.2.1.5.9 *Herbicide Application*

Herbicide application at the Livermore Site is performed primarily to eliminate vegetation along security fences and on the perimeter of certain facilities.

E.2.1.5.10 *Invasive Species Control*

The following invasive plant species have been observed in the Arroyo Seco at the Livermore Site: bull thistle (*Cirsium vulgare)*, Italian thistle (*Carduus pycnocephalus*), Mediterranean mustard (*Hirschfeldia incana*), milk thistle (*Silybum marianum*), and perennial peppercress (*Lepidium latifolium*) (Jones and Stokes 2002a). A formal program does not exist at Livermore Site to control invasive plant species.

The bullfrog, a known predator of the California red-legged frog, has been observed at the Livermore Site since 1997 (LLNL 2003ab). A Bullfrog Management Program has been coordinated with the USFWS to reduce, if not eliminate, the presence of this species at the Livermore Site and has operated since 2000 (DOE 2002j, USFWS 2002e). This is discussed in detail in Section E.2.1.5.3.

E.2.1.5.11 *Vehicle Traffic*

Vehicle traffic at the Livermore Site is limited primarily to employees and contractors who work at this site on a regular basis. Most of the vehicle traffic occurs during daylight hours, with the level of nighttime vehicle traffic being much lighter.

E.2.1.5.12 *Schedule of Continuing Activities*

- Under the cyclical 5-year maintenance plan, removal of in-channel vegetation (of pre-designated sections) would be conducted in late summer and executed using a backhoe operated from the upper bank and top of the side slope in 100- or 300-foot linear portions of the drainage.

- For the annual maintenance program, cattail vegetation cutting would occur in August to September, before winter and prior to the onset of frog movements away from the main flow of the arroyo.

- As needed, bullfrog management would be conducted after August 1 and before February, using either the previously demonstrated dewatering technique or the application of rotenone. Additionally, ongoing egg mass removal, and adult bullfrog control efforts are performed. Shooting happens every spring/summer/fall. Egg masses are removed once a week from May through September.

- Construction and demolition projects would be conducted at the times indicated in Chapter 3 under the No Action Alternative, Proposed Action, and Reduced Operation Alternative and Appendix A.

- Other recurring operations would be performed as needed.

E.2.1.6 *Potential Effects of the Project on Threatened and Proposed Threatened Species*

E.2.1.6.1 *Arroyo Las Positas Maintenance Activities*

The revised maintenance plan prepared in 1998 included provisions that enhance long-term frog population survivability and provide added in-stream habitat values for the frog. The potential for individual "take" of a frog during the maintenance work is considered low for the following reasons:

- Preactivity surveys by a site biologist would be performed before late summer removal of sediment from streambed vegetation
- All maintenance crew members would be knowledgeable of in-stream markers for section delineation and sensitive frog pools
- Crew members could identify frogs and would not wade into the arroyo
- No heavy equipment would be placed on the side slopes (except during erosion repair) or in the arroyo (LLNL 1998a)

The glides created by the streambed dredging and vegetation removal would enhance breeding opportunities for the species, and the "checkerboard" succession of the annual maintenance activities would provide a mosaic of glides and adjacent assemblages of wetland vegetation to the benefit of the California red-legged frog. Frog numbers could increase in the arroyo onsite as the habitat quality further improves, leading to frog colonization of other suitable habitats in the larger arroyo system.

It cannot be assured, but it is expected that the glides created for the California red-legged frogs will adequately serve as breeding sites and dispersal locations, and that the dredging maintenance of certain sections would, over time, enhance relative populations of the frog in the arroyo. For example, prior to the listing of the frog as "threatened," catch basins that trapped winter sediment transport at Site 300 were occupied by frogs within a month after dredging. Egg masses were detected subsequently at these locations in the spring. A similar pattern would be expected at the Livermore Site arroyo pools under the proposed maintenance plan. In addition, with the implementation of the other onsite mitigation measures (e.g., California red-legged frogs detected at other Livermore Site locations being translocated to suitable arroyo habitat), "take" would be minimized if California red-legged frogs were to appear in any of the other onsite drainages (LLNL 1998a).

Use of heavy equipment to mow the entire upper bank of the arroyo once in the spring and the possible trimming of the *Typha* to 48 inches in height (in late summer) would probably not result in mortality of frogs. To minimize adverse effects of arroyo maintenance, operations would be conducted approximately 50 feet from the wetted channel and during temperature extremes that motivate the frog to be closely tied to the local, hydric conditions. Raking of the trimmed *Typha* would occur during the daytime and on the side slopes where frogs are unlikely to be in the late summer because of minimal vegetation or cover and high temperatures. In addition, a qualified wildlife biologist would supervise the activity. The frog's shelter would remain intact and cattails tend to grow prolifically in these areas of the drainage throughout fall and winter months. It is also unlikely that in-stream willow cutting at basal height would lead to frog mortality, because no wading in the stream would occur and the willows would always be of small stature.

Overall, the action of heavy equipment disrupting habitat and the length of time that is required for the vegetation to return to a reasonable maturity (2 years) would cause 20 to 40 percent of the arroyo to be in transition or habitat succession at any particular time (LLNL 1998a).

E.2.1.6.2 *Maintenance for Other Onsite Drainage Systems (DRB and the B571 Wetland)*

The potential for individual "take" of a frog during the maintenance work is considered low for the following reasons:

- Preactivity surveys by a site biologist would be performed prior to maintenance activities
- All maintenance crew members would be knowledgeable of markers for delineating sensitive frog areas
- Crew members could identify frogs and would not wade into the DRB or the B571 wetland
- No heavy equipment would be placed on the side slopes (except during erosion repair) in the DRB and other drainage locations

E.2.1.6.3 *Bullfrog Management Plan*

Both bullfrog control techniques (i.e., dewatering and rotenone) would negatively affect species that require water for hydration or respiration (i.e., invertebrates, amphibian larvae, and fish). Most amphibians, with the exception of bullfrogs, would be metamorphosed by August 1; therefore, the impact to the native herpetofauna community would be greatly reduced if not eliminated. Aquatic invertebrates would be negatively affected but are capable of rapid colonization and are, therefore, not likely to be extirpated by either control technique. The only native fish detected in either the DRB or the Arroyo Las Positas is the prickly sculpin (*Cottus asper*). The following three nonnative fish species have also been observed: mosquito fish (*Gambusia affinis*), catfish (*Ictalurus*), and goldfish (*Carrassius auratus*). Fish present during dewatering would be negatively affected by the control techniques, but are also capable of colonization (DOE 2002j, LLNL 2003bz).

E.2.1.6.4 *Construction Activities*

Proposed construction activities for the next 10 years would not be in areas where the California red-legged frog is routinely present and impacts from such construction would be minimal. Mitigation measures are provided in Section E.2.1.9 to minimize any adverse impact.

E.2.1.6.5 *Maintenance of Security Buffer Components Located in Formerly Designated Critical Habitat for the California Red-Legged Frog*

Proposed perimeter fence maintenance activities in the security buffer areas on the north and east side of the Livermore Site would not be in close proximity to the Arroyo Las Positas and DRB where the California red-legged frog is present, and critical habitat that had been designated for the California red-legged frog in these security buffer zones has been rescinded. Security buffer maintenance activities, which occur in upland areas, would have minimal impact on the California red-legged frog. Mitigation measures are provided in Section E.2.1.9 to minimize adverse impacts.

E.2.1.6.6 *Decontamination and Demolition of Facilities*

The decontamination and demolition of Buildings 171, 292, and 514 at the Livermore Site could potentially result in direct mortality of California red-legged frogs if individual frogs were present at the project site during demolition. However, these facilities occur in upland areas that are not typically frequented by California red-legged frogs. The proposed decontamination and demolition would likely have minimal adverse effect on this species. These activities would eliminate approximately 95,000 square feet (2.2 acres) of developed space at the Livermore Site after these structures have been demolished and then landscaped to prevent erosion of soil into wetland areas.

E.2.1.6.7 *Maintenance of Facilities, Paved Roads, and Utilities*

The routine maintenance of facilities, paved roads, and utilities at the Livermore Site could potentially result in mortality of California red-legged frogs, because the entire site is within the dispersal capability of this species. However, because the maintenance of facilities, paved roads, and utilities are primarily in upland areas, these activities would pose a minimal risk to California red-legged frogs. Additionally, these activities would be conducted during the daylight hours when this species is not typically active.

E.2.1.6.8 *Landscaping and Grounds Maintenance*

Landscaping and grounds maintenance activities at the Livermore Site have the potential to result in mortality of California red-legged frogs, because the entire site is within the dispersal capability of this species. However, because the landscaping and grounds maintenance activities avoid known wetland breeding areas and associated nonbreeding areas, these activities would pose a minimal risk to California red-legged frogs. Additionally, these activities would be conducted during the daylight hours when this species is not typically active.

E.2.1.6.9 *Herbicide Application*

Herbicide application at the Livermore Site is primarily for maintaining security fences free of vegetation. At no time are herbicides sprayed on habitat suitable for California red-legged frog breeding. Herbicide applications should pose minimal risk provided the formulations are applied in accordance with EPA pesticide label instructions; under conditions with little or no wind to avoid herbicide drift; only to the extent necessary; and in accordance with the additional LLNL safeguards discussed in E.2.2.6.1.1.9.

E.2.1.6.10 *Invasive Species Control*

Bullfrog control represents the only invasive species control activities at the Livermore Site. The beneficial impacts of those activities are discussed in Section E.2.1.6.3

E.2.1.6.11 *Vehicle Traffic*

Vehicle traffic has the potential to result in mortality of California red-legged frogs at the Livermore Site. However, the risk is minimal because California red-legged frogs are more active at night when traffic is limited.

E.2.1.7 ***Interrelated Actions***

Interrelated actions are defined as part of a larger action and are dependent upon the larger action for their justification. The *Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (SSM PEIS) selected the Livermore Site for construction of the National Ignition Facility (NIF). NNSA is completing installation and beginning commissioning of the NIF at LLNL. The goals of NIF are to achieve fusion ignition in the laboratory for the first time by using inertial confinement fusion technology, based on an advanced design solid state laser, and to conduct high-energy density experiments in support of national security and civilian applications. The NIF will provide NNSA with the ability to evaluate weapon performance issues to ensure that the nation's nuclear deterrent remains safe and reliable without underground nuclear testing.

The SSM PEIS discussed the potential for affecting the nearby Arroyo Las Positas and potential foraging habitat for the western burrowing owl. The SSM PEIS concluded that there would be no adverse impact to these resources from the construction and operation of the NIF. The NIF facility construction is now complete. Few impacts would occur to biological resources during operation of the NIF. Traffic to and from the NIF could result in the loss of individuals of some species due to road kill. No adverse impacts to special status species would be expected from operation of the NIF.

E.2.1.8 ***Cumulative Effects***

Livermore Site activities described in this biological assessment include those that are expected to occur over the next 10 years. No other projects are envisioned for site operations. SNL/CA is managing its section of Arroyo Seco to protect California red-legged frog habitat and to create a 30-acre wildlife reserve on the east side of that facility. The incremental effect of the Proposed Action on biological resources within the area would be positive, particularly in the long term, when taken in the context of the continuing conversion of wildlife habitat for agricultural, residential, commercial, and industrial use in the vicinity of the Livermore Site. Because operations described here would not be expected to adversely affect listed species and sensitive habitat present at the Livermore Site and surrounding land, there would not be any cumulative effects.

E.2.1.9 ***Conservation and Mitigations***

Mitigation measures for activities that could potentially impact the California red-legged frog at the Livermore Site are listed below.

E.2.1.9.1 *Arroyo Las Positas Maintenance Project*

Mitigation and compensation for the potential impacts of this project are organized into two groups. The first group represents a series of mitigation measures for implementation during high-bank maintenance activities. The second group consists of measures for implementation during the dredging operations. These measures, previously approved by the USFWS, are also applicable for protection of California red-legged frogs site-wide in other aquatic environments (LLNL 1998a, USFWS 1998).

Bank-Mowing and Cattail-Pruning Mitigation Measures

A qualified wildlife biologist would survey the project site for California red-legged frogs prior to work being initiated. Areas identified as having California red-legged frogs would be marked with LLNL special status species flagging, tape, or other visible demarcations. A map would be disseminated to the project crew with the sensitive frog location exclusion zones clearly outlined. All vegetation cutting and removal in these areas would be performed in a manner that would not directly affect frogs.

A qualified wildlife biologist would be present at the project location during the late summer arroyo work and would actively monitor the progress of the dredging and trimming operations. If a red-legged frog were observed, all work in the area that could affect the frog would be halted until the frog was contained safely in a bucket with an inch or two of water and a shaded top. As soon as work had proceeded through the area, the frog would be returned to its point of capture.

Vegetation cutting within 50 feet of the frog pools in Reaches 1 and would be performed using rotary tools to a height of at least 24 inches. A qualified wildlife biologist would perform all vegetation cutting within this area. Vegetation located in the pelagic and marginal zones of occupied frog habitat would be cut using pruning shears or handsaws. No wading in the arroyo would occur in these areas.

The cattail vegetation cutting would occur in August to September, before winter and prior to the onset of frog movements away from the main flow of the arroyo. Preactivity surveys would be performed in the work location prior to disturbance, and a qualified wildlife biologist would be available should a frog be detected (LLNL 1998a).

Dredging and Site-wide Mitigation Measures

A qualified wildlife biologist would survey the project site for California red-legged frogs prior to work being initiated. Areas identified as having California red-legged frogs would be marked with LLNL special status species flagging, tape, or other visible demarcations. Prior to the project impact activity, these areas would be searched and any frogs found would be collected by a service-approved biologist and placed in a ponded enclosure until the annual maintenance procedures of dredging, etc., have been completed; then they would be returned to the arroyo at or near the location where they were collected. Similarly, if frogs were found in other drainages onsite during or prior to maintenance activities, they would be collected and relocated to the arroyo. Documentation of the number and distributions of frog relocations would be sent to USFWS at the end of the year.

Prior to work in the arroyo, all persons involved would be briefed on the status, behavior, markers, and regulatory status of the frog; penalties for take of frogs and habitat; and special protection measures being implemented. A qualified wildlife biologist, who would have the authority to stop activities in order to avoid a take, would directly oversee all activities. No vehicles would be used in the arroyo channel bottom for erosion repair, removal of sediments or vegetation, or for collection of vegetation cuttings, except in those locations that contain concrete aprons that periodically may require scraping (LLNL 1998a).

E.2.1.9.2 *Maintenance for Other Onsite Drainage Systems*

Mitigation for the other drainage system maintenance activities in the DRB and B571 wetland would follow the same safeguards established for the Arroyo Las Positas Maintenance Program in Section E.2.1.9.1. These measures were previously coordinated and approved by the USFWS (LLNL 1998a, USFWS 1998).

E.2.1.9.3 *Bullfrog Management Plan*

Mitigation for bullfrog management was previously coordinated and approved by USFWS (DOE 2002j, USFWS 2002e). These mitigation measures would include seasonal control techniques, surveys and relocation, and water sampling.

Seasonal Control Techniques: Based on historic surveys of the Arroyo Las Positas and the DRB, the California red-legged frog metamorphoses occurs in July, therefore any control technique would occur after August 1 and before February.

Surveys and Relocation: Intensive nocturnal surveys would be completed prior to either control technique. Adult California red-legged frogs detected within a control area would be captured and fitted with a radio transmitter and left in place or relocated to the Arroyo Las Positas as described in the 10(a)(l)(A) Federal Fish and Wildlife Permit Number TE053672-0.

Water Sampling: If rotenone is used, pretreatment and post treatment water sampling would be completed to ensure that rotenone is not released from the control area before it has degraded to accepted regulatory levels.

E.2.1.9.4 *Construction Activities*

Mitigation for the construction activities would follow the same safeguards established for the Arroyo Las Positas Maintenance Program provided in Section E.2.1.9.1. These measures were previously coordinated and approved by USFWS (LLNL 1998a, USFWS 1998).

E.2.1.9.5 *Maintenance of Security Buffer Components Located in Formerly Designated Critical Habitat for the California Red-Legged Frog*

Mitigation for the maintenance of security buffer components (e.g., weed control along fences and mowing of grass and other vegetation in the buffer zones) would follow the safeguards provided in Section E.2.1.9.1. These measures were previously coordinated and approved by USFWS (LLNL 1998a, USFWS 1998).

E.2.1.9.6 *Demolition, Routine Maintenance, Herbicide Control, and Vehicle Traffic*

Mitigation for the demolition and routine maintenance activities would follow the same safeguards established for the Arroyo Las Positas Maintenance Program provided in Section

E.2.1.9.1. These measures were previously coordinated and approved by USFWS (LLNL 1998a, USFWS 1998). Herbicide application would be conducted in accordance with EPA pesticide label, and ground areas subject to spraying would be surveyed by a LLNL wildlife biologist to prevent adverse impacts to the California red-legged frog. No specific mitigation measure is proposed for vehicle traffic. However, the limited number of vehicles operating at night at the Livermore Site would help to minimize transportation impacts to the California red-legged frog.

E.2.1.10 *Compensation and Set-Asides*

Mitigation credits for a total of 17 acres of offsite habitat could be necessary as DOE compensation for annual arroyo maintenance impacts; CERCLA-related discharges of water to the arroyo, (which will subsequently be eliminated); and site-wide habitat modifications resulting from operational activities. The intent of this subsection is to describe the process for estimating comprehensive offsite mitigation bank values for known site-wide impacts to frogs and habitat in 1998 and in the future at LLNL. Based on the following calculations provided in the amended biological assessment submitted in June 1998 and approved by USFWS in August 1998 (LLNL 1998a, USFWS 1998), a 17-acre area of compensation is proposed as appropriate:

1. Total mitigated wetland acreage for CERCLA-related water discharge cessation into the arroyo in the future = 10 acres.

The additional water LLNL is responsible for adding to the arroyo from groundwater remediation efforts allows approximately 10 acres of the arroyo to remain inundated perennially from the DRB outfall to the Patterson Pass Road overpass. This area is delineated as wetland habitat.

2. Total mitigated acreage for the remaining arroyo habitat impacts due to maintenance (annual dredging, etc., which affects various sections of habitat quality for 2 years each) = 4 acres.

    a. Calculation of overall acreage:
    The arroyo drainage consists of the following areas (see Figure E.2.1.5.2–1):
    16 acres total (7,000 feet × 100 feet mainstem) - 10 acres (see above) = 6 acres
    + 1.8 acres (800 feet × 100 feet central tributary)
    + 2.3 acres (1,000 feet × 100 feet tributary) = 10.1 acres

    b. Calculation of appropriate mitigable acreage:
    A 40 percent compensation calculation due to annual maintenance impacts would be applied only to the 10.1 acres (DRB to Greenville Road infall plus two tributaries) that are not part of the CERCLA mitigation acreage (DRB to Patterson Pass Road).
    10.1 acres total × 20 percent/year (× 2 years) = 4.0 acres

3. Potential impacts to California red-legged frogs or habitat in locations (DRB, southern tributary, and B571 wetland) outside Arroyo Las Positas could total 3 acres.

The site-wide habitat consists of the following areas:
Mitigation Value *

5.5 acres (800 feet × 300 feet DRB)	× .25
0.5 acres (200 feet × 100 feet southern tributary)	× 1.0
0.7 acres (300 feet × 100 feet B571 tributary)	× 1.0
Total= 3.0 acres	

* The numeric mitigation value expresses the impact to the habitat value expected in each area as a result of planned maintenance or project construction. The DRB habitat would not likely be altered over time. The southern tributary would be filled and moved to the east when another facility is constructed at its location. The B571 tributary would require infrequent trimming of cattails and wetland vegetation to satisfy flood capacity requirements.

4. Therefore, total compensatory offsite acreage would be 17 acres. The 1:1 mitigation ratio identified in the 1997 biological assessment would be applied. The additional 0.5:1 identified in the 1997 biological assessment would not need to be applied to this revised project because a loss of connectivity would not occur in the arroyo system as part of the revised project (LLNL 1998a).

10 acres (CERCLA-related discharges)
4 acres (loss of habitat in transition due to maintenance)
3 acres (potential future site-wide impacts)
17 acres TOTAL

E.2.1.11 *Conclusion and Determination*

Under the Proposed Action, the amended Arroyo Las Positas Maintenance Project and Site-wide Drainage Systems and future cessation of treated groundwater discharge could adversely affect the California red-legged frog by causing take of an individual or individuals and loss of in-stream habitat. As a result of the redesign of the proposed Maintenance Project, the near-future effect on the frog population and habitat at LLNL, as well as for dispersal of frogs within the arroyo continuum, would be considered positive. The bullfrog management program would have a positive effect on the California red-legged frog population at LLNL. The cumulative effects of the project should, in fact, result in the enhancement of breeding and hiding pools for the frog onsite, protection of a wetland community, and conservation for potential future loss of specific site-wide habitat values by appropriate offsite compensation. Take-avoidance mitigation measures would also be implemented during all components of the maintenance plan in the arroyo and site-wide drainage systems to protect frogs and their offspring.

Construction-related projects may affect (but are not likely to adversely affect) the California red-legged frog. Proposed Livermore Site construction activities for the next 10 years would not be in areas where the California red-legged frog is routinely present. Direct effects would be minimized through implementation of pre-construction surveys.

Demolition of facilities would be likely to provide a long-term indirect benefit to the California red-legged frog. With approximately 85 percent of the Livermore Site already developed, any demolition of existing structures would help reduce the amount of developed land. Direct effects would be minimized through implementation of pre-demolition surveys.

Maintenance of facilities, paved roads, and utilities may affect (but are not likely to adversely affect) the California red-legged frog. These operations would occur primarily within upland areas at the Livermore Site. Maintenance activities would continue to be routinely reviewed by LLNL wildlife biologists to minimize the potential for direct effects on this amphibian.

Landscaping and grounds maintenance activities may affect (but are not likely to adversely affect) the California red-legged frog. However, because the landscaping and grounds maintenance activities would continue to avoid known wetland breeding areas and associated nonbreeding areas, these activities would pose a minimal risk to California red-legged frogs.

Herbicide application may affect (but are not likely to adversely affect) the California red-legged frog. Herbicides would have minimal impact on this species when used in accordance with their EPA pesticide label instructions. Also, herbicide projects would proceed only after approval is received from LLNL wildlife biologists.

Vehicle traffic may affect (but is not likely to adversely affect) the California red-legged frog. However, the potential impact is reduced because the majority of traffic occurs during the daylight hours when adults of this species are not typically active; most of the California red-legged frog breeding and nonbreeding areas are in less developed parts of the site; and migrations of this species are infrequent.

E.2.2 Site 300

E.2.2.1 *Introduction*

Site 300, an NNSA facility, is located in San Joaquin and Alameda counties, California. This part of the biological assessment relates to continuing Site 300 activities under the Proposed Action: grading and maintaining fire trails; storm drainage system maintenance; culvert improvement and installation; prescribed annual burning; proposed termination of surface water releases; construction related projects; decontamination and demolition of facilities; maintenance of facilities, paved roads, and utilities; landscaping and grounds maintenance; herbicide application and disking; invasive species control; ground squirrel control; vehicle traffic; explosive testing; high explosive process water surface impoundments and a sewage oxidation pond. The biological assessment has been prepared to determine the extent that which these Proposed Action activities would affect any of the threatened or endangered species, or their critical habitat listed below. This biological assessment has been prepared in accordance with legal requirements set forth under Section 7 of the *Endangered Species Act* (16 U.S.C. §1536[cj]).

E.2.2.2 *Affected Species*

The species considered in this biological assessment are:

- California red-legged frog (*Rana aurora draytonii*), a federally listed threatened species (61 FR 25813-25833)

- Alameda whipsnake (*Masticophis lateralis euryxanthus*), a federally listed threatened species (62 FR 64306)

- California tiger salamander (*Ambystoma californiense*), a federally listed proposed threatened species (68 FR 28649)

Based on habitat assessments, field surveys, and distribution data, the California red-legged frog, Alameda whipsnake, and California tiger salamander were identified as either having the potential to occur or as occurring at the Site 300 Proposed Action project areas. The areas pertaining to the Proposed Action addressed in this biological assessment include formerly designated critical habitat for the Alameda whipsnake and California red-legged frog (Figure E.2.2.2–1).

E.2.2.2.1 *Critical Habitat*

E.2.2.2.1.1 Alameda Whipsnake

Although critical habitat for the Alameda whipsnake was established by USFWS on October 3, 2000, 400,000 acres of that critical habitat were rescinded by a recent court order (CC Times 2003). Site 300 contains about 1,592 acres of formerly designated Alameda whipsnake critical habitat (Figure E.2.2.2–1). It is possible that during the next few years that critical habitat for this species may be reinstated again at Site 300 when the USFWS publishes a new critical habitat proposal. Primary constituent elements for the Alameda whipsnake include habitats that support scrub communities such as mixed chaparral, chamise-redshank chaparral, coastal scrub, annual grassland, and oak woodlands adjacent to scrub habitats (65 FR 58933). The formerly designated critical habitat within Site 300 contains many the Alameda whipsnake primary constituent elements, including annual grassland and oak woodland habitats linked to sage scrub habitats and rock outcrops (Jones and Stokes 2001).

E.2.2.2.1.2 California Red-Legged Frog

Although critical habitat for the California red-legged frog was established by the USFWS on March 13, 2001, most of that critical habitat has been rescinded by a court order (USDCDC 2002). However, it is possible that during the next few years the critical habitat for this species may be reinstated again at Site 300 when the USFWS publishes a new critical habitat proposal (USFWS 2003). Site 300 contains approximately 4,050 acres of formerly designated California red-legged frog critical habitat, (60 percent of the Site 300). Primary constituent elements for the California red-legged frog include both aquatic and upland habitat where suitable breeding and nonbreeding habitat are intermingled throughout the landscape and are interconnected by continuous dispersal habitat (66 FR 14626 March 13, 2001) (Jones and Stokes 2001).

E.2.2.3 *Unaffected Species*

The large-flowered fiddleneck (*Amsinckia grandiflora*) is federally listed as endangered (50 FR 19374, May 8, 1985) and state-listed as endangered. The large-flowered fiddleneck occurs in two populations (one experimental and one natural) in designated critical habitat near Building 858 (LLNL 2001bb). A small population of this species has also been known to occur in Draney Canyon, near the Site 300 Alameda/San Joaquin county line, but this population has not been observed since 1997. A portion of Site 300 (640 acres) is designated critical habitat for this species; however, there would be no affect on this species or its critical habitat as a result of the Proposed Action activities (refer to Figure E.2.2.2–1). Dr. Tina Carlsen monitors this population of large-flowered fiddleneck at Site 300 (Jones and Stokes 2002a). Any future projects that could affect this species or its critical habitat would be evaluated separately.

The San Joaquin kit fox (*Vulpes macrotis mutica*) is federally listed as endangered (32 FR 4001) and state-listed as threatened. Protocol-level surveys were conducted for this species in 1991, and hundreds of project-specific surveys have been conducted at the site since 1993. No kit fox were recorded at Site 300 in 1991 and none have been detected there in subsequent surveys, including a recent mammal (mesocarnivore) survey in 2002 (CSUS 2003). Available data suggest that Proposed Action projects would not likely affect the San Joaquin kit fox. Although no kit fox were observed in the above-mentioned surveys, LLNL wildlife biologists continue to monitor for the presence of kit foxes at Site 300 due to records of this species in the vicinity of the site. A comprehensive mitigation and monitoring plan was developed for this species in the 1992 LLNL EIS/EIR (LLNL 1992a).

The valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) is federally listed as a threatened species (45 FR 52803). Protocol level surveys were conducted in 1991 and project-specific surveys have been conducted at Site 300 since 1993. No beetles were detected at Site 300 during any of those surveys. In May of 1997, USFWS issued Site 300 a biological opinion for pruning elderberry shrubs along the edge of a fire trail in the southeast corner of the site for three separate time periods. One pruning occurred in May/June 1997, and no beetles or evidence of beetles were detected (Jones and Stokes 2001). In 2002, four surveys were conducted during April and May at Site 300 for the valley elderberry longhorn beetle and its host, the blue elderberry plant. Elderberry plants were found at six locations at Site 300 and two locations on adjacent land southeast of Site 300 in a CDFG preserve. During these surveys, 10 exit holes, considered to be from valley elderberry longhorn beetles, were found in elderberry plants. Additionally, six adult beetles were observed in a canyon just north of Elk Ravine, with two of the adults clearly exhibiting identifying characteristics of the valley elderberry longhorn beetle (Arnold 2002). No facility construction activities would be allowed to occur within a 300-foot radius of known locations of elderberry bushes without prior consultation with the USFWS. Because of these protective measures, the valley elderberry longhorn beetle would not be adversely affected.

Two seasonal pools at Site 300 were altered prior to 1990 to make them deeper. Protocol-level surveys were conducted at these two sites in 1991; no vernal pool fairy shrimp, vernal pool tadpole shrimp, or longhorn fairy shrimp were identified in the pools. During a 2001–2002 wet season survey, the California fairy shrimp (*Linderiella occidentalis*), a Federal species of concern, was found in a vernal pool (FS-04) in the northwest part of Site 300. Another branchiopod, the California clam shrimp (*Cyzicus californicus*), which is not on Federal or California special status species lists, was also found in this vernal pool (Jones and Stokes 2001, Condor Country Consulting 2002). However, because the Proposed Action projects would not affect these two seasonal pools, listed shrimp species are not considered in this biological assessment.

The Swainson's hawk (*Buteo swainsoni*) is state-listed as threatened by the CDFG. This hawk was observed in 1994 on the southeastern perimeter of Site 300 and the adjacent CDFG Ecological Reserve. The Swainson's hawk nests within riparian habitats and is often associated with alfalfa crops and other forms of agriculture. This species was observed within close proximity to Site 300, but probably forages occasionally within the site boundaries (LLNL 2003by). The Swainson's hawk is not considered in this biological assessment because Proposed Action projects would not likely affect the occasional foraging activity at Site 300.

The willow flycatcher (*Empidonax traillii*) is state-listed as endangered by the CDFG. This flycatcher was observed for the first time at Site 300 during a constant effort mist netting survey in Elk Ravine in 2003 (LLNL 2003ac). The willow flycatcher was observed in part of Elk Ravine that is not being affected by continuing activities and is not anticipated to be adversely impacted.

E.2.2.4 *Consultations to Date*

- 1990–1991 EIS/EIR (Appendix F) biological assessment consultations.
- Spring 1994: Site 300 biologists informally consulted with USFWS on a proposed sewage pond maintenance project at Site 300 when the California red-legged frog was proposed endangered.
- May 1997: USFWS issued a biological opinion with mitigation measures identified for the valley elderberry longhorn beetle habitat alteration along a Site 300 fire trail.
- 1998 to present: Numerous informal Section 7 consultations with USFWS for project-specific activities that could, as proposed, indirectly affect threatened and endangered species (e.g., the California red-legged frog or the Alameda whipsnake) or their habitat.
- December 20, 2000: Site 300 biologist Jim Woollett met with biologist Curt McCasland of USFWS to discuss the proposed and ongoing project activities for annual maintenance and operational activities within developed areas at Site 300 and within critical habitat areas for the California red-legged frog and the Alameda whipsnake at Site 300. A subsequent telephone conversation on the same topic between Mr. Woollett and Mr. McCasland occurred on January 22, 2001. Formal consultation was not required for these maintenance projects because they will be conducted in developed, industrial areas, which do not contain the species and do not comprise the primary constituent habitat elements for the species.
- March 2, 2001: Site 300 submitted a technical assistance request to USFWS for proposed maintenance and operational activities in the Alameda whipsnake and California red-legged frog critical habitat.

- May 2001: Phone conversation and field meeting with USFWS biologist Don Hankins indicated that formal consultation was required for the proposed project (fire trail maintenance, storm drain system maintenance, culvert improvements and installations, prescribed burning, and termination of cooling tower water releases) that had been included in the technical assistance request.

- September 10, 2001: A species list was received from USFWS. The list includes species potentially occurring at the project site that are listed as threatened, endangered, or proposed for such listing under the *Endangered Species Act*.

- September 20, 2001: LLNL staff met with USFWS biologist Don Hankins to discuss the several continuing operators and their potential effects on the California red-legged frog, California tiger salamander, and the Alameda whipsnake and their habitats. This biological assessment incorporates avoidance and mitigation measures and enhancement opportunities discussed at that meeting.

- December 6, 2001: NNSA submitted the November 2001 biological assessment to USFWS for continuing operations at Site 300.

- May 17, 2002: USFWS issued a biological opinion that continuing operations as described in the biological assessment are not likely to jeopardize the continued existence of the California red-legged frog or the Alameda whipsnake at Site 300 and also are not likely to destroy or adversely modify their designated habitat at this facility (USFWS 2002b).

- October 28, 2002: USFWS provided a species list for both the Livermore Site and Site 300 for the LLNL SWEIS (USFWS 2002d).

E.2.2.5 *Proposed Action Project Activities*

The Proposed Action would comprise 15 Site 300 management activities: (1) grading and maintaining fire trails; (2) ongoing program of maintenance of the storm drainage system; (3) improving and installing culverts; (4) prescribed annual burning; (5) termination of surface-water releases from Buildings 827, 851, and 865; (6) construction related projects; (7) demolition of facilities; (8) maintenance of facilities, paved roads, and utilities; (9) landscaping and grounds maintenance; (10) herbicide application and disking; (11) invasive species control; (12) ground squirrel control; (13) vehicle traffic; (14) explosive testing; and (15) explosive process water surface impoundments and sewage oxidation pond.

The biological opinion (1-1-02-F-0062) for the continuing operations of Site 300 authorized the incidental take of 25 California red-legged frogs and 5 Alameda whipsnakes during fire trail grading, storm drainage system maintenance, culvert improvement and installation activities, prescribed burns, and termination of surface water releases from several buildings (USFWS 2002b). However, the Proposed Action for this LLNL SW/SPEIS includes a number of additional projects noted above. Therefore, NNSA requests that the level of incidental take of California red-legged frogs and Alameda whipsnakes be modified to address all Site 300 operations included in this LLNL SW/SPEIS.

Although critical habitat was formerly designated for the California red-legged frog and the Alameda whipsnake at Site 300, the designation has been rescinded. The USFWS may redesignate critical habitat for these species during the 10-year period covered by the LLNL SW/SPEIS (USDCDC 2002, USFWS 2003, CC Times 2003). Therefore, NNSA may request a conference on this topic.

This section of the biological assessment discusses the temporal and spatial effects that the proposed project activities at Site 300 may have on federally listed threatened, endangered, proposed, and candidate species and their critical habitats, and outlines mitigation measures that would be specific to those effects. Mitigation measures would be implemented as identified in sections on continuing activities (see also Section E.2.2.5.16).

E.2.2.5.1 *Grading and Maintaining Fire Trails*

An 85-mile system of dirt fire trails currently allows vehicle access to all areas of Site 300 (Figure E.2.2.5.2–1). The purpose of the trails is to curtail onsite and offsite movement of wildfires. Fire trails also provide the only access to remote areas of Site 300 for fire protection and security personnel. Annual fire trail grading has been performed in late April and early May since 1953, when the trails were first cut. Grading is generally very shallow across the surface of the trail.

E.2.2.5.2 *Storm Drainage System Maintenance*

Storm drain systems associated with roadways are periodically cleaned to remove debris. This activity minimizes potential for flooding and subsequent erosion of nearby facilities and support structures. Figure E.2.2.5.2–1 identifies locations where storm drainage system maintenance and general maintenance would occur.

Maintenance of culverts involves hand tools such as shovels, or heavy equipment such as backhoes, and is generally performed during the dry season or when water is not present. Maintenance at these crossings could include the removal of vegetation from existing wetlands and drainages. This activity would be infrequent, however, and generally would be conducted in late summer, when California red-legged frog adults and tadpoles can be verified as no longer present in waterbodies. The following maintenance activities could be involved in keeping watercourses and drainages operational:

- Erosion repairs and preventive measures, including installation or repair of riprap or gabion structures
- Fill and installation of jute netting, or other erosion control fabrics
- Removal of storm debris such as branches, silt, and trash
- Watershed upgrades with additional or relocated inlets

E.2.2.5.3 *Culvert Improvement and Installation*

Four sites have been identified (Figure E.2.2.5.2–1) where existing culverts should be upgraded or new culverts installed to prevent upland runoff from cutting through fire trails and to reduce sediment load in nearby drainages. NNSA proposes to install new culverts or replace culverts as follows:

- Replace one existing culvert, approximately 18 to 24 inches in diameter, at the Oasis wetland with two culverts, each 24 inches in diameter and 60 feet long, to transport water down the slope. The eroded slope would be replaced with approximately 200 cubic yards of native soil. After the culvert is laid and the slope has been rebuilt, the slope would be stabilized with an erosion-control blanket and an appropriate erosion-control seed mix.
- Install two new culverts at Round Valley, each 36 inches in diameter and 40 feet long.
- Install a new culvert at Lower Elk Ravine, 48 inches in diameter (or smaller) and 40 feet long.

E.2.2.5.4 *Prescribed Annual Burning*

Grassland areas immediately surrounding shot facilities and specific locations on the Site 300 perimeter are burned annually under prescribed conditions (Figure E.2.2.5.4–1). The purpose of the prescribed burns is to prevent wildfires.

This maintenance activity has taken place since the site began operations in 1955. Each year, typically during the last week in May through the first week in July, approximately 2,000 acres are burned (Jones and Stokes 2001, LLNL 2003q). Figure E.2.2.5.4–1 denotes the areas subject to prescribed burning. No riparian, wetland, or sage scrub habitats are affected by the burning activity. These prescribed burns move quickly with relatively low heat due to the frequency of burning and low overall fuel volume. In addition to this burning activity, a small portion in the experimental large-flowered fiddleneck population is annually burned according to a study design approved by USFWS (LLNL 2001bb).

Approximately 620 acres of designated California red-legged frog critical habitat and approximately 385 acres of designated Alameda whipsnake critical habitat fall within a scheduled prescribed burn area at Site 300 (Figure E.2.2.5.4–1) (USFWS 2002b).

There is a confirmed beneficial result of annual burning on native plants such as bunchgrass (BioSystems 1986a); a native bunchgrass prairie habitat occurs at Site 300 almost solely within the prescribed burn areas.

E.2.2.5.5 *Termination of Surface Water Releases*

Some buildings at Site 300 have used or continue to use cooling tower systems that circulate water to cool buildings and equipment. A byproduct of the cooling tower systems is a regular release of blowdown water into proximal drainages. These regular water releases have inadvertently created perennial wetlands of various sizes adjacent to the towers (Table E.2.2.5.5–1, Figure E.2.2.5.5–1).

Potable water is supplied to the artificial wetlands at Buildings 827, 851, and 865 since their cooling tower water supply has ceased. In 1996, for example, operations at Building 865 were discontinued and the facility was designated inactive. Potable water was then supplied to the wetland originally created by this cooling tower. Potable water was also supplied to wetlands at Buildings 851 and 827 following a project in 1994 to redirect the cooling tower water to subsurface leach fields to comply with regional water board requirements to eliminate these discharges.

TABLE E.2.2.5.5–1.—*Summary of Wetland Features Associated with Cooling Tower Water Releases*

Cooling Tower Location	Wetland	Wetland Suitable CRLF Area Acres	Breeding Habitat Acres	CRLF or CTS Present
Building 801 (1 pool)	Artificial	0.03	0.001	None detected
Building 827	Artificial	0.03	No pools	None detected
Building 851	Artificial	0.02	No pools	None detected
Building 865 (3 breeding pools)	Artificial	0.55	0.0003	CRLF (breeding)
Total Acreage		**0.62**	**0.004**	

Source: Jones and Stokes 2001.
Note: CTS = California tiger salamander; CRLF = California red-legged frog.

The artificial wetland at Building 801, however, is still fed by cooling tower water. There are no plans to terminate water releases from Building 801; however, maintenance in the drainage channel to remove cattails would be conducted as needed. Water would not be removed from any of the wetlands created by potable water prior to development of the enhancement areas (see Section E.2.2.9.1). Because of the termination of water releases, 0.62 acre of artificial wetlands would be eliminated (Jones and Stokes 2001).

The Building 801 cooling tower has been discharging water into its associated wetland for over 20 years. The pool associated with the wetland was formed within the last year after vegetation was cleared around the culvert. Buildings 827 and 851 have been discharging potable water into the artificially created wetlands for about 7 years. Wetlands associated with Buildings 851 and 827 do not have standing water.

At Building 865, a 0.55-acre wetland was artificially created over 16 years ago by cooling tower surface water releases. This is the only artificially created wetland that contains California red-legged frogs. There are three California red-legged frog breeding pools associated with this wetland; each pool is approximately 7 feet in diameter, and all are located below outfall culverts.

E.2.2.5.6 *Construction Related Projects*

Under the Proposed Action, the Energetic Materials Processing Center (EMPC) would be constructed at Site 300 (see Figure E.2.2.5.6–1). This planned facility would be comprised of approximately 40,000 square feet and would be located in the southeast quadrant of Site 300. The facility would replace Buildings 805, 806, and 813. The operations of Building 807 would move to this center, but Building 807 would be retained and waste packaging operations from Building 805 would be moved to Building 807. The EMPC would house modern explosives machining, pressing, assembly, inspection, and some radiography. An additional building would provide an inert machine, offices, and shower/change room facilities. Three magazines capable of storing 1,000 pounds of explosives each would also be built (LLNL 2002ap).

Two projects would be constructed if either the Proposed Action or the No Action Alternative were selected. The first would be a wetland enhancement project previously coordinated with the USFWS involving the enhancement and protection of 1.86 acres of wetland after the termination of artificial wetlands near Buildings 801, 827, 851, and 865. This project is discussed in Section E.2.2.5.5 (Jones and Stokes 2001, USFWS 2002b). The second project would involve receipt of water from the Hetch Hetchy water system as a part of the Site 300 Revitalization Project as described in Appendix A of this LLNL SWEIS. Construction aspects of this second project have already been completed.

E.2.2.5.7 *Decontamination and Demolition of Facilities*

Under the Proposed Action, Building 808 at Site 300 would be decontaminated and demolished. After the structure has been demolished, the area would be landscaped for soil retention. This building would be demolished if either the Proposed Action or the No Action Alternative were selected.

E.2.2.5.8 *Maintenance of Facilities, Paved Roads, and Utilities*

LLNL would continue to maintain facilities, paved roads, and utility systems at Site 300 in support of the site mission. Utilities maintained would include water, electrical, fuel, and sewer systems. These operations would occur primarily within developed areas representing less than 5 percent of the total site acreage.

E.2.2.5.9 *Landscaping and Grounds Maintenance*

LLNL would continue to conduct landscaping and grounds maintenance operations at the Site 300 in support of the site mission. These activities would include mowing lawns; trimming shrubbery; planting and maintaining plant species at various locations on Site 300; and performing site landscaping. Landscaping and grounds maintenance activities would occur primarily within developed areas representing less than 5 percent of the total site acreage.

E.2.2.5.10 *Herbicide Application and Disking*

For general weed and fire control at Site 300, herbicides such as Krovar®, Oust®, and Roundup Pro® would be applied in the fall and winter to the road shoulders, around buildings, and around power poles in the firing areas. In the remainder of the GSA and around landscaped areas, road shoulders, and around power poles, herbicides such as Roundup Pro®, Ronstar®, and Pendulum®, would be applied in the fall and winter months, avoiding areas where sensitive plant species exist. Area around Environmental Restoration Division test wells would be sprayed for weed control whenever necessary with Roundup Pro® (LLNL 2003ah).

Most of the property has not been disked or dry-farmed since it was acquired. Infrequently, a narrow swath of land would be disked along the northern, and part of the northeastern and eastern boundaries of the site. This perimeter disking, when done, would be performed in May, providing added protection during prescribed burning against the possible escape of fire to offsite properties. Although disking would remain an option (depending on seasonal conditions), prescribed burning would be preferred for wildfire control (LLNL 2003ah).

E.2.2.5.11 *Invasive Species Control*

Field bindweed (*Convolvulus arvensis*), bull thistle (*Cirsium vulgare)*, Italian thistle (*Carduus pycnocephala*), Mediterranean mustard (*Hirschfeldia incana*), milk thistle (*Silybum marianum*), and yellow star-thistle (*Centaurea solstitialis*) are among the invasive plant species present at Site 300 (Jones and Stokes 2002a). A formal invasive species control program has not been established at Site 300. However, annual prescribed burns have been used elsewhere against certain invasive plant species such as yellow starthisle, which is present at Site 300 (see Section E.2.2.5.4) (Lass et al. 1999). Prescribed burns could have an ancillary benefit in controlling this species (Pollak and Kan 1998). Additionally, the design for the enhanced wetlands at the Super High Altitude Research Project (SHARP) Facility would include measures to reduce the establishment of invasive plants (see Section E.2.2.9.2).

The bullfrog, a known predator of the California red-legged frog, has not been observed at Site 300. However, if it should be detected there, then a bullfrog management program would be implemented with the same procedures described for the Livermore Site in Section E.2.1.5.2.

The feral pig (*Sus scrofa*), a known predator of the California red-legged frog, is occasionally removed from Site 300 and would continue to be removed, as necessary (LLNL 2003ab).

E.2.2.5.12 *Ground Squirrel Control*

Presently, there is no active ground squirrel control program anywhere at Site 300. Control would be done, on an as needed basis, around the explosive process water surface impoundments, using Fumitoxin (aluminum phosphide) fumigant, traps, or zinc phosphide treated grain bait stations (LLNL 2003ah).

E.2.2.5.13 *Vehicle Traffic*

Vehicle traffic at Site 300 is limited primarily to the small staff of workers required to maintain and operate this site. Most of the vehicle traffic would continue to occur during daylight hours, with nighttime vehicle traffic continuing to be being sparse.

E.2.2.5.14 *Explosive Testing*

At Site 300, three primary outdoor explosives testing facilities are approximately 1 mile from the site's northern border. Explosives testing would be conducted almost entirely during the day. The explosions would occur on a daily to weekly basis. A fourth explosives testing facility is now enclosed.

E.2.2.5.15 *Explosive Process Water Surface Impoundments and Sewage Oxidation Pond*

Explosive process water surface impoundments and a sewage oxidation pond are present at Site 300. The impoundments are lined with a high-density polyethylene liner.

E.2.2.5.16 *Schedule of Continuing Activities*

- Fire trail grading would occur annually from approximately April through mid-June, with April and May typical.

- Prescribed burning would occur annually typically from the last week of May through the first week of July, depending on weather conditions.

- Removal of storm debris such as branches and trash from the storm drainage system would be conducted as needed.

- Vegetation and sediment removal around culverts would occur during the dry season, prior to October 15.

- Culvert improvement and installation activities also would occur during the dry season, prior to October 15.

- Termination of water release would occur only when California red-legged frog mitigation sites are established. The preferred time to terminate water release would be at the end of the dry season (late September to early November).

- Construction and demolition projects would be conducted at the times indicated in Chapter 3 under the No Action Alternative, Proposed Action, and Reduced Operation Alternative and Appendix A of the LLNL SW/SPEIS.

- Other recurring operations would be performed as needed.

E.2.2.6 *Potential Effects of the Proposed Action Activities on Threatened and Proposed Threatened Species*

This section describes the potential direct and indirect effects of Proposed Action activities on the California red-legged frog, California tiger salamander, and the Alameda whipsnake. The primary direct-effect mechanisms considered in this biological assessment would include fire trail grading; prescribed burns; storm drainage system maintenance, improvement, and culvert installation; termination of surface water releases; construction related projects; decontamination and demolition of facilities; maintenance of facilities, paved roads, and utilities; landscaping and grounds maintenance; herbicide application and disking; invasive species would control; ground squirrel control; vehicle traffic; explosive testing; and operation of high explosive process water ponds and sewage lagoon. Potential indirect effects on listed species would include degradation of water quality and formation of barriers to migration/dispersal. A discussion of the direct and indirect effects for each species follows.

E.2.2.6.1 *California Red-Legged Frog*

E.2.2.6.1.1 Direct Effects

E.2.2.6.1.1.1 Burning and Fire Trail Grading

There would be no direct effect on the California red-legged frog's primary constituent elements or its formerly designated critical habitat as a result of burning or fire trail grading. Approximately 620 acres of formerly designated California red-legged frog critical habitat falls within a prescribed burn area, all of which is upland grassland habitat (USFWS 2002b). It is unlikely that modification of this habitat would cause the direct mortality of any individual frogs, for four reasons: (1) perennial aquatic habitat where some frogs spend a majority of the year is not burned; (2) prescribed burning would occur typically from May through July, outside the dispersal period, thereby reducing the potential for direct effects on individual California red-legged frog from fire trail grading or burning in upland habitat; (3) most areas are burned annually and the fires do not generate much heat and California red-legged frog, using upland burrows for aestivation, are unlikely to be affected by a low-intensity fire; and (4) the grading of fire trails would occur along existing trails, previously disturbed (Jones and Stokes 2001).

E.2.2.6.1.1.2 Storm Drainage System Maintenance

This activity would occur during the dry season. However, there could be some water remaining in the storm drainage system. Sediment removal would improve frog habitat and thus have a positive effect on the population, but it could also lead to mortality of individual frogs. Therefore, any wet drainages would be inspected by a biologist prior to and during excavation.

E.2.2.6.1.1.3 Culvert Improvement and Installation

These activities at the Oasis, Round Valley, and Lower Elk Ravine locations would have the potential to result in direct mortality of individual frogs. However, because work would be conducted during the dry season, it is unlikely that the replacement and installation of new culverts would directly affect frogs. Mitigation and avoidance measures to further minimize potential for direct effects on the California red-legged frog or its habitat are provided in E.2.2.6.1 (Jones and Stokes 2001).

E.2.2.6.1.1.4 Termination of Surface Water Releases

This activity would directly affect the California red-legged frog and its habitat by eliminating the source of water sustaining one wetland where frogs are known to occur (Jones and Stokes 2001).

Affected Site 1: Building 865 Wetland

This artificially created wetland consists of three small pools below culvert outfalls and a 328-foot long wetland. The wetland is choked with cattails (in the foreground of the upper photo in Figure E.2.2.6.1.1.4–1). Pools average 7 feet in diameter; three of the four are known breeding locations for California red-legged frogs. The Site 300 biologist has monitored this pond for 6 years; frogs have been present at the site each year (Jones and Stokes 2001).

Removal of the artificial water source currently supplied to the Building 865 wetland would affect 0.55 acre of wetland habitat and approximately 0.003 acre of breeding habitat (Jones and Stokes 2001).

Affected Site 2: Building 801 Wetland

This site consists of a small pool and associated wetland. The pool, sparsely vegetated with cattails, is roughly 6.6 feet in diameter with an area of less than 0.001 acre. The wetland, heavily vegetated with cattails, is 0.03 acre in area. Water has been discharged into this wetland for a number of years; however, the pool has only existed since the outfall below the culvert was cleared of vegetation. Although the California red-legged frog does not occur at this site, the pool provides potential breeding habitat for this species. This wetland would continue to be fed by the Building 801 cooling tower; therefore, no net impact would be expected (Jones and Stokes 2001).

Affected Sites 3 and 4: Buildings 851 and 827 Wetlands

The cooling towers at Buildings 851 and 827 have associated wetlands of less than 0.02 acre for both sites. There is no standing water at either of these locations, and neither wetland provides occupied California red-legged frog habitat. The Site 300 biologist has monitored these wetlands consistently for the last 6 years and has never observed a California red-legged frog at either wetland. The termination of water from the two sources would impact low-quality California red-legged frog habitat.

E.2.2.6.1.1.5 Construction Related Activities

Under the Proposed Action, construction of the EMPC would result in the disturbance of approximately 40,000 square feet of soil at Site 300. A field reconnaissance of the proposed EMPC site was performed to detect the presence of special status wildlife species and/or their habitats at Site 300. No California red-legged frogs were detected in the proposed construction area (LLNL 2003ag). The construction location would be within the area at Site 300 where designated critical habitat for the California red-legged frog has been rescinded by court order until further notice (USDCDC 2002). Depending on the outcome of ongoing critical habitat litigation, it is possible that the USFWS could redesignate this area as critical habitat for the California red-legged frog.

The proposed EMPC construction would be within the dispersal capability of California red-legged frogs from breeding and nonbreeding areas in the southeastern part of Site 300. Therefore, a pre-activity survey would be conducted prior to the groundbreaking for the EMPC to minimize the potential for incidental take of California red-legged frogs.

E.2.2.6.1.1.6 Decontamination and Demolition of Facilities

It is unlikely that Building 808 decontamination and demolition activities would result in direct mortality of the California red-legged frog unless individuals of this species are present at the project site. However, this facility is located in an upland area that is not typically frequented by California red-legged frogs. The proposed decontamination and demolition would likely have minimal adverse effect on this species. The decontamination and demolition of Building 808 at Site 300 would eliminate approximately 1,500 square feet of developed space after this structure has been demolished and then landscaped for soil retention.

E.2.2.6.1.1.7 Maintenance of Facilities, Paved Roads, and Utilities

The routine maintenance of facilities, paved roads, and utilities at Site 300 would probably not result in direct mortality of California red-legged frogs, because the maintenance of facilities, paved roads, and utilities would be primarily in upland areas, which would pose minimal risk to California red-legged frogs. Additionally, these maintenance activities would be conducted during the daylight hours when this species is not typically active.

E.2.2.6.1.1.8 Landscaping and Grounds Maintenance

Landscaping and grounds maintenance activities at Site 300 would probably not result in direct mortality of California red-legged frogs, because these activities would avoid known wetland breeding areas and associated nonbreeding areas. Additionally, these activities would be conducted during the daylight hours when this species is not typically active.

E.2.2.6.1.1.9 Herbicide Application and Disking

Herbicide application at the Site 300 would be performed primarily to eliminate vegetation along security fences and on the perimeter of some facilities. Preactivity surveys for the presence of sensitive natural resources would be performed prior to disking, and Site 300 maintenance staff would receive training annually on special status species identification and distribution. The Site 300 maintenance staff would follow mitigation measures established by wildlife biologist to protect sensitive wildlife and habitats (e.g., American badger dens) from the potential effects of disking. No known mortality of special status wildlife has occurred as a result of the disking activity during the past 8 years. The perimeter-disking project would proceed only after consultation with a LLNL wildlife biologist (LLNL 2001c).

Herbicides would not be applied to aquatic habitat suitable for California red-legged frog breeding. Prior to late-fall application, ground areas subject to spraying would be assessed by a LLNL wildlife biologist. Also, herbicide projects would proceed only after consultation with the wildlife biologist (LLNL 2001c). California red-legged frog populations were lower in areas downwind from areas where agricultural pesticides are applied (Davidson et al. 2001). Herbicide applications would pose minimal risk provided the formulations are applied in accordance with EPA pesticide label instructions; under conditions with little or no wind to avoid herbicide drift; only to the extent necessary; and in accordance with the additional LLNL safeguards.

E.2.2.6.1.1.10 Invasive Species Control

The occasional removal of feral pigs, a known predator and cause of habitat degradation, would have a beneficial effect on California red-legged frogs. No bullfrogs have been observed at Site 300, so bullfrog control measures have not been required.

E.2.2.6.1.1.11 Ground Squirrel Control

The occasional control of ground squirrels with Fumitoxin (aluminum phosphide) fumigant, traps, or zinc phosphide treated grain bait stations would probably not result in direct mortality of California red-legged frogs, unless conducted in frog habitat. The impact from the application of these rodenticides would be negligible when used in accordance with their EPA pesticide label instructions.

E.2.2.6.1.1.12 Vehicle Traffic

Vehicle traffic at Site 300 could result in mortality of California red-legged frogs found on roads or fire trails. However, the risk is considered low because vehicle traffic at Site 300 would be limited; the majority of traffic would occur during the daylight hours when this species is not typically active; most of the California red-legged frog breeding and nonbreeding areas are in less accessible parts of the site and migrations of this species are infrequent. A large population of California red-legged frogs is in the Advanced Test Acceleration (ATA) drainage ditches, which are adjacent to a road. There would be some potential for frog-vehicle interaction here, although it would be low because most traffic occurs during the day.

E.2.2.6.1.1.13 Explosive Testing

Explosives testing would probably not result in direct mortality of California red-legged frogs. Additionally, the explosives testing areas are not in prime habitat for the California red-legged frog (BioSystems 1986c). Further, explosives testing would be primarily conducted during the daylight hours when this species is not typically active.

E.2.2.6.1.1.14 Explosive Process Water Surface Impoundments and Sewage Oxidation Pond

The California red-legged frog has been observed only at the overflow pond (also referred to as the percolation pond) and not at the sewage oxidation pond (Jones and Stokes 2001, LLNL 2003ab). These ponds provide suboptimal habitat and would not likely adversely affect the California red-legged frog population at Site 300.

E.2.2.6.1.2 Indirect Effects

E.2.2.6.1.2.1 Storm Drainage System Maintenance

Storm drainage system maintenance activities would indirectly benefit the California red-legged frog habitat. Previous drainage maintenance activities at Site 300 involved periodic removal of sediment in catch basins and below culverts. These activities resulted in the creation of deep pools suitable for breeding by the California red-legged frog. The continuation of this maintenance activity would maintain this additional breeding habitat.

Because the Proposed Action activities would not be expected to pose a barrier to movement of frogs during the wet season, no indirect impact to California red-legged frog would be expected (Jones and Stokes 2001).

E.2.2.6.1.2.2 Erosion

Grading of fire trails disturbs sediment that could indirectly affect the California red-legged frog by reducing habitat suitability. During a Site 300 survey in 2002, natural erosion from a fire trail crossing and inadequately designed culvert was noted to have degraded the adjacent aquatic habitat (Wetland 12 in Appendix F of this LLNL SW/SPEIS) and in Lower Draney Canyon. Wetlands in this area no longer have adequate depth to support breeding by the California red-legged frog, although breeding was noted in this area in 1999 (LLNL 2003ab). Erosion from another fire trail is shown in Figure E.2.2.6.1.2.1–1.

Source: LLNL 2003ad.

FIGURE E.2.2.6.1.2.1–1.—*Erosion in Elk Ravine above Building 812*

E.2.2.6.1.3 Mitigation and Avoidance Measures

To protect the California red-legged frog and its habitat, the following avoidance and mitigation measures would be implemented at Site 300 during maintenance activities (Jones and Stokes 2001):

- The loss of breeding habitat for the California red-legged frog at Building 865 would be offset by plans to enhance California red-legged frog habitat onsite (see Section E.2.2.9).
- All storm drainage system maintenance would be performed during the dry season, or when water is not present in the work area. In the four areas scheduled for culvert improvement or installation, a preactivity survey would be conducted within 24 hours of construction. A qualified biologist would be present during construction to examine potential burrow sites within the work zone to determine if they are occupied by the California red-legged frog.
- Prior to fire trail grading, prescribed burning, storm drainage system maintenance, and culvert improvement and installation activities, a qualified biologist would provide worker awareness training to all project personnel. This training would include recognition of California red-legged frog and its habitat.

- Construction personnel and equipment would be confined to designated work areas and approved access roads.
- If the California red-legged frog were encountered during preactivity surveys or during project activities, all work would cease until the frog is removed and relocated or the frog would be temporarily held in a wetted container. Frog collection would be performed by a USFWS-approved biologist.
- Any incidental take would be immediately reported to USFWS at (916) 414-6600.

E.2.2.6.2 *Alameda Whipsnake*

E.2.2.6.2.1 Direct Effects

E.2.2.6.2.1.1 Firetrail Grading

This activity could result in direct mortality of individual snakes from grading equipment during grading. Mitigation measures have been identified to minimize potential for direct impact of this activity on this species (see Section E.2.2.6.2.3) (Jones and Stokes 2001).

E.2.2.6.2.1.2 Storm Drainage System Maintenance, Culvert Improvement/Installation, and Termination of Surface Water Releases

Because these activities would not occur within the Alameda whipsnake habitat, they would not directly affect the Alameda whipsnake or its critical habitat. In addition, there would be no direct effects on the Alameda whipsnake from termination of water supply to the artificially created wetlands at Buildings 865, 801, 851 and 827.

E.2.2.6.2.1.3 Prescribed Burns

Prescribed burns would be anticipated to occur within 400 feet of the nearest edge of sage scrub, the primary constituent habitat elements of the Alameda whipsnake (Figure E.2.2.6.2.1.3–1). At four other locations (along the east boundary), small isolated patches of sage scrub would be close to the burn area boundary, but separated from it by a fire trail. No known fires have encroached on these areas within the past 46 years. Because Alameda whipsnakes are known to use grassland habitat within 400 feet of sage scrub and rock outcrops at Site 300, there would only be a small potential for direct mortality as a result of prescribed burns. No Alameda whipsnake mortality has been observed at Site 300 after a prescribed burn (LLNL 2001a). In addition, because the Alameda whipsnake inhabits fire-dependent communities, the species has probably acquired behavioral adaptations that minimize potential for mortality from fire (Jones and Stokes 2001). A research proposal has been coordinated with the USFWS to investigate, in greater depth, the effects of prescribed burning on the Alameda whipsnake at Site 300 and several other locations (Swaim 2002c). The USFWS has also issued a biological opinion on this project (USFWS 2002a).

E.2.2.6.2.1.4 Construction Related Activities

Under the Proposed Action, construction of the EMPC would result in the disturbance of approximately 40,000 square feet of soil at Site 300. A field reconnaissance of the proposed EMPC site was performed to detect the presence of special status wildlife species and/or their habitats at Site 300. No Alameda whipsnakes were detected in the proposed construction area (LLNL 2003ag). The proposed EMPC site would be some distance from coastal scrub habitat where the Alameda whipsnake has been observed, so it is unlikely that this project would affect this species. The proposed EMPC site is not located in formerly designated critical habitat for the Alameda whipsnake.

E.2.2.6.2.1.5 Decontamination and Demolition of Facilities

It is unlikely that Building 808 decontamination and demolition activities would result in direct mortality of the Alameda whipsnake, because this facility is not located in an area with suitable habitat for this species (see Figure E.2.2.6.2.1.3–1). Therefore, proposed decontamination and demolition would likely have minimal effect on this species. The decontamination and demolition of Building 808 at Site 300 would eliminate approximately 1,500 square feet of developed space after this structure has been demolished and then landscaped for soil retention.

E.2.2.6.2.1.6 Maintenance of Facilities, Paved Roads, and Utilities

The routine maintenance of facilities, paved roads, and utilities at Site 300 would probably not result in direct mortality of the Alameda whipsnake, although a potential for direct impact exists in the southwest portion of the site where suitable habitat for this species exists. Mitigation measures have been identified to minimize the potential for direct effects on the Alameda whipsnake (see Section E.2.2.6.2.3)

E.2.2.6.2.1.7 Landscaping and Grounds Maintenance

Landscaping and grounds maintenance activities at Site 300 would probably not result in direct mortality of the Alameda whipsnake, although a potential for direct impact exists in the southwest portion of the site where suitable habitat for this species exists. Mitigation measures have been identified to minimize the potential for direct effects on the Alameda whipsnake.

E.2.2.6.2.1.8 Herbicide Application and Disking

Herbicide application at the Site 300 would be performed primarily to eliminate vegetation along security fences and on the perimeter of some facilities. Preactivity surveys for the presence of sensitive natural resources would be performed prior to disking, and Site 300 maintenance staff would receive annual training on special status species identification and distribution. The Site 300 maintenance staff would follow mitigation measures established by wildlife biologists to protect sensitive wildlife and habitats from the potential effects of disking. No known mortality of special status wildlife has occurred as a result of the disking activity during the past 8 years. The perimeter-disking project would proceed only after consultation with a LLNL wildlife biologist (LLNL 2001c).

Herbicide formulations would pose minimal risk when applied in accordance with their EPA pesticide labels and under conditions with little or no wind so as to avoid herbicide drift. Herbicides would no be sprayed on habitat suitable for the Alameda whipsnake. Prior to late-Fall application, ground areas subject to spraying would be assessed by LLNL wildlife biologist. Also, herbicide projects would proceed only after consultation with a wildlife biologist (LLNL 2001c).

E.2.2.6.2.1.9 Invasive Species Control

The control of certain invasive plant species during prescribed burns would probably not result in direct mortality of Alameda whipsnakes, as discussed in E.2.2.6.2.1.3 Prescribed Burns. The occasional removal of feral pigs, a known predator and cause of habitat degradation has a beneficial effect on Alameda whipsnakes.

E.2.2.6.2.1.10 Ground Squirrel Control

The occasional control of ground squirrels with Fumitoxin (aluminum phosphide) fumigant, traps, or zinc phosphide treated grain bait stations would probably not result in direct mortality of the Alameda whipsnake. The impact from the application of these rodenticides would be anticipated to be negligible when used in accordance with their EPA pesticide label instructions.

E.2.2.6.2.1.11 Vehicle Traffic

Vehicle traffic at Site 300 could result in direct mortality of the Alameda whipsnake. However, the risk is considered low because vehicle traffic at Site 300 would be limited and most of the suitable habitat for the Alameda whipsnake is in less accessible parts of the site.

E.2.2.6.2.1.12 Explosive Testing

Explosives testing would probably not result in direct mortality of the Alameda whipsnake, because the test areas are not in areas with suitable habitat for the Alameda whipsnake.

E.2.2.6.2.1.13 Explosive Process Water Surface Impoundments and Sewage Oxidation Pond

Operation of the explosive process water surface impoundments and sewage oxidation pond would probably not result in direct mortality of the Alameda whipsnake, because they are not located in areas with suitable habitat for this species.

E.2.2.6.2.2 Indirect Effects

Prescribed burning would temporarily alter approximately 385 acres of grassland habitat within the formerly designated critical habitat (USFWS 2002b). No suitable coastal sage scrub habitat for the Alameda whipsnake would be affected. Burning would not take place in any of the coastal sage scrub or rock outcrops or in any grassland closer than 400 feet from primary constituent habitat elements for this species.

There would be no indirect effects on the Alameda whipsnake as a result of termination of surface water releases to the artificially created wetlands or from activities associated with storm drainage system maintenance and culvert improvement/installation. Fire trail grading would not indirectly affect the Alameda whipsnake or whipsnake habitat by creating any barriers to dispersal.

E.2.2.6.2.3 Mitigation and Avoidance Measures

In order to protect the Alameda whipsnake and its habitat during annual burning and grading activities, Site 300 would implement the following mitigation and avoidance measures (Jones and Stokes 2001):

- Prior to fire trail grading and prescribed burning, a qualified biologist would provide worker awareness training to all project personnel; this training would include recognition of the Alameda whipsnake and its habitat.
- If the Alameda whipsnake were encountered during grading, work would cease until the snake is removed and relocated by a USFWS-approved biologist.
- If the Alameda whipsnake were encountered during any project activity, work would cease until the snake is removed and relocated by a USFWS-approved biologist.
- Any incidental take of this species would be immediately reported to USFWS at (916) 414-6600.

E.2.2.6.3 *California Tiger Salamander*

E.2.2.6.3.1 Direct Effects

E.2.2.6.3.1.1 Burning and Fire Trail Grading

Grading of fire trails would be unlikely to result in the direct mortality of individual California tiger salamanders, because this activity would occur during the summer, after individual salamanders have dispersed from breeding pools into upland refugia. Fire trails would be graded along previously disturbed existing trails. Song Pond, a known breeding pool for California tiger salamanders, falls within a prescribed burn area. However, burns would occur during May–July when the California tiger salamander would be below ground, thereby reducing the likelihood of direct effects this activity could have on the California tiger salamander. In addition, because these burns would occur annually and fuel load would be low, impacts associated with this activity would be reduced (Jones and Stokes 2001).

E.2.2.6.3.1.2 Storm Drainage System Maintenance

Storm drainage system maintenance could result in the direct mortality of the California tiger salamander because, these activities could occur in perennial drainages. However, because maintenance activities would be conducted in late summer or fall, it is unlikely that the California tiger salamander would occur within the Proposed Action project areas. Mitigation measures described for the California red-legged frog would further reduce potential to directly affect the California tiger salamander (Jones and Stokes 2001).

E.2.2.6.3.1.3 Culvert Improvement and Installation

These activities could result in the direct mortality of the California tiger salamander, because they could occur in areas of ponded water. However, because improvement and installation work would be conducted after the breeding season, it is unlikely that the California tiger salamander would occur within the Proposed Action project areas. Mitigation measures have been identified to further minimize potential for direct effects on the California tiger salamander or its habitat (Jones and Stokes 2001).

E.2.2.6.3.1.4 Termination of Surface Water Releases

The termination of water from Buildings 865, 851, and 827 would not directly affect the California tiger salamander; these artificial wetlands have been monitored by the Site 300 biologist for 6 years and the California tiger salamander has never been identified at these sites.

E.2.2.6.3.1.5 Construction Related Activities

Under the Proposed Action, construction of the EMPC would result in the disturbance of approximately 40,000 square feet of soil at Site 300. A field reconnaissance of the proposed EMPC site was performed to detect the presence of special status wildlife species and/or their habitats at Site 300. No California tiger salamanders were detected in the proposed construction area (LLNL 2003ah). The proposed EMPC construction would be within the dispersal capability of California tiger salamanders from areas in the southeastern part of Site 300 where this species has been observed. Therefore, a pre-activity survey would be conducted prior to the groundbreaking for the EMPC to avoid injury to California tiger salamanders.

E.2.2.6.3.1.6 Decontamination and Demolition of Facilities

It is unlikely that Building 808 decontamination and demolition activities would result in direct mortality of the California tiger salamander unless individuals of this species are present at the project site. However, this facility is in an upland area that is not typically frequented by California tiger salamanders. The proposed decontamination and demolition would likely have minimal adverse effect on this species. The decontamination and demolition of Building 808 at Site 300 would eliminate approximately 1,500 square feet of developed space after this structure has been demolished and then landscaped for soil retention.

E.2.2.6.3.1.7 Maintenance of Facilities, Paved Roads, and Utilities

The routine maintenance of facilities, paved roads, and utilities at Site 300 would probably not result in direct mortality of California tiger salamanders, because the maintenance of facilities, paved roads, and utilities would be primarily in upland areas, which would pose minimal risk to California tiger salamanders. Additionally, these maintenance activities would be conducted during the daylight hours when this species is not typically active.

E.2.2.6.3.1.8 Landscaping and Grounds Maintenance

Landscaping and grounds maintenance activities at Site 300 would probably not result in direct mortality of California tiger salamanders, because these activities avoid known wetland areas inhabited by this species. Additionally, these activities would be conducted during the daylight hours when this species is not typically active.

E.2.2.6.3.1.9 Herbicide Application and Disking

Herbicide application at Site 300 would be performed primarily to eliminate vegetation along security fences and on the perimeter of some facilities. Preactivity surveys for the presence of sensitive natural resources would be performed prior to disking, and Site 300 maintenance staff would receive annual training on special status species identification and distribution. The Site 300 maintenance staff would follow mitigation measures established by a wildlife biologist to protect sensitive wildlife and habitats (e.g., American badger dens) from the potential effects of disking. No known mortality of special status wildlife has occurred as a result of the disking activity during the past 8 years. The perimeter-disking project would proceed only after consultation with a LLNL wildlife biologist (LLNL 2001c).

Herbicides would not be applied on aquatic habitat suitable for California tiger salamander breeding. Prior to late-fall application, ground areas subject to spraying would be assessed by LLNL wildlife biologists. Also, herbicide projects proceed only after consultation with a LLNL wildlife biologist (LLNL 2001c). Herbicide applications should pose minimal risk to the California tiger salamander provided the formulations are applied in accordance with EPA pesticide label instructions; under conditions with little or no wind to avoid herbicide drift; only to the extent necessary; and in accordance with LLNL safeguards.

E.2.2.6.3.1.10 Invasive Species Control

The occasional removal of feral pigs, a known predator and cause of habitat degradation, would have a beneficial effect on California tiger salamanders. No bullfrogs have been observed at Site 300, so bullfrog control measures have not been required.

E.2.2.6.3.1.11 Ground Squirrel Control

The occasional control of ground squirrels with Fumitoxin (aluminum phosphide) fumigant, traps, or zinc phosphide treated grain bait stations would probably not result in direct mortality of California tiger salamanders unless conducted in California tiger salamander habitat. The impact from the application of these rodenticides would be negligible when they are used in accordance with their EPA pesticide label instructions.

E.2.2.6.3.1.12 Vehicle Traffic

Vehicle traffic at Site 300 could to result in mortality of California tiger salamanders found on roads or fire trails. However, the risk is considered low because vehicle traffic at Site 300 would be limited in comparison to that at the Livermore Site; the majority of traffic would occur during the daylight hours when this species is not typically active; and migrations of this species are infrequent.

E.2.2.6.3.1.13 Explosive Testing

Explosives testing would probably not result in mortality of California tiger salamanders as the explosives testing areas would not in prime habitat for the California tiger salamander (BioSystems 1986c). Further, explosives testing would be primarily conducted during the daylight hours when this species is not typically active.

E.2.2.6.3.1.14 Explosive Process Water Surface Impoundments and Sewage Oxidation Pond

The California tiger salamander has been observed at the overflow pond (also referred to as the percolation pond) only, and not at the sewage oxidation pond. This species has also been observed at the explosives process water surface impoundments (Jones and Stokes 2001, LLNL 2003ab). These ponds provide suboptimal habitat and would not likely adversely affect the California tiger salamander population at Site 300.

E.2.2.6.3.2 Indirect Effects

Fire trail grading would disturb sediment that could result in an indirect negative impact on the California tiger salamander by reducing habitat suitability. Storm drainage system maintenance would create deep pools, enhancing the California tiger salamander breeding habitat. There would be no indirect effect on this species as a result of prescribed burning, and the prescribed burning would not likely pose a barrier to movement of salamanders during the wet season (Jones and Stokes 2001).

E.2.2.6.3.3 Mitigation and Avoidance Measures

To protect the California tiger salamander and its habitat, Site 300 would implement the same avoidance and mitigation measures discussed for the California red-legged frog (Jones and Stokes 2001).

E.2.2.7 *Interrelated Actions*

Interrelated actions are part of a larger action and dependent upon the larger action for their justification. The Proposed Action operations would not be part of a larger project or plan, although a research project has been coordinated with the USFWS to evaluate the effects of prescribed burns on the Alameda whipsnake at several locations, including Site 300, as discussed in Section E.2.2.6.2.1.3, Prescribed Burns (Swaim 2002c). The USFWS has already issued a separate biological opinion on this research project that is including Site 300 as one of its study locations (USFWS 2002d). There would be no interrelated effects on listed species within the project area with the exception of the Alameda whipsnake investigation.

E.2.2.8 *Cumulative Effects*

The Proposed Action activities at Site 300 would not result in cumulative effects. Typically, cumulative effects under the *Endangered Species Act* would include all future actions "reasonably certain to occur" within the action area. There are no known additional future activities planned at Site 300 that would contribute to cumulative effects on listed species covered in this biological assessment (Jones and Stokes 2001). The incremental effect of the

Proposed Action on biological resources within the area would be positive, particularly in the long term, when taken in the context of continuing conversion of wildlife habitat for agricultural, residential, commercial, and industrial use in the vicinity of Site 300.

E.2.2.9 *Conservation and Mitigation*

One of the Proposed Action projects would remove a maximum of 0.62 acre of wetland habitat, of which the California red-legged frog occupies only 0.55 acre (Table E.2.2.5.5–1). Of the 0.55 acre, 0.003 acre of occupied California red-legged frog breeding habitat would be affected. Approximately 0.07 acre of unoccupied wetland habitat would also be affected (wetlands at Buildings 801, 827, and 851). NNSA proposes to mitigate for the 0.62-acre artificial wetland removed by protecting and enhancing selected area, and increasing breeding opportunities for the California red-legged frog and the California tiger salamander in areas where breeding habitat is limited or nonexistent. These designated areas would be managed and protected for the California red-legged frog and the California tiger salamander. A minimum of 1.86 acres of wetland habitat would be enhanced and protected for the California red-legged frog and the California tiger salamander. Three mitigation sites for potential enhancement are described in detail below.

E.2.2.9.1 *Potential Enhancement Sites*

E.2.2.9.1.1 Oasis Canyon Wetland

The Oasis Canyon wetland, comprising 1.16 acres (see Figure A-l in Appendix A), originates at an abandoned inclined mine shaft seep. In 2001, this wetland was observed to have high-quality breeding and nonbreeding habitat that would be managed (e.g., invasive species control) and protected as a natural drainage in perpetuity for the California red-legged frog (Jones and Stokes 2001). However, no breeding was noted in 2002 at this location due to sedimentation (LLNL 2003ab).

E.2.2.9.1.2 Mid Elk Ravine

Mid Elk Ravine, comprising approximately 1.6 acre, is a perennial drainage vegetated with mature willows, oaks, and cattails. The Site 300 biologist has conducted frog surveys in this drainage since 1996. Nonbreeding California red-legged frogs have been observed in the drainage, but no breeding frogs have been detected in this drainage during surveys. The drainage lacks pooled water areas of sufficient depth to provide suitable breeding habitat.

Enhancement of this drainage by creating one or more ponds in selected areas would increase suitable habitat for breeding frogs in an area where such habitat is limited. The site would allow breeding ponds of about 0.15 acre.

E.2.2.9.1.3 SHARP Facility Seep

A perennial 0.08-acre seep located in the upper Elk Ravine watershed is one of the proposed enhancement areas for the California red-legged frog and the California tiger salamander. The seep is approximately 328 feet west of Building 865 and is currently surrounded by the remains of a concrete structure. Due to close proximity to the Building 865 wetland (occupied by the

California red-legged frog), the SHARP Facility seep could provide an important breeding site for the California red-legged frog. Figure E.2.2.6.1.1.4–1 shows the SHARP Facility enhancement area. At peak capacity, the enhancement area would sustain a pond up to 0.07 acre in area with a maximum depth of approximately 4 to 6 feet. The proposed enhancement of this seep would be conducted prior to the termination of the supplied water to the Building 865 wetland.

E.2.2.9.2 *Creation of Breeding Habitat*

The proposed preservation and management activities are intended to compensate primarily for impacts on 0.55 acre of artificial wetland, part of which provides dispersal and foraging habitat for the California red-legged frog and the California tiger salamander. The first component of these mitigation actions would involve the establishment of a 1.86-acre mitigation area consisting of existing riparian and wetland resources that provide equal or greater habitat value than the affected wetlands. NNSA would permanently set aside this area for the protection and management of the California red-legged frog.

The second component would involve the creation of a minimum of 0.01 acre of breeding habitat at two distinct locations in Site 300. The main goal of this approach is to compensate for impacts on artificial breeding pools by creating pools of equal or greater habitat quality. The two components of the proposed California red-legged frog and the California tiger salamander mitigation actions are summarized in Table E.2.2.5.5–1 and described in detail in the following sections.

Biologists and hydrologists selected two locations in the Elk Ravine watershed for the creation of breeding ponds and associated semipermanent marshes. The two sites will be referred to as the SHARP Facility and Mid Elk Ravine mitigation sites. They were selected largely because the topography and hydrologic conditions at both sites are highly suitable for pond and marsh creation. A general description of existing environmental conditions at each site and a general description of the proposed mitigation approach and associated construction methods are provided below (Jones and Stokes 2001).

E.2.2.9.2.1 The SHARP Facility

The SHARP Facility is located near the headwaters of Elk Ravine on the opposite side of the road from Building 865 (Figure E.2.2.6.1.1.4–1). The seep and surrounding area consist of the lower half of a small, ephemeral drainage trending east-west. This drainage way was altered during the early 1990s when the facility was constructed (Jones and Stokes 2001).

During the late 1990s, a perennial groundwater seep developed, which now surfaces along the northwestern embankment. This seep is associated with subsurface drainage from the west side of Site 300 and, therefore, was sampled for tritium contamination. Low concentrations of tritium, below drinking water standards, have been detected in this water. The exact rate of flow from the seep is unknown, but was estimated to range from 0.25 to 1 gallon per minute during August 2001. This estimate is expected to be representative of flow rates during the summer months, but flow rates may vary considerably throughout the year. Water emanating from the seep flows in a thin stream along the northern embankment of the drainageway, where it currently supports a small community of cattails, willows, nettles, and other riparian and wetland vegetation. Water from the seep and the surrounding watershed exits the site through a culvert that drains into upper Elk Ravine, just downstream from Building 865. California red-legged frog, have been found using this area; however, the habitat does not contain the proper characteristics for California red-legged frog breeding (Jones and Stokes 2001).

The SHARP Facility drains approximately 25 acres of steep annual grasslands that are underlain almost entirely by the moderately coarse- and medium-textured Entisols of the Wisflat, San Timoteo, and Arburua series. These soils are, in turn, underlain by weathered sandstone and siltstone at depths ranging from 10 to 31 inches. Mean annual precipitation at Site 300 is approximately 10 to 11 inches, with 90 percent of the precipitation occurring as rainfall between November and April. Mean annual reference evapotranspiration for the nearby town of Tracy is 4 inches per month, ranging from a low of 0.7 inch per month in December to a high of 7.9 inches per month in July. The seep does not currently support a breeding population of California red-legged frogs or California tiger salamanders due to the lack of pooled water areas (Jones and Stokes 2001).

The general mitigation approach, construction method, and maintenance procedures for the SHARP Facility breeding pond were addressed in a recent biological assessment and related biological opinion (Jones and Stokes 2001, USFWS 2002b).

E.2.2.9.2.2 Mid Elk Ravine Site

The Mid Elk Ravine site, located immediately south of Building Complex 812, consists of a 200-foot reach of the main channel of Elk Ravine and a section of moderate-to-steep slopes that abut the channel on either side. Most of Elk Ravine is intermittent drainageway, but a perennial seep located approximately 1,200 feet upstream of the site provides a constant, low-volume flow of water, estimated to range from 5 to 10 gallons per minute. This estimate is probably representative of the average flow rate during the summer months, but the rate may vary considerably throughout the year. The seep supports a continuous stand of riparian and wetland vegetation extending several thousand feet downstream from its source.

The subject reach of the Elk Ravine channel is 3 to 7 feet wide and 3 to 8 feet deep, with a gradient of approximately 3 to 5 percent. The channel supports a thick stand of cattails and fewer numbers of associated hydrophytic species. The bed of the channel consists primarily of fine sands, silts, and clays trapped by the cattails. The soil survey of San Joaquin County indicates that the hill slope that bounds the western side of the channel is occupied by soils of the Alo and Vaqueros series, while the hill slope that bounds the eastern side of the project reach is underlain by soils of the Wisflat, Arburua, and San Timoteo series. As described above, the soils of the Wisflat, Arburua, and San Timoteo series are shallow, medium-textured Entisols underlain by sandstone and siltstone bedrock at depths ranging from 10 to 30 inches. Soils of the Alo and Vaqueros series are moderately deep, Vertisols (i.e., expansive clay soils) underlain by shale at depths of 30 inches to more than 6 feet.

The subject reach of Elk Ravine drains a 1,470-acre watershed that consists almost entirely of steep annual grasslands underlain by soils of the Wisflat, Arburua, San Timoteo, Alo, and Vaqueros series. Impervious surfaces, such as roads, buildings, parking lots, and staging areas comprise an estimated 0.5 percent of the watershed. Precipitation and evapotranspiration characteristics for the Mid Elk Ravine site are identical to those described above for the SHARP Facility (Jones and Stokes 2001).

The general mitigation approach, construction method, and maintenance procedures for the Mid Elk Ravine breeding habitat site were addressed in a recent biological assessment and related biological opinion (Jones and Stokes 2001, USFWS 2002b)

E.2.2.10 *Compensation and Set-Asides*

E.2.2.10.1 *Alameda Whipsnake*

Mitigation measures for impacts on the Alameda whipsnakes would include participation in a 5-year study on the effects of burning on this species. Site 300 has agreed to support and participate in a study proposed by the USFWS Recovery Program on the potential effects of prescribed burns on the Alameda whipsnake (Jones and Stokes 2001).

E.2.2.10.2 *California Red-Legged Frog*

Mitigation for impacts on California red-legged frog habitat would include monitoring the enhancement areas annually for 5 years and semi-annually for the next 5 years to determine whether the ponds are functioning as intended and to determine whether invasive bullfrogs have colonized the enhancement sites. Monitoring would involve spring surveys for the California red-legged frog. If bullfrogs were discovered at the site, the Site 300 biologist would make the necessary effort to remove adults and larvae.

A 5-year report would be prepared and submitted to USFWS. This report would document the results of annual surveys in enhancement areas and evaluate the success of the proposed mitigation plan (Jones and Stokes 2001).

E.2.2.11 *Contingency Plan*

If, after 10 years, the proposed enhancement pond mitigation action were not effective, the Site 300 biologist would discuss the results with USFWS.

E.2.2.12 *Conference*

As noted in Section E.2.2.5.5, a preliminary survey was conducted for the proposed EMPC in March 2003 without detecting any protected or sensitive species. NNSA would like to request a conference with the USFWS to discuss: (a) any plans that the USFWS may have to redesignate critical habitat for the California red-legged frog in the vicinity of the proposed EMPC site at Site 300; and (b) any measures required to address the California tiger salamander at Site 300 in the event the status of this species is elevated from proposed threatened to threatened.

E.2.2.13 *Conclusion and Determination*

With implementation of proposed avoidance, conservation, and mitigation measures, the Proposed Action activities may affect (but are not likely to adversely affect) the Alameda whipsnake, California tiger salamander, and California red-legged frog.

Fire trail grading may indirectly affect the California red-legged frog and California tiger salamander; however, mitigation measures would minimize the potential impact. The Alameda whipsnake may be affected by this activity; however, pre-activity surveys would minimize the potential for incidental take.

Storm drainage system maintenance is likely to provide a long-term, indirect benefit to California red-legged frog and California tiger salamander habitat by creating pools and enhancing breeding habitat. Direct effects would be minimized through implementation of pre-activity surveys. This activity would have no effect on the Alameda whipsnake.

Culvert improvement and installment may affect (but are not likely to adversely affect) the California red-legged frog and California tiger salamander. Direct effects would be mitigated through the implementation of avoidance and mitigation measures. There would be no effect on the Alameda whipsnake as a result of this activity.

The proposed burning of grassland in the Alameda whipsnake critical habitat may affect (but is not likely to adversely affect) the Alameda whipsnake. The impacts on the Alameda whipsnake associated with annual prescribed burning in grassland habitat are unknown. Future conservation of this species would be fostered through a research project conducted by NNSA that would address this impact.

The termination of surface water release may affect the California red-legged frog. NNSA would mitigate for the loss of 0.62 acre of artificial wetlands through the permanent protection and enhancement of a minimum of 1.86 acres of natural wetland habitat. This habitat would be managed and protected for the continued recovery of the California red-legged frog.

Construction-related projects such as the proposed EMPC 300 may affect (but are not likely to adversely affect) the California red-legged frog and California tiger salamander. These species were not observed during a field reconnaissance of the proposed construction site in an upland location. Direct effects would be minimized through implementation of a pre-construction survey. There would be no effect on the Alameda whipsnake.

Demolition of facilities would eliminate approximately 1,500 square feet of developed space, after this structure has been demolished and then landscaped for soil retention. Building 808 is not in an area with suitable habitat for the Alameda whipsnake, so its demolition would have no effect on that species.

Maintenance of facilities, paved roads, and utilities may affect (but are not likely to adversely affect) the California red-legged frog, California tiger salamander, and Alameda whipsnake. These operations would occur primarily within the developed part of Site 300, be representing less than 5 percent of the total site acreage. Maintenance activities would be routinely reviewed by LLNL wildlife biologists to minimize the potential for direct effects on these species.

Landscaping and grounds maintenance may affect (but are not likely to adversely affect) the California red-legged frog, California tiger salamander, and Alameda whipsnake. Since the landscaping and grounds maintenance activities would avoid known wetland breeding areas and associated nonbreeding areas, these activities would pose a minimal risk to California red-legged frogs and California tiger salamanders. The impact of these activities on the Alameda whipsnake would likely be minimal due the relatively small amount of suitable habitat for this reptile at Site 300, with much of it not subject to typical landscaping and grounds maintenance.

Herbicide applications may affect (but are not likely to adversely affect) the California red-legged frog, California tiger salamander, and Alameda whipsnake. Herbicides would likely have minimal impact on these three species when used in accordance with their EPA pesticide label instructions. Also, herbicide projects would proceed only after consultation with a LLNL wildlife biologist.

Ground squirrel control is not likely to affect the California red-legged frog and California tiger salamander since there is presently no active ground squirrel control program anywhere at Site 300. Control is done, on an as needed basis, around the explosive process water surface impoundments using rodenticides in accordance with EPA pesticide label instructions. Ground squirrel control at the surface impoundment would not have an effect on the Alameda whipsnake.

Vehicle traffic may affect (but is not likely to adversely affect) the California red-legged frog, California tiger salamander, and Alameda whipsnake. However, the potential for impact would be reduced because the majority of traffic would occur during the daylight hours when adults of this species are not typically active; most of the California red-legged frog breeding and nonbreeding areas would be in less accessible parts of the site; and migrations of this species are infrequent. The impact of vehicle traffic on the Alameda whipsnake would likely be minimal due the relatively small amount of suitable habitat for this reptile and its unsuitability for most vehicles.

Explosive testing may affect (but is not likely to adversely affect) the California red-legged frog and California tiger salamander. However, the explosive testing sites are in areas that provide suboptimal habitat for these species. Explosive testing would have no effect on the Alameda whipsnake since these sites are not in areas with suitable habitat for this species.

The sewage oxidation pond may affect (but is not likely to adversely affect) the California red-legged frog and California tiger salamander. These two amphibians have been observed at the overflow pond only and not at the sewage oxidation pond. Further, the pond provides suboptimal habitat for these species.

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