SECTION 3
COVERED ACTIVITIES
AND THEIR IMPACTS
3.0 COVERED ACTIVITIES AND THEIR IMPACTS

As part of the HCP, Stanford is seeking a Section 10(a) incidental take permit from the Service and NOAA Fisheries. An incidental take permit can be issued for one-time site-specific activities or projects, or for a broader program of multiple ongoing or annual maintenance activities. Stanford is seeking the latter type of incidental take permits that will allow it to operate and develop the University, and perform the Covered Activities described below.

This section describes the Covered Activities that Stanford routinely performs, including the construction of new facilities. All of the activities described below are Covered Activities, unless the HCP specifically excludes them from coverage. The Covered Activities include activities related to water management, academic uses, maintenance and construction of urban infrastructure, recreational and athletic uses, general campus management and maintenance, activities that are carried out by Stanford’s tenants, and future development. All of these activities are necessary to keep the University operating, and most of these activities have been ongoing for many years. These activities represent the type of University operations that could affect the Covered Species, and allow the University to analyze the potential effect of its operations on the Covered Species. But, because of the size and diversity of operations, and the changes in technology that are continually occurring, it is not possible to describe all of the University’s actions in complete detail. Therefore, the discussion of impacts on the Covered Species by the Covered Activities is addressed qualitatively in this section. The cumulative effect of these activities, with the implementation of the HCP’s Conservation Program, are then quantitatively assessed in Section 5.3 of the HCP. Section 4.0 of the HCP describes the Conservation Program that will avoid or minimize the take of Covered Species caused by the Covered Activities.

This section describes many activities that individually present a very low chance of causing either direct or indirect take of Covered Species. When viewed cumulatively, however, these common activities likely do result in take, and if this take is not minimized or mitigated for, it could, over time, have a potentially significant effect on the Covered Species. The HCP is designed to benefit the Covered Species and increase the likelihood of their persistence at Stanford. If the HCP is successful, the Covered Species populations at Stanford will increase, and, as the Covered Species become more abundant, they will inhabit more areas at Stanford. Although this will provide a significant benefit to the Covered Species, the number of individuals of the Covered Species that are taken, particularly while conducting routine activities could increase when the Covered Species start inhabiting areas that are currently uninhabited. The percentage of the local populations impacted, however, will remain the same or will decrease as the overall population of Covered Species continues to increase.

Therefore, while any one of the Covered Activities, at any given time, may not result in the take of Covered Species, the activities are all considered Covered Activities because, on a cumulative basis, they could result in take.

3.1 “LAKE” WATER SYSTEM

Stanford University operates a dual water supply system that provides both potable and non-potable water to the campus. The dual water system provides operational flexibility, reliability, and cost efficiency for the University. The San Francisco Public Utilities Commission Water Department (SFPUC) supplies Stanford with potable water. The potable water supply is chloraminated for disinfection by the SFPUC. Stanford also maintains groundwater wells that are routinely monitored and are of potable-water quality. The non-potable water supply currently is used mainly for irrigation and as a backup to potable water for fire protection. The non-potable water system is referred to as the Lake water system, and is made up of water diversions from Los Trancos Creek, San Francisquito Creek, and Searsville Reservoir, and occasionally supplemented by the wells. Lake water is stored in Felt Reservoir and Searsville Reservoir (Figures 3-1 and 3-2).

Although non-potable, Lake water could be treated and made available for human use in case of an emergency.

The Stanford Utilities Division, which is part of the University Facilities Operations Department, is responsible for the planning, operation, and maintenance of the domestic water supply. Lake water, chilled water/steam system, and the sanitary sewer and storm drainage systems. These systems include many components, such as water diversion facilities; creek monitoring devices; dams; reservoirs; deep wells; over 200 miles of water, sewer and drainage piping; open channels; fire hydrants; manholes; and meters. All of these water management facilities and activities are needed to support academic research and a daily campus population of about 30,000 people.

3.1.1 Water Diversions

Stanford University holds riparian and pre- and post-1914 appropriative water rights and licenses that entitle the University to divert water from Los Trancos Creek, San Francisquito Creek, and Searsville Reservoir. Stanford currently exercises these water rights by operating the following water diversion facilities: 1) the Los Trancos diversion located on Los Trancos Creek; 2) a pump station1 on San Francisquito Creek at the Stanford golf course; and 3) the Searsville Dam diversion (Figure 3-2). Felt Reservoir is the largest storage reservoir in the Stanford Lake water system.

1 There are two sets of pumps on San Francisquito Creek; these are referred to as the Felt pumps and the Lagunita pumps, and are combined into one facility.
Operation of Los Trancos Creek Diversion. Water from Los Trancos Creek is diverted by an in-stream structure located on Los Trancos Creek just downstream from the Stanford property boundary near Arastradero Road. The Los Trancos Creek diversion facility includes a small diversion dam, a by-pass channel/ fish ladder, screen, and a concrete-lined conveyance channel (flume). From this structure, the water is contained in the flume and flows by gravity to Felt Reservoir (Figure 3-2). To facilitate fish passage the structure was modified in the mid-1990s, using a design provided by the California Department of Fish and Game. The modified structure improved fish passage and helped prevent the diversion of fish into the conveyance flume. However, that fish ladder and screen were highly labor intensive, negatively affected diversion operations, and resulted in a reduction in the amount of water that can be diverted from Los Trancos Creek to Felt Reservoir, particularly during high flows.

Stanford, in consultation with NOAA Fisheries and the California Department of Fish and Game, studied ways to enhance conditions for steelhead through improvements to the water diversion facilities. The proposed structural modifications and operational changes to the Los Trancos Creek and San Francisquito Creek Pumping Station diversions, and accompanying maintenance to restore storage capacity at the Felt Reservoir, are known as the Steelhead Habitat Enhancement Project (SHEP). The design for the proposed modifications and operating protocols for the SHEP were finalized by Stanford, in consultation with the California Department of Fish and Game, and NOAA Fisheries. NOAA Fisheries issued a Biological Opinion to the US Army Corps of Engineers for the project in April 2008 and the state CEQA process was completed in August 2008. Construction of the SHEP will be completed by October 15, 2009. Operation of the diversion after that time will be in accordance with the SHEP agreement. The new protocols will substantially increase flows through the fish ladder, which will enhance conditions for steelhead migration and spawning. These enhancements also will accommodate the upstream and downstream movement of juvenile steelhead.

Although the diversion is located adjacent to the golf course, it is unrelated to the operation of the golf course. In February 1986, the diversion was moved from the currently non-operating in-stream Lagunita diversion downstream to its present location because of extensive collapsing of the flume. It was configured with an in-stream weir and pumping facilities with perforated pipe intakes that are essentially at-grade. In 1998, under permits from Santa Clara Valley Water District, California Department of Fish and Game, and Santa Clara County, the station was completely reconstructed and now consists of an infiltration gallery and two sets of subsurface pumps: the Lagunita pumps, which convey water to Lagunita through a flume, and the Felt pumps, which convey water to the pipeline that extends from Felt Reservoir to campus (Figure 3-2). Both sets of pumps are located in a single pump station facility. One purpose of the Felt pumps is to pick up the Los Trancos Creek water bypassed at the fish ladder facility. The losses at Los Trancos have not been consistently made up by the San Francisquito Creek pump station for various reasons, including limited pump capacity. The SHEP includes structural modifications and operational changes to this diversion facility which, as described above, will be in place by October 15, 2009 and will enhance steelhead habitat and downstream passage.

Construction of the two modified diversion facilities and the accompanying sediment removal to restore storage capacity at the Felt Reservoir are not Covered Activities under this HCP, and have been permitted by NOAA Fisheries and various federal and state agencies separately.

The physical presence of the Los Trancos diversion and San Francisquito Creek Pumping Station once they have been modified in accordance with the SHEP, ongoing operation of the facilities as approved under the SHEP, and the future maintenance of these facilities are Covered Activities under this HCP.

Operation of Searsville Diversion. The Searsville Dam was built by Spring Valley Water Company in 1892 and is located downstream from the confluence of Corte Madera and Sausal creeks in the San Francisquito Creek watershed. An intake structure, dam, and piping system comprise the diversion. The system is a gravity-feed diversion utilizing valved intakes at various elevations in a standpipe just inside the dam, with the discharge piping exiting through the bottom of the dam and extending through Stanford lands to the campus. An in-line booster pump station is located over a mile below the dam. The maximum diversion from Searsville Reservoir is currently 3 cubic feet per second (cfs), limited by the diameter of the pipe and its partially corroded condition.

Water typically overtops Searsville Dam and spills throughout the rainy season, and generally stops flowing over the dam in late spring or early summer. In years with much higher than average rainfall, the overflow can continue until mid-summer. Due to its multiple block construction, water seeps through the dam year-round, during both wet and dry years.
For purposes of this HCP, between October 1 and April 30 of each year, Stanford will not divert water to the standpipe if the surface elevation of Searsville Reservoir drops to more than 1 foot below the spillway. In addition, diversions to the standpipe during this period will not exceed 300 acre-feet. The maximum instantaneous rate of diversion to the standpipe shall not exceed 3 cfs and the total annual diversion amounts will be consistent with historic diversion rates2 (evaluated over decades not year to year), and will not exceed 600 acre-feet.

Searsville Reservoir is described in Section 3.1.3.

**Maintenance of the Los Trancos Creek Diversion Facility.** Maintenance of the Los Trancos Creek diversion facility consists of activities both during the diversion season and the off-season. Diversion season maintenance includes occasional repair of the fish screen brush mechanism, frequent clearing of accumulated gravel and debris from all of the flow paths (radial gate, ladder, bypass channel and flume), and occasional repair of the gate mechanism. Generally, high creek flows trigger the need for this maintenance work. For safety reasons, all of this work is done after high creek flows (when problems typically occur) have subsided, and there is minimum disturbance to creek flow. These activities usually take a few hours, and usually occur several times each diversion season. When necessary to facilitate maintenance activities in the ladder and bypass channel, the creek flow is temporarily rerouted through the opened radial gate; no coffer dams or piping of creek flow is necessary for this routine maintenance.

**Maintenance of the San Francisquito Creek Pumping Station.** Maintenance of the San Francisquito Creek pump station involves much less invasive activity than maintenance of the Los Trancos Creek diversion facility because of the pump station’s configuration. Pump station maintenance activities consist primarily of backwashing of the siltation gallery and piping with lake water, and pump repairs. Backwashing of the gallery involves periodic (up to daily, depending on operations and creek sediment conditions) valve exercising (opening and closing) in the piping near the top of bank, and agitation of accumulated sediments above the gallery in the creek. During routine pump servicing, the out-of-water top of the vault is simply opened and work can proceed with no direct contact with the creek.

Repair of the pumps is typically performed in the summer low-flow periods; however, in rare emergencies, the pumps in the vaults may need to be accessed for repair/removal during the diversion season. If extensive maintenance is required, the adjacent creek is blocked off from the vault area by seines and cleared of fishes before workers enter the vault area. This is rarely needed and is done on average once every 20 years and affects an area approximately 50 feet in length.

**Maintenance of the Searsville Diversion.** The Searsville diversion facility also requires maintenance activity. Every few years, the intake system needs repairs or the screened intake openings and valves in the reservoir just above the dam need to be adjusted. The work is usually performed by divers, without dewatering or coffer dams. Flushing of the intake piping is typically done at the beginning of the rainy season each year and occasionally during it. Pipe flushing is accomplished by opening blow-off valves on tees from the mains, and results in discharges of sediment-laden water into either the creek or land just above it, depending on location. However, flushing is done when creek flows are high and naturally sediment-laden to avoid, or at least minimize, the disruption of water and quality and habitat. Maintenance of pipes through the Searsville Dam is similar to maintenance of other pipelines, which is described further in Section 3.1.4.

### 3.1.1.1 Potential Effects of the Water Diversions on the Covered Species

Stanford’s diversion facilities were modernized during the 1990s and again in 2009 to protect steelhead. Physical and operational changes were made at these times. The physical changes to the facilities included the installation of fish screens and ladders. These physical changes and changes in the operation of Stanford’s water diversions have significantly reduced the effects of the water diversions on the Covered Species. However, the operation of the current diversions may still result in the incidental take of steelhead.

**Operation of the Los Trancos Diversion.** On April 21, 2008, NOAA Fisheries issued a Biological Opinion and Incidental Take Statement for the SHEP (Appendix A). This Biological

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2 Historical diversion rates (between 1932 and 2008):

- over 700 acre-feet 3 times (4 percent of the time)
- over 600 acre-feet 10 times (13 percent of the time)
- over 500 acre-feet 27 times (36 percent of the time)
- over 400 acre-feet 37 times (49 percent of the time)
- over 300 acre-feet 47 times (62 percent of the time)
- over 200 acre-feet 55 times (72 percent of the time)
- over 100 acre-feet 58 times (76 percent of the time)
Opinion evaluated the effects on steelhead and impacts to designated Critical Habitat of constructing, operating, and maintaining the SHEP facilities. The Biological Opinion found that the SHEP will result in minor and short-term adverse effects to steelhead and Critical Habitat during construction, and that the long-term effects of the SHEP are beneficial to steelhead and designated Critical Habitat by largely eliminating the impacts of Stanford’s water diversions on stream flows that are important to steelhead (Appendix A at pgs. 38-39). The SHEP includes modifications to the design of the fish ladder and fish screen that will allow Stanford to more efficiently divert water during periods of high flows. The new fishway has been designed to comply with current California Department of Fish and Game and NOAA Fisheries criteria for anadromous fish passage. By increasing diversions during high flow periods, Stanford will have greater flexibility to increase bypass flows during low-flow periods. This flexibility, along with an improved fishway, will enhance creek conditions for steelhead during both low- and high-flow periods. The effects of the diversion operation on steelhead have been addressed in the SHEP Biological Opinion.

However, take of steelhead would occur; thus, the presence, operation, and maintenance of the Los Trancos Creek diversion facility is covered under this HCP. NOAA Fisheries’ Incidental Take Statement sets a limit on the amount of take that is authorized and imposes reasonable and prudent measures and terms and conditions that NOAA believed were necessary and appropriate to minimize take of steelhead (Appendix A at pgs. 39-46). As part of the HCP, Stanford’s long-term operation of this facility will comply with the Incidental Take Statement issued for the SHEP.

Operation of the San Francisquito Creek diversion does not affect California tiger salamanders because this species is not found at the diversion site or in areas downstream, and these areas do not provide suitable tiger salamander habitat. California red-legged frogs, garter snakes, or western pond turtles have not been observed at this location for at least a decade. However, the area does provide potential habitat for these species and they may intermittently occupy the area in the future. The operation of the pumps will not impinge or entrain these species. Because of the flashy nature (i.e., often rapidly fluctuating flow level) of the creek, the manipulation of water levels caused by the diversions will not affect western pond turtles, red-legged frogs, or garter snakes that may infrequently inhabit downstream areas.

**Operation of Searsville Diversion.** Operation of the Searsville diversion does not impact California tiger salamanders because they are not found at the diversion site or in downstream portions of the creek, and these areas do not provide suitable tiger salamander habitat. Manipulation of water levels caused by the diversions will not affect western pond turtles, red-legged frogs, or garter snakes found downstream of the dam because the diversion amount is small relative to the natural creek flow. Potential downstream effects to steelhead due to water diversions could possibly occur during the period when there is water overflowing the dam. These potential effects, possible fluctuating water levels and flow rates, are insubstantial due to the large amount of water flowing in the creek (mean cfs per month for San Francisquito Creek as measured at the USGS gage station located near the intersection of Junipero Serra Boulevard and Alpine Road during the rainy season of December through April ranges from 27 cfs to 78 cfs). During the period when there is no overflow, the amount of water flowing through the dam is fairly constant and not affected by the amount of water being diverted.

**Maintenance of the Diversion Structures.** The maintenance activities associated with the current diversion facilities could have short-term adverse effects on the Covered Species, particularly steelhead. Maintenance of the diversion structures involves work in the creeks, though this work typically occurs during the summer or fall, when the creeks are low or dry. Maintenance occasionally requires isolating a short portion of the creek affected by the work with coffer dams and temporarily confining flows to a short length of pipe.

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3 Take of steelhead from the presence, operation, and maintenance of the modified facilities also is authorized by the Incidental Take Statement that NOAA Fisheries issued as part of the April 2008 SHEP Biological Opinion.
Maintenance of the Los Trancos Diversion. California tiger salamanders, garter snakes and western pond turtles do not occupy the Los Trancos diversion site. Maintenance of the diversion facility therefore does not affect them. California red-legged frogs may use Los Trancos as a dispersal corridor. Maintenance of the diversion facility could affect California red-legged frogs. Red-legged frogs could be adversely affected by maintenance workers and equipment. The effects of the diversion maintenance on steelhead have been addressed in the SHEP Biological Opinion (Appendix A).

Maintenance of the San Francisquito Creek Pumping Station. Maintenance of the San Francisquito Creek diversion does not affect California tiger salamanders because this species is not found at the diversion site, and this area does not provide suitable tiger salamander habitat. California red-legged frogs, garter snakes, or western pond turtles have not been observed at this location for at least a decade. However, the area does provide potential habitat for these species and they may intermittently occupy the area in the future. Maintenance workers and equipment could adversely affect these species.

Maintenance activities associated with the facility could produce short-term impacts to steelhead when steelhead are excluded or moved from the area of the station, or with a change in water quality as sediments are stirred up during maintenance activities. The effects of the diversion maintenance on steelhead have been addressed in the SHEP Biological Opinion (Appendix A).

Maintenance of the Searsville Diversion. California red-legged frogs, garter snakes, and western pond turtles have not been observed at Searsville Reservoir since the 1990s. However, these species may occur intermittently and, they may become established if habitat conditions improve. A few steelhead are present in the pool immediately downstream of the dam (surveys typically find fewer than 15 steelhead in that reach of the creek). The presence of work crews at the diversion facility could disturb steelhead, California red-legged frogs, garter snakes and western pond turtles. Flushing of the pipes/valves at the base of the dam could have short-term effects on downstream water quality, which could adversely affect any steelhead or red-legged frogs that are located immediately adjacent to the pipe downstream of the dam. Maintenance of the Searsville diversion will not affect California tiger salamanders because this species is not present at or near the diversion facility, and the area does not provide suitable habitat.

3.1.2 Creek Monitoring Facilities

Two semi-automated water quality and sediment monitoring devices were installed by the City of Palo Alto in 2002 in the San Francisquito watershed on: (1) Los Trancos Creek (at Piers Lane), and (2) San Francisquito Creek (at Piers Lane) (Figure 3-1). The equipment was installed by, and continues to be owned by, the City of Palo Alto. The stations are operated by Stanford as part of the San Francisquito Watershed Council’s Long-Term Monitoring and Assessment Program (LTMAP).

Equipment at each of the stations is mounted on a 4.5’ x 4.5’ concrete pad located near the top of bank. Cables extend from the automated equipment into the creek for the purpose of continuous monitoring of factors such as pH levels and temperature. Flexible Teflon tubing extends from the equipment into the stream and draws water quality samples at a frequency of six times per year. These samples are collected and transported to local laboratories for more thorough water quality analysis and testing. Strainers are installed on the tubing to prevent vegetation, fish, or invertebrates from being trapped in the tubing. Samples are drawn at varying flow rates throughout the rainy season.

The tubing, cables, and probes that extend into the stream are occasionally damaged by high-flows. These are replaced during low-flow periods as needed, which is generally once per year.

A third monitoring device, which is operated by the City of Palo Alto and therefore not covered by the HCP, is located on lower San Francisquito Creek at Newell Road. In 2004, as part of the LTMAP and to provide additional data from the San Francisquito Creek watershed, Stanford installed an additional monitoring station on Bear Creek, downstream from Sand Hill Road in Stanford’s Jasper Ridge Biological Preserve. Stanford also maintains a stream flow and sediment transport gauge on Corte Madera Creek at Westridge Drive. This site is not on Stanford’s property, but is operated by the University.

3.1.2.1 Potential Effects of the Creek Monitoring Facilities on the Covered Species

The presence and operation of the water quality and sediment monitoring devices will not affect any of the Covered Species. These facilities extend minimally into the creeks (only probes to collect water quality samples and data are located in the channels) and will not trap individual steelhead during water sampling, or inhibit their dispersal.
Maintenance of these facilities could affect steelhead and red-legged frogs. Steelhead and frogs frequently hide under in-stream objects, including pipes and tubes and are found in the vicinity of the creek monitoring devices. Although unlikely, workers repairing these facilities could therefore inadvertently disturb an individual steelhead and frog. However, such impacts would not have any long-term effects on steelhead or frogs. None of the other Covered Species are expected to be encountered during maintenance of the creek monitoring facilities because they would be unlikely to be hiding under in-stream objects.

3.1.3 Open-Water Reservoirs

Stanford maintains three open-water reservoirs: Searsville Reservoir, Felt Reservoir, and Lagunita (Figure 3-1).

Searsville Reservoir
(DWR # 614-000; National ID # CA00669)

In 1892, the Spring Valley Water Company built the Searsville Dam on Corte Madera Creek to provide a stable water supply to the local communities. Approximately 15 square miles of the San Francisquito watershed is upstream of the Searsville Dam. The dam is 68 feet tall, 260 feet in length, and is constructed from interlocking cement blocks. In 1914, Stanford University acquired the dam and water rights from the Spring Valley Water Company.

Water from the Searsville Reservoir is currently used to irrigate the campus and leased lands, and for fire protection. At the present time, sedimentation has partially filled Searsville Reservoir; Searsville Reservoir is now divided into three parts called Upper Searsville, Middle Searsville, and Searsville (Figure 3-1).

San Francisquito Creek contains one of the few remaining steelhead runs in the San Francisco Bay drainage. Steelhead spawn throughout the San Francisquito Creek system, including those portions that flow through Stanford land. Searsville Dam is a barrier to fish migration in the system, and isolates some 3 to 5 miles of suitable spawning habitat from migrating adults. Native stock rainbow trout still, however, occupy many of the tributaries upstream from Searsville Dam. The Searsville Dam also creates a warm-water lacustrine environment that was not found in the system historically, and the Searsville Reservoir acts as a sediment sink that reduces seasonal sediment transport that previously moved through the San Francisquito Creek watershed. There are also extensive wetlands associated with the reservoir, and new wetlands are continuing to form upstream.

When Stanford acquired the dam, the capacity of the reservoir was 355 million gallons (approximately 1,090 acre-feet). As of 2000, the reservoir capacity has been diminished to approximately 81 million gallons (250 acre-feet), due to naturally occurring and anthropogenic erosion in the upper watershed (upgradient of Stanford lands), resulting in silting of the Searsville Reservoir basin. Sediments transported by Corte Madera Creek are the primary source of infilling of the Searsville basin. If the current siltation rate continues or increases, and sediments are not removed by dredging or flushing, Searsville will be completely filled with sediment within the 50-year life of this HCP. Predictions of exactly when this will happen vary, depending upon assumptions about future weather patterns. Stanford University has commissioned several studies to better understand the likely consequences of increased sedimentation of Searsville Reservoir, including streamflow and sediment transport monitoring on tributaries to Searsville Reservoir, surveys of biotic resources in San Francisquito Creek, and analyses of flooding and sedimentation problems upstream of Searsville Reservoir.

Operation and Maintenance of Searsville Reservoir. The Searsville Dam needs to be operated and maintained in order to keep it in good operating condition, and to comply with California Division of Safety of Dams regulations. These operations involve the following activities:

- **Activate, maintain, and periodically** (i.e., every 5 to 10 years) replace intake valves or tower,
- **Maintain flashboard system**, which consists of removable timber boards that fit into slots along the top of the dam, raising the effective height of the dam when installed,
- **Annually, physically clean cement dam face to remove accumulated debris and plant growth and trim or remove vegetation that is encroaching at the ends of the dam structure,**
- **Annually, activate valves and perform blow-off testing (pipe flushing) (see Section 3.1.1.1),**
- **Repairs of the dam structure appurtenances (e.g., railings, valve towers/hardware).**

Searsville Reservoir, like many other reservoirs, requires sediment management in order to maintain its capacity. An average of 15,000 cubic yards of sediment is deposited in the reservoir each year. During the life of the HCP, Stanford may initiate dredging in order to maintain the year 2000 capacity of the reservoir. Sediment will be removed from the reservoir bottom using appropriate technologies and methods. The initially preferred method will involve a floating suction dredge with the sediments slurried through a pipeline to agricultural lands downstream for drying and processing. If reservoir bottom conditions prevent suction dredging, a secondary method may involve transporting large equipment on barges to locations in the reservoir. A second barge may be needed to hold sediments transported by Corte Madera Creek for barge transport to another site for drying and processing.

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4 Despite this siltation, Stanford has been able to continue diversions at Searsville Dam by adjusting the operation of the water diversion to more efficiently divert water into the conveyance and distribution system during higher flow periods in winter and spring.
the container filled with dredged sediment, and this material would then be transported off-site for disposal. Dredging will be conducted during periods when no water is passing over the dam. Some of the dried sediments may be reused for agricultural purposes on Stanford lands, and the remainder would be used elsewhere at Stanford or hauled away to a landfill. Any amount of permanent land conversion associated with processing of periodic dredging would be mitigated in accordance with Section 4.4 of the HCP.

In addition, two parallel above-ground pipelines, approximately 100 feet long, are located immediately below the dam structure. These pipelines are well above the typical dry-season water level and are exposed during much of the year. Stanford occasionally (once every few years) repairs those pipelines and will eventually need to replace them. Pipeline repairs consist of work on the joints (tightening and resealing). The maintenance work is performed in the summer when creek flow is low and water level is below the pipes, so no direct disruption of the creek occurs. Replacement of the pipes once over the next 50 years is anticipated, and this work, too, will occur during the dry season.

Presence of Searsville Dam. Searsville Dam was built in 1892, almost 80 years before the ESA was enacted. Many of the nearby communities developed, in part, because of the water storage that Searsville provided, and it has become an integral part of the landscape. Searsville Dam does not provide for the upstream or downstream passage of fish. Steelhead have been isolated from their historical spawning and rearing habitat in Corte Madera and Sausal creeks since the dam was constructed in 1892. In this HCP, Stanford is not requesting an incidental take permit authorizing the presence of the dam. Fish passage at Searsville Dam and Reservoir may be provided in the future if major modifications are made at the dam. However, Stanford does not currently plan to modify Searsville Dam and is only requesting incidental take authorization for the routine maintenance and operation of the dam, which does not include any major repairs or modifications to the dam. Any modification to Searsville Dam, such as modifying the dam for flood control purposes, is beyond the maintenance activities described in Section 3.1.3 and is not a Covered Activity.

It is important to emphasize that Searsville Reservoir is changing rapidly. A sediment impact study of Searsville Reservoir was completed for Stanford in 2002 and the effects of lowering the dam were assessed (Northwest Hydraulic Consultants 2002). The 2002 study found that the present rate of sediment deposition within the reservoir lies approximately 12 feet below the dam’s spillway and the current rate of deposition is many times greater than the rates observed historically. However, the long-term solution to this problem is not known at this time and the effect of Searsville filling with sediment is beyond the scope of this HCP. Therefore, any major modification of Searsville Dam and Reservoir to address the sediment filling is not a Covered Activity. Likewise, any activity that would include increasing the capacity of Searsville Reservoir beyond its year 2000 capacity is not a Covered Activity. As Stanford continues to evaluate alternatives for the long-term management of Searsville Dam and Reservoir, the feasibility for providing steelhead access to historical habitat in Corte Madera and Sausal creeks will be studied (see Searsville Dam Measure in Section 4.2.1).

Felt Reservoir
(DWR # 614-002; National ID# CA00670)

The storage capacity at Felt Reservoir is approximately 1,050 acre-feet (341,250,000 gallons), and the current dam was completed in 1930. The earthen berm is 67 feet tall and 590 feet in length. Felt Reservoir is an off-channel reservoir located in the lower foothills between Highway 280 and Alpine Road, in Santa Clara County (Figure 3-1). The surrounding land is rolling grasslands that are used for livestock grazing. Felt Reservoir is filled almost entirely from the Los Trancos Creek diversion, but recent system upgrades allow for water from the pumping station on San Francisquito Creek (located at the Stanford golf course) and Searsville Reservoir to be moved to Felt Reservoir for storage and distribution (Figure 3-2). In addition, the Felt Reservoir capacity was restored by the SHEP in 2008 (Appendix A). Stanford is required by the California Division of Safety of Dams to control rodent activity on the dam to preserve structural integrity. Rodent abatement takes place as needed, using County, State, and federally approved control methods. The reservoir and dam are annually cleaned to remove accumulated debris and function-impacting plant growth. The valves and pipes are subject to annual blow-off testing. Minor repairs to the dam structure are conducted as needed. It is anticipated that within the term of this HCP, sediment will have to be removed to retain the reservoir’s capacity. Sediment removal in Felt Reservoir will occur in the dry season, when the water level is low (i.e., approximately 20 percent of reservoir water is present), and areas requiring sediment removal are exposed. Backhoes and other heavy equipment will be used to remove sediment.
Lagunita
(DWR #614-003; National ID# CA00671)

Lagunita is an off-channel seasonal reservoir that was created in the late 1870s as a stock pond and water-holding facility for Leland Stanford’s Palo Alto Stock Farm and vineyard. The earthen berm is 16 feet tall and 2,500 feet in length. It is located in the developed portion of the campus, just to the north of Junipero Serra Boulevard. The University’s main campus borders Lagunita on three sides, and Junipero Serra Boulevard separates Lagunita from the lower foothills.

In most years, Lagunita partially fills with rainwater runoff during the winter. The runoff amount varies widely with the amount and intensity of rainfall. The Lagunita lakebed and berm are permeable (losing an estimated 500 gallons a minute to percolation), and in order for Lagunita to hold water for more than a few weeks at a time, and provide suitable California tiger salamanders breeding habitat, water needs to be added. Historically, in most years of above average winter rainfall, Stanford added water to Lagunita, usually between mid-March and mid-June. In those wet years that Stanford added supplemental water to Lagunita, the reservoir was filled to the desired water level by late March and water levels were typically maintained through University commencement (mid-June). Managed water levels have varied considerably over the last 100 years, depending on water availability in San Francisquito Creek, projected use of Lagunita, and functioning of the diversion system and storage facility. In years that Lagunita is supplemented with creek water, the reservoir will typically retain water for approximately 1 month after the addition of water ceases and will be dry by late July. Even in years with exceptionally high rainfall, Lagunita dries by late spring or early summer without supplemental water, and in most years it would be dry by May without the addition of supplemental water. During years with below average rainfall (or during years when the timing of storms resulted in a lower than average creek flow), Lagunita is often dry in late January.

Stanford will continue to manage Lagunita diversions and water levels with the operation of its upstream diversion facilities, as described in the following operations plan:

1. During years where rains have allowed the accumulated storm water runoff in Lagunita of 3 feet on the staff plate, elevation 122’ above Mean Sea Level (MSL) on January 15, Stanford will operate the Lagunita diversion at San Francisquito Creek, or otherwise convey water (i.e., well water or reclaimed water, but Stanford will not use treated domestic, potable water for this use) to Lagunita, at a rate adequate to maintain the water level in Lagunita at an elevation of 124 +/- 1 foot, which places the water surface near the toe of the berm on the northeast side. (Note that late season storm events may cause the reservoir level to temporarily rise above the managed level of 124 feet.) At the managed elevation of 124 feet, the water covers a surface area of approximately 16 acres, 8 acres of which are at a depth of 0 to 2 feet and another 8 acres are at a depth between 2 and 4 feet; a few hundred square feet near the drain will have a depth greater than 4 feet. In years where there is normal or above rain fall, the water level in Lagunita will generally stabilize at 126 foot above MSL. At this level the reservoir covers approximately 20 acres, of which 4 acres are 0 to 2 feet deep, 8 acres are 2 to 4 feet deep, and approximately 8 acres are more than 4 feet deep. The diversion of creek water to Lagunita will be implemented only if: 1) the Lagunita diversion facilities are safe and operational, 2) there is sufficient water available in San Francisquito Creek at the point of diversion and water diversions to Lagunita are not in significant conflict with other environmental considerations, 3) there are not overriding public safety and health concerns raised by governmental agencies associated with water in Lagunita, and 4) Lagunita is considered critically important to the local persistence of the California tiger salamander. The diversion of creek water to Lagunita will continue only as long as these conditions remain met, or until the following two conditions are triggered.

2. On April 1, the flow of San Francisquito Creek and status of California tiger salamanders in and around Lagunita will be assessed, and Stanford will exercise professional judgment whether to continue, reduce, or cease diversions to Lagunita. If California tiger salamanders are present and creek water is available (relative to the operating parameters of the diversion system and potentially competing environmental concerns), the diversion rate will not be reduced from what is necessary to maintain the 124 +/- 1-foot level unless it is deemed appropriate
for California tiger salamander management. A constant inflow of relatively cool creek water can act to retard California tiger salamanders larval development. It is likely that in some years it will be desirable for the salamanders to lower the water level in mid-spring to 122 ft +/- 1 ft above MSL. This lower level would result in a slightly warmer Lagunita, which would still cover approximately 8 acres with several feet of water. This controlled lowering mimics the drying of natural bodies of water occupied by California tiger salamanders. While not expected, overriding public safety and health concerns raised by governmental agencies associated with water in Lagunita could require the cessation of diversion.

3. In the late spring/early summer, Stanford will cease diversions from San Francisquito Creek to Lagunita, and the water level at Lagunita will be allowed to drop naturally through percolation, evaporation, and transpiration. The diversions may be extended if California tiger salamanders development is not sufficiently advanced, and there is adequate water in San Francisquito Creek.

The berm that surrounds Lagunita is maintained with a Bermuda grass cover that is irrigated, fertilized, and mowed so that it maintains a pleasant visual quality throughout the year. In addition, Stanford is required by the California Division of Safety of Dams to control ground squirrel activity on the berm to ensure structural integrity. Ground squirrel abatement takes place as needed using County-approved control methods such as trapping and poison baiting. In the early fall, when Lagunita is dry, the reservoir bottom is mowed for fire control. These activities are all annual maintenance necessities and are Covered Activities, except for the use of poison.

The drain system requires routine maintenance and periodic upgrades. The two drain structures and associated pipes occupy approximately 0.1 percent of Lagunita's surface area. Additionally, the earthen berm occasionally needs minor repair (filling of potholes and removal of dead trees). The berm may need some significant work during the life of the HCP. The amount of permanent land conversion associated with significant berm work would be mitigated in accordance with Section 4.4 of the HCP.

Several maintenance changes have occurred at Lagunita in the last decade in response to the increased concern over California tiger salamanders. Stanford stopped discing the lake bottom in the early fall for fire control because the discing could have adversely affected California tiger salamanders and garter snakes. Instead, Stanford began mowing the reservoir bottom, which has fewer effects on the tiger salamanders and garter snakes. In addition, as discussed in Section 3.6.2 below, two recreational uses of Lagunita were discontinued. Stanford currently plans to modify its diversion facilities to improve their efficiency at various flow levels, which could assist Stanford in ensuring the availability of water for Lagunita.

3.1.3.1 Potential Effects of Water Reservoirs on the Covered Species

California red-legged frogs, garter snakes, and western pond turtles have not been observed at Searsville Reservoir since the 1990s. However, these species may occur intermittently and, they may become established if habitat conditions improve. The routine maintenance and operation, including periodic dredging, of the reservoir and dam may adversely affect these species.

Transporting the dredging equipment and offloading it into the reservoir could harm or kill red-legged frogs, western pond turtles or garter snakes, or displace them from the area. Turbidity resulting from the dredging could affect egg masses, and release of hydrogen sulfide could reduce oxygen levels in the reservoir affecting frog tadpoles and metamorphs. Suction in shallow water along edges could dislodge or suffocate egg masses, suffocate frog tadpoles, and displace or harm red-legged frogs, pond turtles, or garter snakes.

Clearing of the pipes/valves at the base of the dam could affect downstream water quality. Short-term declines in downstream water quality due to the required pipe flushing could adversely affect any steelhead or red-legged frogs that are located immediately adjacent to the pipe downstream of the dam.

California tiger salamander do not occur here and will not be affected.

The presence of the 100+ year-old dam structure is a complete barrier to upstream steelhead migration. The dam has existed for more than 100 years and Stanford is not requesting an incidental take permit authorizing the presence of the dam. Searsville Reservoir is filling with sediments and some areas downstream may be gravel-deficient as a result. Stanford has not determined if, in the future, accumulated sediments would be removed from Searsville Reservoir to restore a larger capacity than the year 2000 capacity, and if so, which removal method would ultimately be chosen. Therefore, the potential impacts of future large-scale sediment removal activities cannot be evaluated in this HCP, and the removal of the accumulated sediment, beyond periodic maintenance dredging conducted to maintain year 2000 reservoir volume, is not a Covered Activity under this HCP.

A major repair/renovation of Searsville Dam, if needed, could involve extensive work in the creek immediately downstream of the dam, including isolating a portion of the creek, de-watering the isolated portion, and temporarily confining the flow to a short length of pipe. Work of this magnitude could have implications for downstream water quality. The extent of a major repair of Searsville cannot be foreseen with any certainty at this time. Thus, any repairs beyond the ordinary maintenance de-
scribed in Section 3.1.3 are not Covered Activities and will be permitted separately if, and when, the repairs become necessary. If major modifications or repairs are made to Searsville Dam, Stanford will, as part of the major modification or repair, address fish passage (see Section 4.2.1).

Operation and maintenance of Felt Reservoir will not affect California tiger salamander or steelhead because they are not located at the Reservoir. If the HCP’s Conservation Program is successful, the population of California red-legged frogs and garter snakes will increase, and their range will likewise increase and could expand to Felt Reservoir during the life of the HCP. If these species become present at Felt Reservoir, dredging of accumulated sediment with heavy equipment could adversely affect them. Western pond turtles are periodically found in Felt Reservoir. Sediment removal would not affect any turtles that were present because they would follow the water ponding and move away from the dry mud that would be removed. If garter snakes are foraging in the vegetation that grows as the water recedes, the operation of heavy equipment could result in take.

Given the rate of water withdrawal, size of the reservoir, and the screening of the pipe intakes, western pond turtles are not impinged on the water intake screen and could not enter the pipe system. The substantial changes in water level during the year, however, are likely not optimal for turtle growth and survival, and western pond turtles left at Felt Reservoir therefore have a poor chance of long-term survival.

Lagunita provides breeding habitat for California tiger salamanders and the surrounding areas, including the berm, serve as upland habitat. Stanford manages Lagunita primarily for the benefit of California tiger salamanders. The operation of Lagunita likely has few, if any, significant adverse effects on California tiger salamanders because the management regime was specifically designed to benefit California tiger salamanders. However, the routine maintenance of Lagunita could result in the direct take of a small number of California tiger salamanders, or indirect take through habitat modification. Virtually all maintenance activities occur during the dry season and invasive practices, such as drain replacement or repair, are very limited in their extent and time frame.

Garter snakes are also present at Lagunita and vicinity. Operation of the reservoir provides a significant benefit to the species, but mowing in and around Lagunita could adversely affect garter snakes. Since the mid-1990s mowing has been conducted during periods when most, if not all, salamanders and snakes are inactive (during the hottest part of the mid-afternoon) and the mowers are set to cut vegetation no closer than 8 inches from the ground. It is unclear whether the snakes do better, worse, or are indifferent to mowed versus un-mowed vegetation.

Maintenance and operation of Lagunita do not affect western pond turtles, California red-legged frogs, or steelhead because none of these species inhabit the seasonal reservoir, and it does not provide suitable habitat for them. However, turtle species other than western pond turtles are occasionally released at Lagunita without Stanford’s authorization. In spring 2008, for example, a red-eared slider was repeatedly seen in Lagunita. It is therefore possible that in the future a western pond turtle could be released, without Stanford’s authorization, into the reservoir. Lagunita is a seasonally filled reservoir and therefore does not provide suitable habitat for western pond turtles, and any western pond turtle that is subject to an unauthorized release at Lagunita would therefore have a very poor chance of survival.

3.1.4 Distribution System

Underground pipes, water lines that span the creeks on the underside of bridges, and above-ground filters, valves, and pump stations are located in virtually all areas of Stanford University. These were constructed in order to meet the demands of the University and surrounding communities. Maintenance and the upgrading of these facilities occur on a regular basis. New utilities are commonly constructed, in response to changes in the University’s needs and to comply with public safety codes. Maintenance of existing lines (mainly excavation and flushing of lines) and the construction of new lines are typically limited to 3- or 6-foot-wide utility corridors, and excavation work typically occurs only in the dry months. However, emergency repairs may be required any time of the year.

Some of the existing pipelines are located very close to the creeks, and there are a number of creek-spanning pipes. Utility work in areas adjacent to the creeks often requires Stanford to remove a substantial amount of vegetation, install coffer dams, temporarily direct the flow of water with a bypass pipe, and temporarily dewater a small portion of the creek. Riparian vegetation is replanted following construction, and erosion protection measures are installed as needed to prevent sediment from entering the creek.

Pipe repairs are performed as needed; however, despite its age, the pipe system is in good shape. Pipe replacements are also performed on an as-needed basis, and much of the system will need to be replaced over the next few decades. Pipe replacement work is performed during the summer low-flow periods, and work areas are contained to avoid/minimize impacts to the creek and its banks.

An in-line booster pump station is located on the Lake Water pipeline approximately 2 miles downstream from Searsville Dam. The pump station boosts the pressure of the lake water, and also conveys the lake water through a filter, in order to reduce sediments and silts from lake water delivered to customers downstream. The filters automatically operate a backwash cycle, which occurs frequently (i.e., daily, and sometimes hourly) during the pump station’s operation, as the filters accumulate sediment. The backwash water is laden with the sediment from the creek, and is discharged to the bank above the creek, so that sediments can settle out before the water re-enters the creek.
3.1.4.1 Potential Effects of the Maintenance and Installation of the Distribution System on the Covered Species

The presence of underground pipes, water lines that span the creeks on the underside of bridges, and above-ground filter, valves, and pump stations do not affect the Covered Species. However, the installation and maintenance of underground pipes and creek-spanning water lines can adversely affect the Covered Species.

The installation of new pipes and maintenance of existing pipes is done during the dry season. Maintenance is performed on an as-needed basis, and new pipes are installed, on average, every 3 to 5 years. Ground disturbance associated with the maintenance of existing pipes and the installation of new pipes in the Lagunita area and foothills could harm or kill salamanders. If an occupied burrow is destroyed, it would likely harm or kill a California tiger salamander. Since maintenance and installation activities that require ground disturbance are done during the dry season when California tiger salamanders are in their burrows, California tiger salamanders should not become trapped in temporary trenches.

Ground disturbing activities associated with the installation and maintenance of pipes in the Lagunita area, foothills, and near San Francisquito and Los Trancos creeks will temporarily disturb small amounts of garter snake habitat and may disturb individual snakes by frightening a snake away from the construction area.

Maintenance and installation of pipes near Matadero and Deer creeks can affect California red-legged frogs and garter snakes. Maintenance and installation of underground pipes would result in a temporary loss of habitat because vegetation removal and trenching would occur along the utility corridor, which is approximately 10 feet wide, and a trench would need to be dug. Such maintenance could occur once every 10 years. These activities could also result in frogs or snakes being disturbed and frightened. Minor changes in the creek bank or topography of the riparian areas would not have any long-term effects.

Maintenance and installation activities near Matadero and Deer creeks would not affect western pond turtles or steelhead because these species do not inhabit the creeks or adjacent riparian areas.

The maintenance and installation of pipes near San Francisquito Creek can affect California red-legged frogs, garter snakes, and western pond turtles. The maintenance and installation of underground pipes near San Francisquito Creek would result in a temporary loss of habitat for these species because vegetation removal and trenching would occur along the utility corridor, which is approximately 10 feet wide. Such maintenance could occur every 5-10 years. These trenching and vegetation removal activities could also frighten any individuals of these species that were in the vicinity of the work. California red-legged frogs, garter snakes, and western pond turtles are not present on Los Trancos Creek and would therefore not be affected by waterline maintenance and installation along that creek.

The maintenance and installation of water lines spanning San Francisquito and Los Trancos creeks (along the underside of bridges) generally do not affect the creek. Although these water lines are attached to the underside of bridges and are usually maintained from the bridge itself, it is possible that if major work in the future is required under the bridge, a coffer dam could be necessary, which would temporarily affect steelhead habitat and disturb individual steelhead. Use of a coffer dam for such work would likely occur one or two times in the life of the HCP. The installation and maintenance of pipes in the adjacent riparian areas would not adversely affect steelhead, and minor changes in the creek bank or topography of the riparian areas as a result of underground pipe maintenance and installation activities would not have any long-term effects.

3.1.5 Wells

Stanford maintains five groundwater wells (Figure 3-1). These wells primarily serve as a backup supply of potable water, but also are used to supplement Lake water for irrigation in the summer and fall. Well water is also occasionally used to maintain water level in Lagunita. The well system is particularly valuable when the Lake water system is unable to meet demand. Operation and maintenance activities include mechanical and electrical work on the pumps, motors, valves, and control systems, as well as periodic refurbishment of the wells.

Due to the cost of operating the wells, Stanford minimizes the amount of time that they are in use. Stanford’s wells are relatively deep (for the area), averaging 300 to 600 feet below the surface. Several thick clay layers, mostly laterally continuous and ranging from 20 to 80 feet thick, form aquitards above and between the coarse water-bearing units.

3.1.5.1 Potential Effects of the Wells on the Covered Species

All groundwater wells take water from at least 100 feet below the surface and they are not hydraulically connected to the creeks. They do not, therefore, affect the creek flow conditions and do not affect steelhead at all.

Maintenance activities at the surface portions of the wells could impact California tiger salamanders, garter snakes or western pond turtles. Such impacts would be confined to disturbing an individual of the Covered Species which might be hiding around the structure. The wells are located out of the current range of the California red-legged frog, and well maintenance will therefore not affect California red-legged frogs. Western pond turtles are only occasion-
ally found in the area where the wells are located. California tiger salamanders and garter snakes are found in the general vicinity of the wells.

### 3.1.6 Non-operating Lagunita Diversion

The Lagunita diversion facility consists of a dam on San Francisquito Creek, a water-directing gate, and a flume that parallels the creek and extends to Lagunita. The existing facility was constructed in the late 1800s, but the California Department of Fish and Game installed a fish ladder on the structure in the mid-1950s, which has been modified several times since. The gate to the flume was closed in the 1980s following partial collapse of the flume, and the facility has not been used to divert water since 1985.

Maintenance activities on the dam and fish ladder consist of physical hand clearing of branches and debris from the ladder and occasional repairs of the ladder and the dam itself. Approximately 10 to 20 times per year during the rainy season, the ladder is cleared, usually after creek flows have subsided. Creek flow is usually not disturbed for this work; however, on average five times each year, the creek flow is deflected from the ladder, using a sheet of plywood, so that large debris can be removed from the ladder without water pressure behind it. This work is usually completed within an hour. On average once a decade, the creek flow is diverted using a cofferdam so that erosion under the dam can be repaired, the concrete repaired as necessary, and/or the ladder repaired.

#### 3.1.6.1 Potential Effects of the Non-operating Lagunita Diversion

This diversion facility does not affect California tiger salamanders, garter snakes, western pond turtles or red-legged frogs because these species are not present at this site. California red-legged frogs have been reported in the vicinity of the structure, but none have been verified to be present in several decades. Western pond turtles have also historically been found in the area of the structure, but no western pond turtles have been observed at the structure for more than a decade.

Steelhead are found in the creek at the non-operating diversion structure, including the large pool downstream. Maintenance activities associated with the existing facility could have short-term adverse impacts on steelhead if a cofferdam were required to conduct maintenance of the structure or repair erosion downstream.

Dispersing steelhead routinely pass the structure. However, even with the fish ladder, the facility does not meet NOAA’s current fish passage guidelines, and NOAA Fisheries believes that the presence of the in-stream facilities could impede steelhead recovery in the watershed. NOAA Fisheries has therefore asked Stanford to remove the barrier to improve juvenile and adult steelhead passage.

In 2006, Stanford studied potential steelhead passage improvements, and concluded that removing the existing fishway, concrete weir, and apron between the abutments and restoring the channel to a more natural configuration would best improve fish passage for adult and juvenile steelhead, and that this approach is preferred by fisheries agencies and environmental professionals. The estimated costs to design, permit, and perform the necessary construction to remove the facilities and restore the channel is $386,000 (in 2006 dollars).

### 3.2 CREEK MAINTENANCE ACTIVITIES

Stanford conducts both routine and emergency creek maintenance work in and around all of the creeks on its property (including Deer, Matadero, Los Trancos, San Francisquito, Corte Madera, Bear, and Sausal). Routine maintenance consists of debris removal, including compliance with requests from the Santa Clara Valley Water District to remove downed trees and other debris from the creeks. This work is typically conducted during periods of low flow, but if an emergency arises, work in a creek can occur at any time of the year. Tree snags and other debris are removed only if they are disrupting the free flow of water or are causing undo erosion.

Debris removal and bank stabilization regularly occurs in the more urbanized areas of campus, such as areas near the Oak Creek Apartments and the Children’s Health Council along San Francisquito Creek, near the Ladera Tennis Club along Los Trancos Creek, and near the Stanford Research Park along Matadero Creek.

Recent bank stabilization efforts at Stanford have involved sinking pillars into the existing bank, with little structural work done on the surface. In a number of locations, however, gabions, rip-rap, and concrete aprons are present. These older types of bank stabilization methods have a tendency to fail, and future repair work is therefore anticipated. During the life of the HCP, bank stabilization would only occur when needed. Stanford would conduct this bank stabilization using bioengineered structures.
and would not use gabions. Timing or need for bank stabilization is not known, but based on past experiences, Stanford anticipates constructing up to 10 bank stabilization structures during the life of the HCP, with each structure up to 200 feet in length, with no more than 50 percent of each structure consisting of hardscape materials such as rip-rap and concrete.

Stanford participates in an annual inter-agency maintenance effort that is coordinated by the San Francisquito Creek Joint Powers Authority (JPA) prior to the winter rainy season. The purpose of this effort is to remove obstructions that could cause flooding or bank erosion. An annual creek walk of San Francisquito Creek is organized by the JPA in September from the Oak Creek Apartments to El Camino Real during which the JPA, Santa Clara Valley Water District, Menlo Park, Palo Alto, and East Palo Alto survey conditions and agree on needed maintenance activities. Trash such as yard waste and other bulky items that are illegally dumped, large vegetation in the channel, fallen trees, and debris jams that extend into the center of the channel are identified during this annual creek maintenance walk. Any obstructions on sections of San Francisquito Creek that are maintained by Stanford are cut and collected using chainsaws and other hand tools, and removed from the creek channel by hand or by a truck-mounted crane where access is possible from the top of the bank. Fallen trees or other debris are usually removed during periods of low or no water flow. Fallen trees or debris jams that are too large to be removed by hand are occasionally encountered in the creeks. These require the use of large equipment and work crews. Due to accessibility, safety, and environmental concerns, heavy equipment remains at the top of the creek bank or on a side bench, if available, but are never used in an active channel. The heavy equipment is used to pull large pieces of debris out of the creek channel. In most reaches of Stanford’s creeks fallen trees and other woody debris are left in place. However, fallen trees or other natural material are removed when there is a risk of flooding or at the request of a public safety agency.

In addition to Stanford’s creek maintenance activities, public agencies with maintenance easements over Stanford’s lands perform flood control and maintenance. Stanford does not have control over the public agencies’ flood control activities, and these activities are therefore not included in the HCP.

San Francisquito Creek runs through the Stanford golf course, and creek-related activities associated with the golf course are described in Section 3.6.1, below.

Tributaries and drainage channels upstream from Searsville Reservoir on Stanford lands require annual maintenance in order to prevent flooding of adjacent roads and residential properties. These maintenance activities include periodic excavation of the existing channels, maintenance of constructed berms, vegetation removal, and bank stabilization.

During the life of the HCP, Stanford may restore the Corte Madera Creek channel and drainage areas upstream of Searsville Reservoir to prevent flooding of adjacent roads and properties. To address siltation that has caused Corte Madera Creek to become braided and result in upstream flooding, Stanford constructed a 400-foot channel segment in 1997 with excavation of the primary old channel with heavy equipment, placement of sediment as a berm alongside the channel, and riparian plantings for bank stabilization. In the future, these maintenance activities may need to be extended downstream to prevent upstream flooding. The work area is expected to be 2,500 feet long and no more than 50 feet wide, using similar methods to those used in 1997. If constructed, these channel modifications would likely need to be extended downstream in subsequent years as the delta front advances towards the dam and Searsville Reservoir fills with sediment. If the reservoir is allowed to fill completely, the channel improvements would need to be extended an additional 2,000 feet to the dam. The amount of permanent land conversion associated with this project would be mitigated in accordance with Section 4.4 of the HCP.

3.2.1 Potential Effects of the Creek Maintenance Activities on the Covered Species

Creek maintenance activities will not affect California tiger salamanders because the creeks at Stanford do not support this species. The hand removal of debris and fallen trees in areas deemed at risk of flooding can cause short-term impacts, but few long-term effects on western pond turtles, California red-legged frogs, garter snakes, and steelhead because very few of these species inhabit downstream reaches that would be affected by the removal. For example, the loss of large woody debris from the creeks may reduce channel complexity and the diversity of microhabitats that provide a positive benefit for steelhead by increasing channel complexity and the diversity of microhabitats. In the rare case where the use of heavy equipment is required, this could have a short-term effect on western pond turtles, California red-legged frogs, garter snakes, and steelhead. Again, as these activities are concentrated in the downstream, more urban portions of Stanford’s creeks, impacts to the Covered Species will be limited to altering steelhead habitat and temporarily disturbing any steelhead in the vicinity of the work.

Bank stabilization efforts, even with comparatively little surface work, often require diverting a portion of the creek – via coffer dams and a bypass pipe. Such work has the potential to adversely affect steelhead through dewatering, fish relocation, and modification of the streambank. Bank stabilization work would frighten any individual western pond turtles, California red-legged frogs, or garter snakes that would be in the vicinity of the work. Tiger salamanders would not be affected by bank stabilization efforts because these areas are not occupied by California tiger salamanders. Further modification of the Corte Madera Creek channel would result in the loss of potential California red-legged frog, garter snake, and western pond turtle habitat.
3.3 FIELD ACADEMIC ACTIVITIES

3.3.1 Jasper Ridge Biological Preserve

Scientists have conducted research at the Jasper Ridge Biological Preserve continuously since 1891, long before it was formally designated a biological field station. This extensive research includes long term studies that are landmarks in ecology and population biology. Jasper Ridge Biological Preserve has a long policy of biological non-intervention, and the vast majority of work conducted at the Preserve does not involve the broad manipulation of natural resources.

Because many of its ecosystems are so well documented and understood, the Preserve provides unique opportunities for scholars to seek answers to questions involving long-term monitoring and observations that could not be performed elsewhere. In addition, the careful management of the Preserve's ecosystems, with a prohibition on large-scale manipulative studies, allows scientists to quantify changes observed in similar ecosystems that are subject to a range of human activities. In addition to facilitating first rate research, this highly accessible field station provides rich undergraduate and graduate educational experiences and plays an active role in educating the general public.

Searsville Reservoir, which is located in the Jasper Ridge Biological Preserve, is used annually to teach several courses at Stanford. It serves as a field laboratory for the introductory biology core, and also has been the focus of numerous research projects.

Jasper Ridge maintains a series of trails that facilitate research and teaching. These trails are packed dirt and generally no more than 5 feet wide. Monitoring facilities, such as weather stations, motion-detecting camera stations, and automated sound recording devices, are used throughout the Preserve, and require routine servicing, such as cleaning, vegetation trimming, etc.

The collection of biotic specimens and the sampling of water, soils, and rocks is frequently part of the teaching and research that occurs at Jasper Ridge. This collection is strictly controlled by Stanford.

Access to biologically sensitive parts of Jasper Ridge, particularly areas where individuals of the Covered Species may reside, is carefully controlled.

3.3.2 Creeks

Researchers at Stanford conduct field activities in the creeks on an annual basis. Much of the research involves monitoring California red-legged frogs, steelhead, and other native fishes that live in the creeks. These efforts also monitor the changes in abundance of non-native species such as bullfrog, mitten crab, and crayfish. Geology and engineering researchers also utilize the creeks on a regular basis to perform research and to support teaching. Like research at Jasper Ridge, research in the creeks is primarily observational and typically non-manipulative. Some collection of specimens, both physical and biotic, does occur. Access to creeks is strictly controlled by Stanford, and is limited to trained researchers; introductory classes and large numbers of students are prohibited from the vast majority of creeks. Monitoring devices are occasionally placed in the creeks or in the riparian zone.

3.3.3 Foothills and Alluvial Plain

Faculty and students from many academic departments routinely use undeveloped portions of the Stanford foothills and alluvial plain. The activities conducted by these academic groups range from field studies in geology, archeology, and engineering, to more humanities-oriented exercises in photography and cinematography. The field studies generally do not involve manipulations of biotic variables or significant earth moving. Study test pits and trenches are, however, used annually in the geology, geophysics, and earth systems courses. These range from simple soil borings to hand excavation of a trench up to 10 feet by 2 feet that remain open for up to a week. There are a number of academic facilities situated in the relatively undeveloped portions of the Stanford foothills and alluvial plain, including student observatory, solar observatory, radio telescopes, independent research institutions, and several plant growth facilities. These facilities require ongoing maintenance and are frequently upgraded (and occasionally expanded). Rodent and vegetation control is conducted at the facilities. Buildings in the main campus are discussed in Section 3.5.5.

Some collection of specimens, both physical and biotic does occur. Access to the foothills for academic purposes is controlled by Stanford, and is limited to approved researchers and classes. The biotically sensitive portions of this area are held off-limits to general studies. Monitoring devices are occasionally placed in the foothills.

There are more than 60 prehistoric archaeological sites and a number of historic period archaeological sites on Stanford's lands. Prehistoric sites include prehistoric Ohlone-Costanoan villages, cemeteries, stone tool raw material quarries, bedrock milling stations and petroglyphs. Historic archaeological discoveries at Stanford include Mexican rancho sites, gold rush towns, American ranches, Japanese and Chinese labor camps, 1906 earthquake rubble dumps, and trash pits associated with early campus housing. Stanford employs a university archaeologist to oversee the protection of the cultural resources, and to facilitate research and teaching activities at these sites. Research focusing on these resources occasionally involves

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5 This collection does not include Covered Species unless permits are obtained from the appropriate agencies.
6 The main academic campus is located on an alluvial plain.
extensive digs and vegetation clearing. These digs are not located within the creeks, but several of the digs have been in locations adjacent to the creeks. Archaeological teaching and research activities are dictated by the size and composition of the archaeological resource. A large-scale archaeological dig might last up to 15 months and consist of a main pit 450 square feet by 6 feet deep, with smaller associated pits. It is roughly estimated that Stanford could undertake up to five large-scale digs near the creeks during the life of the HCP. In addition, it is estimated that Stanford will conduct smaller investigations (e.g., a set of 10 pits, each 18 square feet, 3 feet deep) every few years. Pits are refilled at the end of the archaeological dig.

Additionally, researchers from the University engage in restoration biology throughout the lower foothills. In 2000, the University began funding this restoration work, and the goal is to find cost-effective ways to improve the existing non-native-species-dominated communities. This goal serves the University’s desire to conserve its natural resources and the desire to improve the academic value of the lower foothills.

3.3.4 Lagunita

Lagunita is occasionally used by classes and researchers as an outdoor laboratory and study site. Generally, these academic activities are non-invasive and involve walking around Lagunita, making observations, taking water samples, and sometimes using small boats or rafts to collect information.

3.3.5 Potential Effects of the Field Academic Activities on the Covered Species

Academic activities could have direct and indirect effects on the Covered Species, but most of the impacts of Stanford’s academic activities would be exceedingly minor and of short duration. Most of the academic activities that could cause take involve students or researchers walking through an area where the Covered Species were found. It is unlikely that an individual of a Covered Species would be stepped on or otherwise directly encountered during such activities. Individuals of the Covered Species found in the immediate vicinity of these academic activities could be disturbed by academic activities and alter their behavior. Additionally, if the number of person-visits to an area occupied by a Covered Species were too high, there could be some habitat degradation, or the behavior of Covered Species could be altered.

More invasive academic pursuits, including such tasks as archaeological digs, digging of geological test pits, and conducting habitat restoration projects, also could have short-term adverse effects on the Covered Species, including short-term habitat degradation. Individuals could become trapped in open pits. Continuous visits (i.e., an on-going archaeological dig) could disturb individuals and/or cause Covered Species to leave the area. It should be noted that many of the research activities (e.g., water quality testing, soil characterizations, population studies) would result in information that provides substantial positive benefits to the Covered Species.

The maintenance of facilities, mainly dirt trails and monitoring stations, associated with field academic activities would have only a minor potential to impact Covered Species. As this work typically would occur during daylight hours and during the dry season, any potential impacts would be short-term and minor.

3.4 Utility Installation and Maintenance

A large number of above- and below-ground power, communication, steam, chilled water, water, sewer, and drainage (e.g., flow-filtering manholes and detention basins) utilities, and related facilities exist at Stanford.7 There also is an extensive steam and chilled water system on the main campus. Storm drains are located throughout campus and drain into either San Francisquito Creek or Matadero Creek. A majority of these facilities are located in the main campus. However, essentially all parts of the campus are served, and hence crossed, by utility lines. In addition, existing utilities will have to be improved, and new utilities will be installed during the life of the HCP. Stanford may need to construct additional utility facilities and lines to fully utilize existing utility facilities. Other improvements also might be needed to accommodate new technologies. For ease of operation, and to reduce the potential environmental effects, most new utilities are installed in existing utility corridors.

Many of the existing utilities, including major domestic water supply facilities and power supply utilities, are located in areas that are occupied by the Covered Species. Domestic water system utilities also are located adjacent to, through, and under creeks. Maintenance of existing and new utilities, including utilities located in habitat areas, includes vegetation control around the utility lines and replacement of utilities and associated infrastructure such as power poles. Utilities located in

[7] Some of the utilities such as PG&E and SFPUC facilities are not owned by Stanford. These facilities and the maintenance, repair, and other activities associated with these facilities may be covered under this HCP through Certificates of Inclusion, which are described in Chapter 6.
undepveloped areas are generally accessed by designated access roads or by driving through open grasslands. Underground work is typically limited. This collection does not include Covered Species unless permits are obtained from the appropriate agencies, on a defined utility corridor. When work is done away from existing roads, the surface is usually replanted with a mix of native grasses and forbs (for maintenance considerations, shrubs and trees are not typically planted on top of or below utility lines).

### 3.4.1 Potential Effects of Utilities on the Covered Species

Maintenance and improvements to existing infrastructure are typically confined to the existing footprint of the structure, and, as such, these activities usually have a minimal and temporary effect on the Covered Species. However, some of the maintenance actions, including ground disturbing activities, new utility installations, and utility line maintenance or replacement, work in, under, or adjacent to creeks (e.g., pipeline repair, temporary use of coffer dams, etc.) can result in the take of Covered Species.

Ground disturbance associated with the maintenance or replacement of existing utilities could adversely affect tiger salamanders, red-legged frogs, and garter snakes. These species can become trapped in open trenches or holes if construction sites are not properly fenced or covered. Pond turtles and steelhead are much less likely to be impacted by ground disturbance activities.

The installation of new infrastructure also could adversely affect the Covered Species, and the magnitude and duration of the effects depend upon the type of infrastructure that is installed and the location of the new infrastructure. Installation activities near or across the creeks would have greater effects on the Covered Species located in the creeks, and could result in take; whereas, the installation of new utilities in the developed portions of the campus would likely not affect the Covered Species. The installation of new utilities in the foothills also could impact California tiger salamanders and garter snakes, but would not have an effect on the other Covered Species. The amount of any permanent land conversion associated with new infrastructure would be mitigated in accordance with Section 4.4 of the HCP.

### 3.5 GENERAL INFRASTRUCTURE

Urban infrastructure exists in areas that are occupied by or provide habitat for the Covered Species. This infrastructure includes private roads, unpaved service roads, private bridges, fences, detention basins, buildings, and private residences. Operation of the University, and indeed much of the surrounding community, depends upon the operation of this infrastructure. Therefore, it is mandatory that these uses be maintained. Also, the addition of new structures at existing facilities or operational changes may be necessary.

#### 3.5.1 Roads and Bridges

There is a broad network of Stanford-controlled roads that provide access to all of Stanford. These private roads range from paved four-lane roads in the main campus, to narrow dirt or gravel service roads in the undeveloped portions of the University. These roads are maintained regularly, both for public safety and in an effort to reduce environmental impacts. The type and frequency of road maintenance depends upon the route; heavily traveled paved roads generally require more frequent maintenance than rural service roads. As part of Stanford’s road maintenance activities, roads are occasionally rerouted. Resurfacing, vegetation control, and other similar maintenance activities are conducted during daylight hours, and during periods of no rain. Roads are occasionally realigned, most often in response to public safety concerns or in an effort to reduce environmental impacts.

New roads are occasionally required for public safety or as land uses change. New roads that were not associated with replacement and restoration of an existing road in a more sensitive location would result in a net loss of habitat. The amount of permanent land conversion associated with a new road would be mitigated in accordance with Section 4.4 of the HCP. In addition to Stanford’s system of private roads, several public roads cross Stanford (e.g., Junipero Serra Boulevard, Sand Hill Road, and Stanford Avenue). Activities by Stanford on the public roads located on Stanford’s lands are Covered Activities. Stanford sometimes encroaches into these roadways to maintain utilities or construct salamander tunnels, and these activities are covered by the HCP.

Several private bridges are included in the Stanford roadway system. These bridges are used by authorized University personnel, although several also are used by the public at the golf course and along Piers Lane. These are maintained and improved on an as-needed basis. Maintenance is generally restricted to resurfacing the structure or to trimming overhanging vegetation, but occasionally more significant structural work is required, including replacing spans or supports or the entire bridge. In some situations, a small portion of the creek, typically less than 200 feet, is temporarily contained in a pipe as the creek channel up and downstream

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3. Golf cart paths are not part of the Stanford roadway network, and are therefore included in the Golf Course Covered Activities.
of the bridge is spanned with coffer dams. Major bridge work is fairly infrequent, and it is expected that during the 50-year span of the HCP, coffer dams and bypass pipes will only be needed on three or four occasions. In addition, it is possible during the life of the HCP that Stanford would need to construct new bridges. It is anticipated that any new bridges would span the creeks, with no permanent structures within the creek channel, and that no more than six bridges over creeks where Covered Species are located would be constructed. Construction of new bridges could require temporary falsework in the creek, vegetation removal, and de-watering with coffer dams and bypass pipes.

3.5.1.1 Potential Effects of Roads and Bridges on the Covered Species

Roadway maintenance could disturb habitat for all Covered Species. Indirect take caused by reduced vegetation or minor maintenance-related runoff will also be very limited, and would consist of few individuals of the Covered Species re-locating themselves away from inhospitable areas. Likewise, maintenance workers and equipment could temporarily disturb habitat.

Repair or maintenance of existing bridges or bridge construction can also adversely affect steelhead and California red-legged frogs in the creek. These activities could require the use of falsework and coffer dams, resulting in adverse affects to juvenile steelhead and red-legged frog tadpoles and metamorphs. If an area were de-watered, the relocation of these animals could result in mortalities and increased competition for resources at the relocation site. Maintenance workers and equipment on the creek bank may also disturb red-legged frogs, garter snakes, and western pond turtles.

No disturbance of California tiger salamanders is anticipated during bridge maintenance because tiger salamanders are not found near the creeks at Stanford. Many California tiger salamanders are killed by traffic on roads at Stanford. However, most of the mortalities occur on Junipero Serra Boulevard, a Santa Clara County road that traverses the campus near Lagunita.

3.5.2 Fences

Fences are widespread in the undeveloped portions of campus. Many of the fences are used to control public access, while others define leaseholds. The agricultural tenants also operate a series of fences. In addition, fences are a necessary component of conservation planning at Stanford and are used to protect valuable habitat.

Fences at Stanford are inspected and repaired on a continuous basis. Vandalism, fallen trees, auto accidents, and simple aging all take their toll on the fences. Fence repair work is usually quite simple. A work crew drives as close as possible to the damaged fence and repairs the fence by hand, though power augers are occasionally used for post-hole digging. In addition, Stanford commonly moves existing fences, removes unused fences, and installs new fences. In the case of new fences, shrubby vegetation is sometimes cleared from the fence route.

3.5.2.1 Potential Effects of Fences on the Covered Species

The installation and maintenance of fences at Stanford is a fairly low impact endeavor. It is possible that individual California tiger salamanders, California red-legged frogs, and garter snakes could be disturbed by replacing a fence post or by workcrews accessing the site. The fences do not act as barriers to migration of Covered Species.

3.5.3 Detention Basins

Stanford recently constructed stormwater detention basins within the central campus to intercept increased runoff that may be caused by future campus development. The basins are earthen (unlined), and include subdrains and pipe systems to convey accumulated runoff to the regional storm drain system. The currently existing detention basins in the San Francisquito Creek watershed are just over an acre in size and located along Sand Hill Road near Stock Farm Road. Additional detention facilities (basins and/or buried pipe systems) are planned along Sand Hill Road, both north and south of the existing basins, for future development in the west region of campus. The detention basins located in the Matadero Creek watershed are approximately three acres in size and are located along El Camino Real near Serra Street. This detention system is designed to accommodate 100-year storm events (i.e., storms of a sufficient magnitude that they have no more than a one percent chance of occurring in any given year). The new detention basins will detain the increased runoff and keep it from entering San Francisquito Creek or Matadero Creek until well after the peak creek flow has receded. In the event of a 100-year storm, the basins are designed to drain within approximately 2 days (48 hours). During storm events of lesser magnitude, the basins would hold water for a shorter period of time. The purpose of the basins is to reduce peak flows by detaining a portion of the runoff for a short period of time. The basins do not provide long-term water storage.
3.5.3.1 Potential Effects of the Detention Basins on the Covered Species

While detention basins are temporarily collecting storm water, individual California tiger salamanders may be attracted to them and interrupt their migration to suitable breeding locations. However, while the basins located near Sand Hill Road are within migration distance of the California tiger salamanders, there are significant barriers located between Lagunita and the basins and very few California tiger salamanders are expected to be present. There are no garter snakes, red-legged frogs, or western pond turtles at the detention basins.

3.5.4 Isolated Private Residences

There are a number of modest private residences near Los Trancos Creek and San Francisquito Creek. These residences are not part of defined residential neighborhoods, and are generally associated with the agricultural and equestrian uses (one exception is a residence that houses University personnel involved in the operation of rural University facilities and lands). These houses and their associated yards are subject to normal residential activities including building maintenance, repair and modification, vehicle storage, etc.

3.5.4.1 Potential Effects of Isolated Private Residences on the Covered Species

The limited number of these isolated residences and their location away from the most biologically sensitive areas makes it unlikely that they have an effect on the Covered Species. However, maintenance and ongoing use of residences could result in limited take of California red-legged frogs, western pond turtles, and California tiger salamanders. Such take would likely be in the form of an individual of a Covered Species straying from appropriate habitat into an area of human activity, and subsequently being harmed or trapped. Garter snakes have not been recorded from near the isolated private residences, but it is plausible that a garter snake could enter into a developed area.

3.5.5 Academic Buildings

Stanford’s central campus includes approximately 13 million square feet of academic, academic support and housing structures, including student residences, libraries, laboratories, and lecture halls. The central campus also includes faculty/staff housing. These buildings and their associated landscaping are continuously maintained, frequently modified, and occasionally demolished. New buildings are constantly being constructed, and are discussed under “Future Development.” Academic buildings located out of the main campus were discussed under “Academic Activities.”

3.5.5.1 Potential Effects of Academic Building Maintenance on the Covered Species

Covered Species that enter into the built portions of campus will likely die, due to the number of hazards in the urban environment. Maintenance and modification of these buildings could potentially harm a Covered Species, particularly California tiger salamanders that are occasionally found near buildings adjacent to Lagunita. Additionally, garter snakes are occasionally observed in and around the buildings adjacent to Lagunita. These snakes leave the area as soon as they are encountered by people.

3.6 RECREATION AND ATHLETICS

3.6.1 Stanford Golf Course, Practice Facility, and Driving Range

Stanford University operates an 18-hole golf course north and south of Junipero Serra Boulevard, to the southeast of Sand Hill and Alpine roads (Figure 3-3). There are no pooled water hazards associated with the course; however, San Francisquito Creek flows through the course. There are several cart bridges over the creek and a network of golf cart paths that allow players to access the course.

Golf course maintenance practices are focused on mowing and fertilizing the greens, fairways, and roughs; maintaining the paved golf cart paths; and, in areas that golf play crosses San Francisquito Creek, trimming riparian vegetation on a regular basis. Stanford utilizes an integrated pest management approach for golf course maintenance. Pesticides for weed and insect control are only used as a last resort and in accordance with all State and local pest control regulations. The Stanford golf course has been designated as a “Clean Bay Business” certified by the City of Palo Alto for hazardous materials handling and storage efforts. The pesticide use decreased approximately 75 percent since the mid-1990s. Pests are now spot-treated, as opposed to the previous method of broadcasting those treatments. The “roughs” have been naturalized to provide under-story vegetation for wildlife. Pesticide use will continue to be used in this way, but pesticide use is not a Covered Activity.
There is also an approximately 25-acre golf practice facility located adjacent to the main golf course and Sand Hill Road. This facility is operated and managed in a manner similar to the main golf course.

In addition to the 18-hole course, there is a driving range on approximately 15 acres of modified grassland next to Lagunita on its northwest side. The driving range has its own parking lot, service building, strip of tee boxes, putting green, and chipping mound at the northwest end. The range also includes lighting to allow nighttime operation, target greens, and distance markers. Operating hours are from 8:30 a.m. to 10:00 p.m. on weekdays and from 7:00 a.m. to 10:00 p.m. on weekends. The range closes early on rainy nights.

Driving range balls are collected from noon to closing, depending upon the need. Ball collection is done mechanically using a tractor-driven collecting device. A fence is located at the south end of the range to keep balls on the irrigated part of the turf, which makes ball collection easier.

The golf course, practice facility, and driving range are both periodically redesigned. These changes typically involve moving tees or green locations. These moves are located within the existing footprint of the highly modified landscape.

3.6.1.1 Potential Effects of the Golf Course, Practice Facility, and Driving Range on the Covered Species

Operation and management of the golf course, practice facility, and driving range may adversely affect California tiger salamanders and garter snakes. California tiger salamanders and garter snakes do not utilize the fairway and green portions of the golf course, practice facility, or the driving range for upland habitat, because it is manicured lawn and burrows are not present. California tiger salamanders and garter snakes will traverse the open areas, the fairways, and the greens, but they seem to avoid them as exceedingly few California tiger salamanders and no garter snakes have been observed in such areas during the last 15 years of monitoring at Stanford. Undeveloped portions of the golf course and driving range that are not surrounded by manicured fairways are occupied by California tiger salamanders and garter snakes. California tiger salamanders and garter snakes could also be impacted through mowing of turf, fairways, and greens, and the maintenance of vegetation in the areas adjacent to fairways and greens.

Ball retrieval at the driving range during rainy nights has the potential to harm or kill California tiger salamanders and garter snakes. However, the driving range typically closes on rainy nights due to lack of use and the balls are generally not retrieved during the rain.

The operation and maintenance of the Stanford golf course, practice facility, and driving range may affect western pond turtles and steelhead, through mowing turf, fairways, and greens; maintaining vegetation in the areas immediately adjacent to fairways and greens; maintaining cart bridges; and trimming riparian vegetation where the course plays across the creek. This trimming could disturb steelhead and western pond turtles, and result in the loss of habitat. The reduction in riparian vegetation at the golf course likely does not cause a significant or long-lived increase in water temperature in San Francisquito Creek. California red-legged frogs have not been observed at the golf course or areas downstream for several decades.

Maintenance of the cart bridges could affect the western pond turtles, garter snakes, and steelhead, particularly if major work is required. While even major work is typically conducted outside of the creek banks (using cranes), it is possible that under some circumstances the creek will need to be diverted around the repair site using coffer dams and by-pass pipes. Such extensive work would affect steelhead and possibly western pond turtles and garter snakes.

3.6.2 Lagunita and Felt Reservoir-Related Recreation

Since 2001, Stanford has not used Lagunita for scheduled recreational purposes. In the past, however, numerous community and University activities occurred at Lagunita. During non-drought years, the Stanford Windsurfing Club used Lagunita for windsurfing courses. To support this activity, the Windsurfing Club would bring in storage containers that contained sail boards and small boats. Students could use the sailboards and boats on their own or take lessons throughout the spring quarter during the hours of 9 a.m. to 6 p.m. To facilitate recreational activities, emergent aquatic vegetation was mechanically cleared from part of Lagunita during the late spring and several tons of sand was imported to create a swimming beach. During those periods of formal recreational use, Lagunita was monitored by Stanford for several health-related parameters (Coliform bacteria levels, etc.). Despite the regular outbreaks of “swimmer’s itch”, a generally harmless condition caused by a trematode parasite, Lagunita was a very popular recreational facility.

Formerly, Lagunita was the site of the annual Big Game Bonfire and a mud volleyball fund-raising event. These two popular, traditional events probably had an adverse effect on the California tiger salamanders at Lagunita and were therefore cancelled in the early 1990s.

A partially developed trail system encircles Lagunita. This trail is open and receives heavy public use, including many dogs.

Felt Reservoir is used on a regular basis for equestrian uses and sailing courses. Felt Reservoir is located in an area that is subject to an equestrian lease; however, the reservoir is not open to the public.
3.6.2.1 Potential Effects of Reservoir-Related Recreation on the Covered Species

Currently, of the Covered Species, only western pond turtles are occasionally found at Felt Reservoir. However, California red-legged frogs and garter snakes could be found at the reservoir in the future. Sailing courses could result in short-term avoidance behavior by these species. Equestrian uses also could result in short-term avoidance behavior but horses could kill or injure adult and juvenile individuals of these Covered Species if they do not move off of an equestrian trail adjacent to the reservoir.

The past use of Lagunita for recreational purposes may have adversely affected California tiger salamanders and garter snakes. However, historically the recreational uses prompted the University to fill Lagunita, and likely facilitated California tiger salamander and garter snake breeding at Lagunita and persistence at Stanford. People using the trail around Lagunita may disturb California tiger salamanders and garter snakes. However, it is unlikely that the trail is used on rainy nights when California tiger salamanders are generally migrating.

3.6.3 Recreational Routes

The Santa Clara County Countywide Trails Master Plan identifies several trails through Stanford, and several public trails currently exist (Figure 3-3). The Los Trancos Creek and Adobe Creek trails have been in place for several years, and a portion of the San Francisquito Creek trail was included in the streamside open space plan approved by the City of Palo Alto. Stanford’s 2000 General Use Permit requires implementation of the Santa Clara Countywide Trails Master Plan though the construction, operation, and dedication of two trails that are located roughly along San Francisquito/Los Trancos creeks and Matadero Creek.

Stanford also maintains recreational routes in the “Dish” area of the foothills between Junipero Serra Boulevard and I-280. Recreational use to the area began in the mid-1980s, and Stanford posted a clear set of rules and regulations governing the uses of the trail. Prior to 2000, Stanford did not have the resources to enforce the rules and regulation. As a result more than 13 miles of unauthorized footpaths and an array of structures were built (e.g., tree houses, labyrinths, fire rings, and tunnels). There was 24-hour-a-day access, and numerous dogs were not contained on leashes. In 2000, Stanford initiated a foothills management program, and now pedestrian traffic is only allowed on designated trails. Non-designated trails have been closed off and are being restored, dogs are no longer permitted, and there are frequent security patrols. These measures will reduce human impacts on the flora and fauna of the foothills. The recreational routes are part of the University’s paved service roads. Maintenance of these roads and potential impacts on Covered Species are discussed in Section 3.5.1.

3.6.3.1 Potential Effects of Recreational Routes on the Covered Species

Recreational use of the foothills by pedestrians is now regulated by the University, and members of the public rarely stray from designated paths and are not allowed on-site after dark. Dogs are not allowed in the foothills. Use and maintenance of these recreational routes could disturb California tiger salamanders and garter snakes.

Recreational use of future trails associated with the 2000 General Use Permit along San Francisquito, Los Trancos, and Matadero creeks could affect California red-legged frogs, steelhead, garter snakes, and western pond turtles by bringing humans in proximity to the creeks, but use of the trails will be subject to rules and regulations prohibiting entry into the creeks and unauthorized disturbance of riparian vegetation. In addition, the improvement, operation, and ongoing maintenance of the existing trails could affect these Covered Species through alteration of the streambed and channel, and removal of vegetation.

3.7 GROUNDS AND VEGETATION

3.7.1 Fire Control and Public Safety

Stanford engages in several fire control and public safety activities, including the maintenance of fire breaks and vegetation control. Various techniques are used to control weeds so that they do not become fire hazards in the summer and fall months. The primary techniques are flail mowing, discing, and herbicides. Flail mowing is used for weed suppression in open fields with tall grasses. The mower is attached to a tractor and can cut grass down to ground level. Flail mowing of approximately 70 acres is typically done one to three times during the summer in open space areas. Discing and mowing are used to create fire breaks in grassland areas. Discing is typically used along roads and pathways in the foothills and along Junipero Serra Boulevard. The amount of discing that is typically conducted in sensitive California tiger salamanders areas south of Junipero Serra Boulevard is estimated to be 4,500 feet by 20 feet wide, or a total of about 2 acres.

3.7.1.1 Potential Effects of Fire Control Activities on the Covered Species

All of the vegetation control methods used for fire control can result in adverse effects to California tiger salamanders, garter snakes, or California red-legged frogs. Mowing is currently used to manage vegetation and improve areas for California tiger salamanders. Discing during the dry season is unlikely to adversely affect Covered Species, because the depth of the discing is fairly shallow (approximately 6 inches) and the rodent burrows supporting California tiger salamanders (and possibly California red-legged frogs) tend to be much deeper. Discing could harm any garter snakes present on the surface.
Herbicides could affect the Covered Species by either directly entering occupied burrows or through runoff into the creeks. However, herbicides are generally used as a last resort and on a spot-treatment basis, reducing the likelihood of contaminated runoff or ground saturation. Herbicide use is not a Covered Activity.

3.7.2 Grounds Maintenance

The Stanford Grounds Department maintains the landscaping throughout the campus, including planting and pest control (i.e., weeds and animal pests). The following is the list of activities that Stanford carries out that could affect the Covered Species.

General Maintenance. The Stanford Grounds Department manages formal landscaped areas, including lawns, planters, and road medians. These areas are re-planted, trimmed, irrigated, fertilized, and mowed as needed. Maintenance activities also require substantial infrastructure, including irrigation boxes (e.g., housing valves, timers, etc.). Herbicides are typically used only in the formal landscaped areas and along roads for weed control.

Animal Pest Control. In some locations on campus, burrowing mammals, including ground squirrels, gophers, and moles, need to be controlled for safety reasons and because they destroy the landscaping. Underground poison bait stations and traps are used to control ground squirrels. The bait stations are placed near parking areas and in open fields. Moles and gophers are controlled using traps and poison bait placed in their tunnels. Rats and mice also are controlled via various methods throughout the developed part of campus. Pesticide use is not a Covered Activity, although the other animal pest control methods are Covered Activities.

Temporary Stockpiling/Staging. Stanford periodically has a need for temporary stockpiling of dirt, compost materials, or construction materials on its lands.

Weed Control. Various techniques are used to control weed growth throughout the campus, including mulch cover (wood chips), flail mowing, discing, and herbicides. Wood chips from oak, eucalyptus, and other hardwood trees, are placed along pathways and roads, and around trees and buildings to suppress weed growth, retain water, and suppress fire, and flail mowing is used for weed suppression in open fields with tall grasses. The discing of broad areas was commonly used to control weeds until the early 1990s, but was discontinued in most of the environmentally sensitive areas in favor of the more environmentally sound mowing.

3.7.2.1 Potential Effects of Grounds Maintenance Activities on the Covered Species

Grounds maintenance and vegetation control activities at Stanford have been modified as a result of the implementation of the California Tiger Salamander Management Agreement in June 1998 to avoid and/or minimize the potential effects of the above described activities on California tiger salamanders. Under most circumstances, activities conducted by the Grounds Department will not result in direct take of the Covered Species.

General Maintenance. Since these activities occur primarily in the built portion of campus or in association with a facility, they will not have direct effects on California red-legged frogs, western pond turtles, or steelhead. However, stray California tiger salamanders and garter snakes are found scattered throughout campus and garter snakes and California tiger salamanders could get trapped in irrigation boxes, and landscaping activities could harm individuals.

Animal Pest Control. Control of burrowing mammals can indirectly affect California tiger salamanders by reducing the number of burrows available. It also is possible that the indiscriminate use of rodenticides can cause toxins to enter the local food chain, and affect the Covered Species (primarily California tiger salamanders), and it is also possible that California tiger salamanders can be directly harmed by traps. These pest control efforts do not impact garter snakes, western pond turtles, or steelhead.

Temporary Stockpiling/Staging. The placement of stockpiled materials could affect the terrestrial Covered Species. Individuals of these Covered Species could take refuge in stockpiled materials, resulting in possible take when the materials were moved.

Weed Control. The use of wood chips is unlikely to affect the Covered Species. Mowing also is not likely to directly affect the Covered Species because the timing and location of mowing (open grasslands, daytime, and in dry weather) does not coincide with periods when any of the Covered Species would be present. Biocides will be used according to industry standards and applied by well-trained crews, and their use is not a Covered Activity.
3.8 AGRICULTURAL AND EQUESTRIAN LEASEHOLDS

3.8.1 Intensive Agriculture

Intensive agriculture has been conducted at Stanford for more than a century. Currently, seasonal crops, a vineyard, and a plant production/wholesale nursery are located on Stanford property (Figure 3-4). Stanford has historically played a limited role in the day-to-day operation of its agricultural lessees. Each lessee is responsible for the construction and maintenance of all roads, buildings, and other improvements on the leasehold.

Ranch/Farm. A farm with 260 acres of crops is located in San Mateo County, on the alluvial plain adjacent to San Francisquito Creek. The farm produces a wide variety of organic and non-organic seasonal crops, some of which are sold at an on-site, road-side market. The working ranch/farm requires a number of facilities (storage sheds, maintenance yards, worker housing, etc.), which are scattered throughout the leasehold.

Nursery. An approximately 50-acre nursery lease is located in Santa Clara County. This lease contains a plant growing facility and conducts wholesale selling of trees, shrubs, flowers, and ground cover. The lease is bordered on one side by Los Trancos Creek. As a nursery operation, the lessee is continuously replanting plants and trees into larger containers and storing them on site until sale. Potting materials are brought on-site from other facilities. The materials used are horse stable sweepings (pine chips and manure), redwood shavings, sand, and topsoil. The products are mixed on-site and put into the containers with the plant. Synthetic fertilizer is top-dressed in the containers at the time of planting. There are several buildings on-site that house the office and storage facilities. There also is an extensive irrigation system.

The animal waste and composting material used for planting are not generated on site. They are imported to the site on an as-needed basis. Stockpiled sweeping/compost piles are stored at several locations; one is located approximately 300 feet away from Los Trancos Creek. The piles that contain animal waste are covered and surrounded by a berm to prevent water runoff from entering the stockpile area.

Vineyard. In the late 1990s, an approximately 10-acre vineyard was planted on Stanford lands in San Mateo County, at the site of a former Christmas tree farm. This site abuts an extensive riparian forest associated with Sausal Creek and several unnamed seasonal tributaries.

3.8.1.1 Potential Effects of Agricultural Uses on the Covered Species

Under existing water quality regulations, run-off cannot impair water quality in the creeks. Intensive agricultural uses that are adjacent to or near creeks can result in waterway contamination from pesticides and fertilizers used during farming, and the erosion of loose soils could increase the amount of sedimentation in creeks. Additionally, it is probable that individuals of Covered Species, primarily red-legged frogs and western pond turtles, occasionally wander into areas of intensive agriculture and are subsequently harmed or killed.

Ranch/Farm. Existing water quality regulations prohibit run-off to the creeks that would adversely affect water quality. Ground disturbing activities associated with normal farming activities could harm western pond turtle and California red-legged frogs that stray out of the riparian habitat and into farmed areas. California tiger salamanders and garter snakes have not been found in farmed areas, or in areas immediately adjacent to farmed areas.

Nursery. Existing water quality regulations prohibit run-off to the creeks that would adversely affect water quality and therefore do not adversely affect steelhead. California red-legged frogs could be killed or harmed if they dispersed into nursery operations. California tiger salamanders, garter snakes, and western pond turtles are not located near the nursery area and it does not provide potential habitat.

Vineyard. Covered Species have not been recorded from the immediate vicinity of the vineyard. It is therefore unlikely that operation of the vineyard will have a direct effect on the Covered Species. Existing water quality regulations prohibit run-off to the creeks that would adversely affect water quality.

3.8.2 Equestrian

Approximately 1,200 acres of Stanford’s lands are leased or licensed for equestrian-related activities, including facility-intensive horse boarding and training, and less intensive open pasture and trails (Figure 3-4). A number of boarding and training facilities are situated adjacent to riparian areas known to support the Covered Species. Likewise, many of the access roads for the equestrian facilities are located adjacent to creek banks. Manure and other refuse is collected from the equestrian facilities on a regular basis, stored on-site in piles, and removed for disposal every few days. The refuse piles are covered during the rainy season and are located a minimum of 150 feet from the top of any creek bank.

Horse pastures at Stanford are typically fairly flat, although there are a number located on steep hillsides. Grazing intensity varies, but in many years grazing is insufficient and supplemental feed must be provided.

Pastured horses have limited direct access to Deer and Matadero creeks. Equestrian trails are located throughout the undeveloped portions of Stanford. Trails cross creeks via unimproved crossings only in one location in the San Francisquito watershed and at several locations in the...
Matadero/Deer watershed. These crossings tend to be sites where erosion and horse waste impact water quality. During the last decade, Stanford has eliminated several unimproved creek crossings by constructing a new bridge at Webb Ranch, replacing an existing but decrepit bridge at Glen Oaks, and realigning the horse trail at Webb Ranch and Jasper Ridge Biological Preserve away from the San Francisquito Creek bank.

Horse washing facilities are present in all of the equestrian operations. The horse washing facilities are located more than 150 feet from the top of any creek bank.

3.8.2.1 Potential Effects of Equestrian Uses on the Covered Species

Equestrian-related activities could adversely affect steelhead, California red-legged frogs and western pond turtles by contaminating water sources with animal waste. These impacts are particularly problematic in locations that have stables and paddocks adjacent to the top of creek banks, grazing on steep slopes, and horses that have direct access to creeks (in some pastures and where trails cross creeks). In addition, horses could trample Covered Species, especially in locations that the horses cross the creeks.

3.8.3 Grazing

Stanford maintains grazing leases on approximately 1,000 acres in the foothills (Figure 3-4). Grazing reduces the fuel load and is important for fire hazard reduction. Cattle in individual leaseholds typically free range over several hundred acres. Water troughs and salt licks are scattered throughout the cattle grazing areas and cattle have direct access to several of the minor seasonal creeks. Major creeks are fenced to prevent access by cattle.

3.8.3.1 Potential Effects of Grazing on the Covered Species

Managed grazing generally benefits grassland ecosystems. At Stanford, cattle have not grazed in most of the foothill areas that are occupied by California tiger salamanders and garter snakes since the mid-1980s. The foothill areas that are currently grazed are generally too far from Lagunita to provide upland habitat for California tiger salamanders that breed in Lagunita and garter snakes have not been observed in these areas. However, the grazed areas provide relatively short vegetation and support abundant ground squirrel burrows, which could provide high quality California tiger salamander upland habitat. Thus, managed grazing generally benefits California tiger salamanders, but overgrazing could adversely affect grassland conditions.

3.9 COMMERCIAL AND INSTITUTIONAL LEASEHOLDS

3.9.1 SLAC National Accelerator Laboratory

The Stanford Linear Accelerator Center (SLAC) was founded in 1962 and the construction of the 2 mile linear accelerator was completed 4 years later in 1966 (Figure 3-5). A decade after SLAC was founded, the Stanford Synchrotron Radiation Laboratory (SSRL) was established as a National Users’ Facility. Construction of the SSRL began in 1983 and was completed in 1989. SSRL became part of SLAC in 1992, and in 1994, the PEP II project was initiated, to build the Asymmetric B Factory. The facility was renamed the SLAC National Accelerator Laboratory in 2009.

SLAC is a national research laboratory, probing the structure of matter at the atomic scale, and at much smaller scales with electron and positron beams. The laboratory is operated by Stanford University under a contract from the United States Department of Energy (DOE) and the site is ground leased by Stanford to the DOE. Stanford also performs some maintenance activities and maintains some control over the use of the SLAC site.

3.9.1.1 Potential Effects of SLAC Activities on the Covered Species

SLAC is a federal facility. However, outdoor activities carried out by Stanford at SLAC, such as landscaping, grounds maintenance, and drainage management, are covered by the HCP. Potential conflicts between federally listed species and new or ongoing uses at SLAC would be addressed through a “Section 7” consultation between the DOE and the Service. If the SLAC lease, or a portion of the leased property, reverts to Stanford during the life of this HCP, it will automatically be subject to the HCP, and any subsequent land uses and activities will be carried out in accordance with the terms of the Stanford HCP. The activities carried out by Stanford at SLAC have minimal effects on the Covered Species because the site is in a generally developed area. However, landscaping and similar outdoor maintenance activities could adversely affect individual California red-legged frogs, garter snakes, and western pond turtles that happen to enter the area from adjacent riparian areas.
3.9.2 Independent Research Institutions

A small number of sites located in the “Lathrop” district of the University, in Santa Clara County, south of Junipero Serra Boulevard, are leased to independent research institutions. These sites are within or adjacent to California tiger salamander upland habitat and include improvements typically associated with academic facilities: buildings, roads, paths, parking lots, lighting, etc. Although many of these sites incorporate non-irrigated native plant landscaping, they also include managed landscapes primarily intended for human uses, and include irrigated non-native plants, furnishings, paving, and recreational facilities.

3.9.2.1 Potential Effects of the Independent Research Institutions on the Covered Species

Maintenance and operation of independent research institutions located in the undeveloped portions of campus can result in the take of Covered Species. California tiger salamanders and garter snakes are more vulnerable to impacts from these institutions because they are located in areas that provide upland habitat for these two species. Maintenance of the facilities involves landscaping and utility work, both of which often involve earth moving and vegetation modification. Rodent control also is a necessary part of the management for these institutions, but is limited to the immediate proximity of the buildings. Digging, vegetation removal, and rodent control can take California tiger salamanders. Likewise, unless adequately fenced or covered, short-term trenches can act as traps for dispersing California tiger salamanders, and inappropriately placed structures can act as barriers.

3.9.3 Commercial Leases

There are many urban leases on Stanford lands, primarily in Palo Alto and Menlo Park (Figure 3-5). These leases include the Stanford Research Park, Stanford University Medical Center, Stanford Shopping Center, commercial housing, and other commercial uses. These leases are all located in developed urban areas.

3.9.3.1 Potential Effects of the Commercial Leases on the Covered Species

These leases are for fully developed properties. The ongoing use, maintenance, and re-development of these properties will not have direct effects on the Covered Species. However, stray California tiger salamanders, garter snakes, and California red-legged frogs are occasionally found scattered throughout campus and could be affected by urban activities at these fully developed properties.

3.10 FUTURE CAMPUS DEVELOPMENT

Under the HCP, the future development of Stanford land is a Covered Activity. Potential future development includes new academic, academic support, residential, athletic, and commercial facilities. As discussed in more detail below, the County of Santa Clara granted Stanford a General Use Permit (GUP) that allows Stanford to develop certain lands that are located in unincorporated Santa Clara County. Stanford does not have any specific plans to develop additional land that supports Covered Species, beyond the development permitted by the GUP. However, the Covered Activities include additional future development that could occur during the life of the HCP. This additional development also will require discretionary permits from state and local agencies, which in turn may trigger compliance with state and local regulations, including environmental review under the California Environmental Quality Act (CEQA).

Future development in areas that are already developed, and which do not provide habitat for or support the Covered Species, will not have direct effects on the Covered Species. However, stray California tiger salamanders, garter snakes, and California red-legged frogs are occasionally found scattered throughout campus and could be harmed by future development even in the developed areas.

3.10.1 Development Associated with Santa Clara County 2000 GUP

The development permitted by the GUP is currently anticipated to be completed in approximately 10 years. Most of the development permitted by the GUP will be infill development. However, development could conceivably occur in areas that provide habitat for the Covered Species, primarily California tiger salamander and garter snake habitat. Under the GUP, Stanford could develop land that is occupied by the Covered Species or that provides potential habitat for the Covered Species. For the purposes of analysis, this HCP anticipates that development under the 2000 GUP could result in the removal of 30 acres of habitat.

The remainder of the allowed academic, academic support, and residential development allowed under the GUP will occur in already developed portions of the campus, which do not provide habitat for, or support, the Covered Species. This infill development generally would not adversely affect the Covered Species; however, stray California tiger salamanders, garter snakes and California red-legged frogs occasionally migrate into these developed areas. Therefore, future in-fill development in the central campus is a Covered Activity.
3.10.1.1 Potential Effects of Development under 2000 GUP on the Covered Species

All of the potential environmental impacts of the GUP were addressed in an Environmental Impact Report (EIR) certified by the County of Santa Clara in December 2000. The EIR contains a detailed analysis of the impacts of the GUP on various resources including biological resources. In summary, the EIR found that the academic and residential development permitted under the GUP would result in a minimal amount of take of California red-legged frogs and steelhead, primarily by way of habitat modification. The approved development would result in a loss of California tiger salamander habitat, as well as potential loss of individuals due to direct mortality or reduction of reproductive success (i.e., inability of adults to reach breeding sites, inability of juveniles to disperse to upland habitat).

The EIR imposed several Conditions of Approval to reduce the impacts on these Covered Species to less than significant. One of these Conditions recognized the potential future Stanford HCP, and this HCP will fulfill GUP Condition J.9 as soon as it is approved by the Service:

“Condition J.9. If the CTS is listed as threatened or endangered under the federal Endangered Species Act or any successor statute with the purpose of protecting endangered or threatened species, an appropriate permit will be obtained from the SERVICE. The conditions of the GUP that address California tiger salamanders shall be superseded by any subsequent Habitat Conservation Plan (HCP) approved by the USFWS, so long as the HCP provides at least as much habitat value and protection for CTS as these Conditions of Approval.” (page 24)

At the time of the HCP drafting, none of the academic or residential GUP projects with the potential to impact the California tiger salamander had been proposed or constructed. However, several conditions of approval had been fulfilled, including the construction of eight new breeding ponds south of Junipero Serra Boulevard (JSB) and three amphibian tunnels across JSB.

Future development was also addressed through the California Tiger Salamander Management Agreement, approved by the California Department of Fish and Game, the Service, and Santa Clara County in June 1998. This agreement was entered into before California tiger salamanders were protected under the ESA, and does not provide incidental take authorization. However, the Management Agreement provides conservation guidelines that have been incorporated into the HCP’s Conservation Program (Section 4.0). The HCP will supercede the California Tiger Salamander Management Agreement.

3.10.2 Development Beyond the Santa Clara County 2000 GUP

The GUP will expire when development covered by the permit has been completed. Prior to its expiration, Stanford will determine its needs for housing, educational facilities, recreational facilities, etc., for the next planning horizon. Future development up to at least 2025 will be guided by Stanford’s Community Plan and the existence of the Academic Growth Boundary that was established in 2000. The Academic Growth Boundary restricts virtually all academic growth in unincorporated Santa Clara County to the currently developed portions of campus (primarily north of Junipero Serra Boulevard).

The land use designation for San Mateo County lands are open space/institutional/future study area. The underlying zoning designation is RE/S11, residential estate. This zoning allows housing on a 1-5 acre minimum lot determined by slope. Higher density residential development, non-profit facilities, and farming may also be permitted with a conditional use permit.

Planning for the future development of Stanford’s lands outside of Santa Clara County, and in Santa Clara County beyond the GUP, was estimated based on current planning principles of density and building efficiency. These assumptions present a reasonable forecast of future development during the 50-year life of the HCP; however, actual development could vary from these predictions. Specific future building projects have not been identified at this time, and the forecast is based on the distribution of potential building sites within currently undeveloped land.

In accordance with current planning principles of density and building efficiency, as well as economic and research uncertainties, the HCP forecasts that Stanford could develop 1-3 acres per year of land that provides habitat for, or is occupied by, the Covered Species. Development at this rate would result in a total development of 50-150 acres over the 50-year life of the HCP. This development likely would not occur in regular increments annually, but would more likely occur as a 30-acre project every decade, or a 15-acre project every 5 years, at a maximum. It could also occur as small operational projects that result in permanent conversion of habitat.
3.10.2.1 Potential Effects of Future Development on the Covered Species

The future development beyond the GUP could remove approximately 50 to 150 acres of land that is either occupied by the Covered Species or that provides habitat for the Covered Species. This represents 2 percent to 4 percent of the Covered Species’ habitat, and would not affect the persistence of any of the Covered Species. However, reducing the amount of available habitat could reduce the future maximum size of the species’ populations. Construction activities could result in the take of Covered Species. Species that become trapped in a construction area may be killed or harmed by construction related equipment, and future development could result in new barriers to migration. This would result in the loss of individuals due to direct mortality or reduction of reproductive success if adults are unable to reach breeding sites or juveniles are unable to disperse to upland sites.

3.11 HABITAT MANAGEMENT, MONITORING, AND ENHANCEMENT

Chapter 4 of the HCP describes the Conservation Program that Stanford will adopt in order to contribute to the recovery of the Covered Species, and to minimize the effects of the Covered Activities and mitigate for the unavoidable adverse effects of the Covered Activities on the Covered Species. Under the Conservation Program, Stanford will actively manage, monitor, and enhance some of its land for the Covered Species and will undertake numerous activities to reduce the potential effects of the Covered Activities on the Covered Species. These management, monitoring, and enhancement activities include the preservation of areas that are important for the long-term survival and persistence of the Covered Species, surveys for Covered Species and invasive species, water quality monitoring, revegetation, vegetation management, erecting fences if needed to protect the Covered Species, construction of new wetlands suitable for California tiger salamander reproduction, and employing adaptive management to modify or introduce new management techniques. Many of these activities will occur in the most biologically sensitive areas, where the Covered Species are located.

Specific management and monitoring activities that could affect Covered Species include the activities described below.

Surveys. Surveys will be conducted for Covered and non-native species. Methods include day and night visual surveys, snorkeling, dip netting, trapping, and electrofishing.\textsuperscript{10}

Pond construction. Pond construction includes grading activities to create the pond, planting of native materials and/or hydroseeding, and inoculating the new wetlands with appropriate species of aquatic invertebrates.

Creation of cover piles. This includes use of logs or rocks inserted into the ground. These attract ground squirrels and are useful in enhancing California tiger salamander upland habitat.

Modification of creek banks. A number of management and monitoring activities could affect the creek bank, including bank stabilization, erosion control, removal of barriers in the creek, restoration planting, and removal of non-native plants.

Relocation of “salvaged” individual Covered Species. The Conservation Program includes the relocation of individuals found in harm’s way (e.g., in urbanized areas) to safer locations within protected areas.

Control of non-native species. The Conservation Program includes ongoing surveys for non-native species, and the removal of non-native animal species will occur through hand capture, trapping, and electrofishing. Control of non-native plant species includes mowing, hand removal, grazing, and the spot application of herbicide if hand removal is not effective or is not feasible because of the range of the infestation.

3.11.1 Potential Effects of Habitat Management, Monitoring, and Enhancement on the Covered Species

The management, monitoring, and enhancement activities associated with the Conservation Program will benefit the Covered Species. Although the long-term effect of these activities will be beneficial to the Covered Species and their habitat, the activities could result in the incidental take of the Covered Species.

Surveys. Day and night visual surveys, and snorkeling, will not impact California tiger salamanders. Use of these methods does have the potential to temporarily alter the behavior of steelhead, California red-legged frogs, garter snakes, and western pond turtles, because these species typically attempt to avoid humans by either finding cover or by leaving the immediate vicinity of the person conducting the survey. These effects are minor and generally limited in duration to the brief periods during which the observer is surveying a particular area. Dip netting, trapping, and electrofishing each have the potential to impact the Covered Species. However, if employed with caution, the level of take associated with each of these techniques is minor. Dip netting has the least potential to cause take, but it should be expected that such activities will cause the take of several larval California tiger salamanders and California red-legged frogs, and small steelhead. Dip netting will not affect western pond turtles or garter snakes.

The proposed survey trapping for larval California tiger salamanders involves the use of aquatic minnow traps and is live

\textsuperscript{10} Electrofishing is a NOAA-approved method of temporarily immobilizing steelhead for monitoring or relocation purposes.
trapping. No individuals of any species are released until positive identification is made. Trapping is very unlikely to affect California red-legged frogs or western pond turtles because they are not located at Laguna or the foothills ponds. Garter snakes could become trapped in the shallow traps. Research at Stanford in the 1990s found that steelhead survive being temporarily trapped quite well. Larval California tiger salamanders may exhibit some cannibalism while being held in traps, and invertebrate predators that find their way into traps have been observed to eat amphibian larvae. Being held in a live trap does pose a risk of take, but the potential for take is minimized by frequent checking of the traps and discontinuing the use of the traps if predation or some other factor, such as water quality, becomes a problem.

Electrofishing will not affect California tiger salamanders, and it is very unlikely to affect western pond turtles. While electrofishing will not be used in areas where California red-legged frogs or garter snakes are expected, there is a slight chance that California red-legged frogs will be encountered. If California red-legged frogs or garter snakes are unexpectedly encountered, electrofishing will stop, and the effects on these species will be limited to the very short time period during and just after they are discovered. The effects of electrofishing on California red-legged frogs are generally limited to harassment, and should not result in the death of California red-legged frogs. Inadvertent electrofishing is not anticipated to result in the death of a garter snake. Electrofishing will take a small number of steelhead. Take is generally limited to harassment (e.g., stunning the fish), but can cause death. Take will be minimized by following the NOAA Fisheries’ “Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act, June 2000.”

The spread of pathogens is always a risk when field workers go from one site to the next, particularly in aquatic systems. However, there is very little risk of this problem at Stanford because the equipment (e.g., waders, nets, etc.) used to monitor the Covered Species at Stanford are only used at Stanford or in the immediate vicinity of the University (and all off-campus sites are within the same watersheds which occur at Stanford). Additionally, equipment used in aquatic surveys is typically washed and dried after each use.

Pond construction. The creation of new, off-channel, wetlands will not affect steelhead. Construction of such wetlands could potentially affect western pond turtles, garter snakes, or California red-legged frogs, but preconstruction surveys and project siting considerations will essentially eliminate the chance of take of these species. A limited amount of take of California tiger salamanders, however, is likely when ponds are constructed for California tiger salamanders because the location of the new ponds will likely be in areas that are already occupied by California tiger salamanders and in areas where burrowing rodents are present. With preconstruction surveys and hand excavation of extensive burrow systems, take of California tiger salamanders during future pond construction will be minimized, and on the order of one or two salamanders per new pond. If the new ponds are located at the edge of occupied uplands, then the estimated number of California tiger salamanders impacted by construction activities is further reduced, but these more peripheral ponds will likely take longer to be used by California tiger salamanders.

It is possible that the wetlands could have hydrologic features which cause the wetland to act as population sinks for the Covered Species. As part of the long-term adaptive management program this possibility will be evaluated on a case-by-case basis, and any pond found to have significant negative effects on California tiger salamanders will be modified or eliminated.

Creation of cover piles. Construction of cover piles will not affect steelhead or western pond turtles. Construction of cover piles in or near riparian zones could potentially affect California red-legged frogs and garter snakes, but cover piles would only be constructed in locations noticeably lacking in cover that are very unlikely to support either species. The construction of cover piles in California tiger salamander-occupied uplands could affect California tiger salamanders. Preconstruction surveys, hand-excavation of extensive rodent burrows, and flexibility in where to exactly site the cover piles (they will be sited to avoid locations where construction would cause take) reduce the chance of take.

It is possible that the cover piles could attract predators, competitors, non-native species, or other biological elements that cause take of the Covered Species. As part of the long-term adaptive management program, this possibility will be evaluated on a case-by-case basis, and any cover pile found to have significant negative effects will be removed.

Modification of creek banks and channel. Work on the creek banks or channel will not affect California tiger salamanders, but could affect California red-legged frogs, garter snakes, western pond turtles, and steelhead.

Relocation of “salvaged” individual Covered Species. Relocating individual Covered Species presents a risk that
the species will be harmed or killed. However, the relocation of individual Covered Species is only contemplated if the species is already at risk of being harmed or killed, and the amount of take associated with moving the species is less than leaving the individual in the original risk-causing situation. California tiger salamanders are the most likely of the Covered Species to benefit from relocations as they frequently encounter human-built structures, including roads, during their rainy season migrations. Numbers of California tiger salamanders potentially handled during each year varies considerably (largely dependent on weather), and ranges from several hundred individuals to be moved off of roads, to a few individuals inadvertently trapped in utility boxes or drains. The release sites are chosen carefully. For example, in the 1990s, most utility box rescues occurred in the dry season, and the rescued California tiger salamanders were released in relatively damp areas or at the entrance of rodent burrows. While such dry season relocations do present risk, leaving the individual California tiger salamanders trapped in utility boxes is virtually guaranteed to result in death of the individual. Additionally, the relocation of individual California tiger salamanders should not affect California tiger salamanders that already inhabit the release area.

During the last decade of active conservation work at Stanford, no California red-legged frogs or western pond turtles were found in situations that required relocation. In the future, as the population of these Covered Species increases, they could require relocation. Care will be taken to minimize the potential for take by handling the species as little as possible and choosing the release site carefully.

Steelhead, particularly small parr and smolts, occasionally become trapped in rapidly drying portions of the creek or in areas around structures. Relocating these individuals to the nearest appropriate habitat can cause take, but the alternative is dying by desiccation.

**Control of non-native species.** Trapping of non-native animal species can cause the inadvertent take of the Covered Species if they are present. Non-native animal species control will not affect California tiger salamanders, garter snakes, and western pond turtles. Steelhead and California red-legged frogs, particularly California red-legged frog tadpoles, may be harassed by non-native species control activities. The proposed trapping involves the use of aquatic minnow traps and is live trapping. No individuals of any species are disposed of until positive identification is made. Being held in a live trap does increase the risk of being eaten or injured by aquatic predators, but this is minimized by frequently checking the traps and discontinuing the use of the traps if predation becomes a problem.

Control of non-native plant species will not affect steelhead or western pond turtles. California red-legged frogs and garter snakes could be affected by the removal of non-native plants in the riparian zone. Such impacts will be short term and non-lethal. Dry season mowing will not affect any of the Covered Species, including California tiger salamanders. Discing has the potential to kill California tiger salamanders, but discing is only allowed in areas where the expected density of California tiger salamanders and garter snakes is very low.