5.0 ENVIRONMENTAL CONSEQUENCES

This section analyzes the effects of issuing the ITPs and implementation of the HCP on the physical, biological, and socioeconomic environment. It describes the direct, indirect, and cumulative effects of three alternatives: the Proposed Action, No Action, and HCP for CTS Only.

The list of activities covered by the Proposed Action (i.e., Covered Activities) is provided in Section 3 and in the HCP (Appendix B). The direct and indirect effects of the Proposed Action and two alternatives on the physical environment are addressed in Section 5.1; on the biological environment in Section 5.2; on the socioeconomic environment in Section 5.3; and on environmental justice in Section 5.4. A summary comparison of effects of the alternatives is provided in Table 5-8, near the end of the section.

Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. They may include the physical effects of population growth or changes in land use.

The possible cumulative effects on each resource are evaluated in Section 5.5. Cumulative effects are the incremental effects of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. Global climate change, for example, is addressed in this section.

Other NEPA required topics are addressed in Section 5.6, Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity, and Section 5.7, Irreversible or Irretrievable Commitments of Resources.

5.1 PHYSICAL ENVIRONMENT

5.1.1 Geologic Hazards and Soils

This section describes the effects on geologic hazards and soil resources caused by the Proposed Action or the alternatives. The effects related to geologic hazards and soils were analyzed qualitatively, and are based on a review of soils and geological information for the affected environment and on professional judgment. The impact assessment evaluates whether the Proposed Action or alternatives would cause slope instability, erosion, or other soil failure that could result in property damage, personal injury, or death. The effects on soil resources, which include the conversion of important farmland soils (Section 4.1.1.3), are also analyzed qualitatively. The analysis assumes Stanford would comply with state laws, current building codes, and local seismic safety standards and ordinances. This would include a geotechnical review of new construction in hazard-prone areas, the use of erosion controls when soil is disturbed, and possible conditions imposed as a result of permits required by other agencies for in-stream activities.

5.1.1.1 Effects of the Proposed Action

Conservation Program. The proposed Conservation Program would not significantly affect geologic features or soils. Some habitat restoration projects constructed as part of the HCP would result in ground disturbance and could increase erosion of soils. However, none of the Conservation Program's enhancement actions, minimization measures, or monitoring would require earth-moving of the scale that could trigger a geologic hazard or adversely affect soil

resources. Management and enhancement activities could involve some earth-moving in hazard prone areas, but would not involve moving large quantities of dirt that could trigger a geologic hazard.

The implementation of certain management and enhancement activities within the San Francisquito/Los Trancos and Deer/Matadero easements such as removing riprap and other in-stream structures in San Francisquito Creek that create barriers to wildlife movement, have the potential to affect or be affected by geologic hazards. For example, the removal of riprap or gabions within creeks could result in unstable bank slopes and if the slopes are not adequately stabilized, they could fail. Likewise, management and enhancement activities in Zone 1 and Zone 2 riparian areas could disturb soils that are prone to erosion. Geotechnical protocols that are already in place for operations and maintenance work, including Stanford Design Facility Guidelines and Santa Clara Valley Water District Best Management Practices (BMPs) for work in and around creeks, would apply to all Conservation Program activities. In addition, the Conservation Program includes erosion control and bank stabilization measures that would stabilize areas that are currently prone to erosion. The removal of in-stream structures would be designed by a qualified engineer, and particularly unstable areas generally would be avoided or specific construction measures would be included to assure that geologic hazards are addressed properly. Therefore, the management and enhancement activities would be done in a manner that addresses the geologic site conditions, including slope stability, erodible soils, and local fault zones.

The implementation of existing geotechnical protocols, including consultation with a qualified engineer and review by local, state, and Federal agencies, would eliminate or minimize the possibility of slope failure caused by Conservation Program activities in unstable geologic areas.

Under the Proposed Action, conservation easements are proposed over lands in Zone 1 that contain geologic hazards, including unstable slopes, and areas with moderate to high potential for earthquake-induced landslides. Preserving these areas with a conservation easement would not adversely affect these geologic hazards. Should there be a geologic failure within a conservation easement, such as a landslide, the hazard could be remediated in accordance with the requirements set forth in Section 4.2 of the HCP.

Conservation Program activities would not induce a geologic event or cause slope instability, erosion, or soil failure, and therefore would not have an adverse effect on resources that are vulnerable to geologic or seismic events.

The San Francisquito/Los Trancos Easement would preclude agricultural land uses on about 10 acres of soil designated as Prime Farmland located along San Francisquito Creek upstream of Alpine Road and about 10 acres of soil designated as Unique Farmland on Los Trancos Creek upstream of I-280. This is a small area of Prime or Unique Farmland, and its preservation in a conservation easement (as opposed to being developed) would not result in an adverse effect on Prime or Unique Farmland.

Ongoing Stanford Operations. Some of the ongoing Covered Activities require ground disturbance, including 1) the maintenance of, repair, replacement and construction of new utilities, pipelines, roadways and bridges; 2) creek bank stabilization; 3) academic activities that involve digging test pits; 4) maintenance of fire breaks; 5) the use of existing and construction of new recreational trails; and 6) agricultural activities. These activities would not trigger a geologic hazard. Further, geotechnical protocols already in place, including Stanford Design Facility Guidelines and Santa Clara Valley Water District BMPs, assure that operations and maintenance work conducted throughout Stanford is done in a manner that reflects the geologic

site conditions, including faults, unstable slopes, and erosive soils. Where these activities occur in Management Zones 1 and 2, the HCP imposes additional erosion control measures. The agricultural lessees operate under a program of BMPs that includes erosion and sediment control measures, such as vegetated filter strips between the agricultural use and the creeks, appropriate revegetation of eroded areas, and use of erosion control blankets. The erosion control, BMPs, and geotechnical protocols minimize the likelihood that the ongoing Covered Activities would result in erosion or that a geologic hazard would affect people or property. Therefore, although the ongoing operations and maintenance involve ground disturbance, they would not cause slope instability, erosion, or soil failure, and thus would not adversely affect geologic hazards.

Future Development. Construction-related activities, such as grading and new building improvements, would not have a significant geologic effect or pose a safety hazard in the event of an earthquake with the implementation of existing state and local building and construction regulations. The Uniform Building Code and California Building Code establish specific design requirements to prevent collapse and minimize structural damage during an earthquake, and each of the local jurisdictions requires geotechnical review or reports for projects in hazard-prone areas. For all construction sites of one acre or larger, the "National Pollutant Discharge Elimination System General Permit for Stormwater Discharges Associated with Construction Activity" (NPDES) requires the development of a Storm Water Pollution Prevention Plan (SWPPP) which specifies actions to prevent and minimize erosion during construction. Local grading ordinances also require measures to reduce erosion. This conclusion is consistent with prior review under CEQA for development approved by the Santa Clara County under the 2000 GUP, which concluded the potential geologic and seismic impacts were less than significant with the application of existing regulations.

The exact location of future development that is not already allowed under the GUP is currently unknown; however, it would not occur within any of the conservation easements or in the CTS Reserve. This future development would undergo review under CEQA and may undergo site-specific geotechnical review under the local agencies' building ordinances.[9] If any site-specific geologic concerns are identified that cannot be addressed through existing regulations, the local permitting agency could impose site-specific mitigation measures. Thus, with the implementation of existing state and local review and regulations, the effects of future development would not cause slope instability, erosion, or soil failure, and would not cause significant adverse geologic effects.

Future development is not likely to significantly affect Farmland soils. Nearly all of the soils designated as Prime or Unique Farmland are located in Zones 1 and 2. Stanford anticipates the future development of 5 to 15 acres in Zone 1 and 10 to 30 acres of development within Zone 2. Although no new development is currently proposed in areas that contain Prime or Unique Farmland soils, up to 45 acres of the approximately 200 acres of Prime or Unique Farmland on Stanford's lands could be affected by future development. Any development that affects these soils would be subject to policies that protect farmland, such as the Farmland Protection Policy Act. The amount of Prime or Unique Farmland that could be converted is small relative to the amount of Prime or Unique Farmland in San Mateo and Santa Clara counties, and therefore the Proposed Action would not have an adverse effect on these resources.

[9] Small permanent conversions of habitat resulting from the ongoing Covered Activities may be exempt from CEQA review, but such small activities should not have adverse geologic related effects.

5.1.1.2 Effects of the No Action Alternative

As described in Section 3, under the No Action alternative, take authorization would be required for any activity resulting in the take of a federally listed species (e.g., red-legged frog, steelhead, tiger salamander, or garter snake). Under this alternative, the individual take authorizations would likely incorporate take minimization measures similar to those defined in the HCP, with the same effect as the Proposed Action, but on a smaller scale in keeping with the level of impact.

Conservation Program. The No Action alternative would not implement a conservation program. Under this alternative, it is assumed that the activities in Zones 1 and 2 that require a permit would also require minimization measures similar to those defined in the HCP for Zones 1 and 2. Several components of the HCP's Conservation Program would not occur under this alternative unless they were included in future individual projects to reduce or prevent incidental take of the listed species. Mitigation measures that could affect geologic hazards or soils would be subject to the same protection measures as described for the Proposed Action (e.g., Stanford Facility Design Guidelines, and BMPs). The project-specific take minimization measures and BMPs related to future permits under the No Action alternative would likely be similar to the minimization and mitigation measures proposed as part of the HCP, and like the Proposed Action, would not result in adverse effects to geologic hazards or soils. The amount of ground disturbance from conservation activities under the No Action alternative may be less than for the Proposed Action's Conservation Program because it would involve mitigation for project-specific impacts, whereas the Proposed Action's Conservation Program includes activities throughout Management Zones 1 and 2 as part of a comprehensive effort to improve Covered Species habitat.

Under the No Action alternative, the conservation easements along San Francisquito/Los Trancos and Matadero/Deer creeks would not be recorded, and the Monitoring and Management Plans would not be implemented. Whether future conservation easements would be recorded over Prime or Unique Farmland soils pursuant to a project-specific incidental take authorization is unknown.

Ongoing Stanford Operations. Under the No Action alternative, Stanford would continue to operate. The ongoing operations and maintenance would be the same as described for the Proposed Action, above, and would have the same effects on geologic hazards and soils as the Proposed Action. Although the ongoing operations and maintenance involve ground disturbance, they would not cause slope instability, erosion, or soil failure, and therefore would not adversely affect geologic hazards or soils.

Future Development. The future development under the No Action alternative would be the same as that under the Proposed Action; therefore, the effects of future development on geologic hazards and soils would be the same under the No Action alternative as described for the Proposed Action.

5.1.1.3 Effects of the HCP for CTS Only Alternative

Under this alternative, the HCP area would be geographically limited to the CTS Basin, which includes the area around Lagunita (90 acres) and the CTS Reserve in the foothills south of JSB (315 acres). Stanford activities that would result in the take of listed species other than tiger salamander would require project-specific incidental take permits.

Conservation Program. The Conservation Program would be limited to activities outlined in the Central Campus CTS Management Plan and the CTS Reserve Monitoring and Management

Plan. The activities in the CTS Reserve Monitoring and Management Plan, such as vegetation mowing and species monitoring, would result in little, if any, ground disturbance, and would not affect geologic hazards or soils. The Conservation Program prohibits development in the CTS Reserve. Similarly, the activities in the Central Campus CTS Management Plan address methods of vegetation and ground animal management, worker education, restriction of off-road vehicles, and monitoring. These activities would not require large-scale earth moving that might trigger a geologic hazard or adversely affect geologic hazards or soils. The Conservation Program under this alternative affects a smaller area and results in less ground disturbance than the Proposed Action alternative's Conservation Program, thus it has less effect on geologic hazards and soils than the Proposed Action. It would likely also have less effect on geologic hazards and soils than the No Action alternative because the No Action alternative may still result in mitigation measures that require more ground disturbance or ground disturbance in more geologically sensitive areas, such as stream banks.

Ongoing Stanford Operations. Specific ongoing activities that could not avoid take of steelhead, red-legged frog, or garter snake would require incidental take authorization from the Service or NMFS. It is assumed that such authorization would require the same minimization measures as proposed in the HCP, and may also require mitigation such as habitat restoration or a conservation easement on Stanford's lands.

The ongoing operations and maintenance covered by this alternative are a subset of the activities that would be covered by the Proposed Action alternative. These operations and maintenance activities would be smaller in scope, and would have less effect on geologic hazards and soils than the Proposed Action or the No Action alternatives. However, Stanford operations outside of the Central Campus CTS Monitoring Plan area and the CTS Reserve area would still occur under this alternative, so it would not result in an overall lower effect on geologic hazards and soils. Ongoing operations and maintenance covered under the HCP for CTS Only alternative would not adversely affect geologic hazards or soils.

Future Development. Future development that could not avoid take of steelhead, red-legged frog, or garter snake would require take authorization from the Service or NMFS. Such authorization would likely require the same minimization measures as proposed in the HCP, and may require a conservation easement as mitigation, but not necessarily on Stanford's lands.

The future development under the HCP for CTS Only alternative would be the same as that under the Proposed Action and No Action alternatives; therefore, the effects on geologic hazards and soils of future development under this alternative would be the same as the effects described for the No Action and Proposed Action alternatives.

5.1.1.4 Comparison of Alternatives

The Proposed Action or the alternatives would not result in significant adverse effects to geologic hazards and soils (Table 5-8). The Conservation Program under the Proposed Action provides bank stabilization that may not otherwise be required, and this would reduce erosion and benefit water quality. The easements proposed in the Conservation Program would also protect Prime Farmland from development. In comparing the alternatives, none pose a significant adverse effect, but the Proposed Action provides a benefit related to geologic hazards and soils.

5.1.2 Cultural and Historic Resources

This section describes the effects of the Proposed Action and alternatives on cultural (archaeological and paleontological) and historic resources. The effects on cultural and historic resources were analyzed qualitatively, and are based on a review of the cultural and historic information for the affected environment and consultation with the University Archaeologist and the State Historic Preservation Office (SHPO). The potential effects on cultural and historic resources is assessed based on the type of resource that could be affected, and whether the Proposed Action or alternatives would result in irretrievable damage to or the destruction of a resource that is considered a culturally or historically significant resource under Federal, state, or local laws.

In compliance with the National Historic Preservation Act (NHPA), the Services jointly initiated consultation with the SHPO pursuant to section 106 of the NHPA by letter dated June 1, 2010. In the June 1, 2010, letter, USFWS and NMFS reported to SHPO the Services' findings that the issuance of ITPs will not affect historic properties. The letter also transmitted the area of potential effect (APE) associated with the undertaking, the specific locations where incidental take may occur, existing protocols used by Stanford to protect cultural resources, and locations where ground-disturbing activities may occur. By letter dated June 24, 2010, Stanford provided to SHPO portions of the Services' April 2010 DEIS pertaining to the potential effects of the proposed action and alternatives on cultural and historic resources. SHPO was also provided the results of a Records Search performed by the California Historical Resources Information System for resources within the APE. Neither the USFWS nor NMFS received a response from the SHPO within 30 days. The Services elected to proceed with the ITP issuance review process in accordance with 36 CFR 800.4(d)(1)(i) which states in part: "If the SHPO/THPO, or the Council if it has entered the section 106 process, does not object within 30 days of receipt of an adequately documented finding, the agency official's responsibilities under section 106 are fulfilled."

The SHPO did respond to USFWS and NMFS by letter dated September 27, 2011, and requested additional information regarding the HCP's proposed conservation easements and avoidance measures. During a telephone conference call with the Services on April 10, 2012, SHPO representatives expressed concern regarding the Services' ability to predict the outcome of all projects associated with implementation of the HCP over the 50-year permit term.

The Services have determined that their responsibilities under Section 106 of the NHPA are fulfilled, based in part on 36 CFR Section 800.4(d)(1) of the NHPA which states in part: "If the agency official finds that either there are no historic properties present or there are historic properties present but the undertaking will have no effect upon them as defined in § 800.16(i), the agency official shall provide documentation of this finding, as set forth in § 800.11(d), to the SHPO/THPO …" and 36 CFR Section 800.4(d)(1)(i) as indicated above. In addition, the Services based their finding on the following factors which were described in the June 1, 2010 letter to SHPO: the entire campus was initially surveyed for cultural resources; protocols are in place for the management, protection and preservation of historic properties; the University Archaeologist reviews all routine ground disturbance; and all projects are designed to avoid cultural resources or are subjected to site-specific mitigation. The Services provided adequate documentation to fully support a finding of No Historic Properties Affected and SHPO failed to respond within the required 30 days. To provide additional safeguards ensuring historical and cultural resources integrity, the USFWS would include as a condition of its ITP that Stanford's conservation activities avoid or minimize potential effects and, where applicable, comply with the Secretary of Interior's *Standards for Archeology and Historic Preservation*.

Similarly, NMFS has developed additional measures protective of historic and cultural resources. These measures, developed in coordination with Stanford University include assessment by a qualified archeologist, notification of NMFS and SHPO, and implementation of measures to avoid, minimize, and treat potential adverse effects. The Procedures for Protection of Cultural and Historic Resources (PPCHR) for the Stanford HCP are designed to address the range of potential effects on cultural and historic resources associated with implementing the HCP's conservation actions for CCC steelhead over the 50-year permit term. The procedures require "case-by-case" review of projects by Stanford's University Archaeologist, or a qualified archeological consultant ("Qualified Archeologist") to ensure consistency with the Secretary of the Interior's *Standards and Guidelines for Archeology and Historic Preservation*. As part of the PPCHR, Stanford will maintain a Qualified Archeologist for the purpose of data gathering, assessment, and management of archeological resources, cultural resources, and historic properties. If cultural resources or historic properties are identified by the Qualified Archeologist within the area of potential effects, Stanford shall prepare an assessment of possible effects and develop measures to preserve or protect properties, or to document their historic values and information. The assessment of potential effects and treatment plan will be provided by Stanford to SHPO and NMFS for each project associated with implementation of the HCP's conservation actions for CCC steelhead that affect cultural resources or historic properties. Additionally, the PPCHR requires coordination with the Qualified Archeologist during an early stage of project planning and includes measures to protect previously unidentified cultural resources that are discovered during construction. The Qualified Archeologist will ensure that sites on, or eligible for, the National Register of Historic Places are properly conserved in compliance with all relevant and applicable laws; that the interests of archeological and Native American communities are met; and that Stanford's projects associated with implementation of conservation actions for CCC steelhead are in compliance with measures to avoid and minimize impacts to cultural and historic resources, and in compliance with treatment plans for potential adverse effects to cultural and historic resources.

5.1.2.1 Effects of the Proposed Action

Conservation Program. The HCP's Conservation Program monitoring, management, preservation, and enhancement activities would occur in Zones 1 and 2 where most of Stanford's 65 archeological sites have been documented to occur. The implementation of certain management and enhancement activities has the potential to impact cultural or historic resources through activities such as removal of the non-operating Lagunita Diversion which is more than 50 years old, moving a barn or a farmhouse away from the creek banks, bank stabilization within the San Francisquito/Los Trancos Easement and Deer/Matadero Creek Easement, and removing riprap and other in-stream structures that create barriers to wildlife movement. These activities could also unearth cultural or historic resources.

Existing Stanford procedures and the PPCHR establish a process to avoid or minimize the risk of damaging or destroying cultural or historic resources. Stanford's archeologist shall be notified at an early stage in the planning process for consideration of potential effects to historic properties and cultural resources. The archeologist shall make a reasonable and good faith effort to identify historic properties and cultural resources that may be within a proposed project area and consult with appropriate parties, including Native American interests, regarding the identification and location of historic properties and cultural resources in each area of potential effects. Stanford may utilize an archeological monitor during any activities that could disturb cultural resources, and if there is a possibility of uncovering human remains, having a Native American monitor present. Site-specific mitigation measures would be developed for potential adverse effects to

cultural and historic resources. In the event that previously unknown buried cultural resources are discovered, all work would stop within 100 feet of the discovery and Stanford's archaeologist would be notified to evaluate the find. Stanford shall treat the discovery in accordance with all applicable state laws, and curate appropriate archaeological materials in Stanford's permanent collection. In coordination with the archeologist, Stanford's University Provost may permanently cease excavation if significant cultural resources are discovered.

USFWS proposes to include as a condition of its ITP that Stanford's conservation activities avoid or minimize potential effects, and comply with the Secretary of Interior's Standards for the Treatment of Historic Properties and Archeological Documentation. NMFS proposes to include adherence with the PPCHR as a condition in its ITP to ensure conservation activities for CCC steelhead avoid or minimize potential effects and comply with the Secretary of Interior's *Standards for Archeology and Historic Preservation*. With Stanford's established procedures and the PPCHR, the proposed Conservation Program would not result in significant adverse effects to cultural and historic resources.

Ongoing Stanford Operations. Since the ongoing Covered Activities could involve ground disturbance anywhere on Stanford's lands, the activities could affect cultural and historic resources. Stanford operations have been ongoing since construction began in 1889. Stanford adopted policies to protect archeological resources in 1988, and maintains a professional staff position (University Archaeologist), collections, and archives of its archeological resources. As noted in Section 4, Affected Environment, procedures have already been put in place to assure that all ground-disturbing activities are conducted in a manner that avoids impacts to known cultural or historic resources. Due to the existing documentation and the protocols for documentation/protection of future cultural resource finds, neither the Proposed Action nor the alternatives will result in significant adverse effects to cultural resources.

Future Development. Development under the 2000 GUP was subject to environmental review by Santa Clara County. An EIR was prepared which addressed the specific impacts of the GUP development on cultural and historic resources.

The GUP EIR found that up to 30 acres of development anticipated under the GUP would not have a significant unavoidable impact on prehistoric and archaeological resources, but that the impact on historic resources could not be mitigated to a less than significant level due to the lack of specific information as to where the development would take place. According to the GUP EIR, because the GUP permits development in areas that contain historic, or potentially historic, buildings it is possible that specific building projects would be proposed that would either remodel or demolish existing buildings that the County considers, or could consider, an historic resource. However, Stanford does not anticipate demolishing or remodeling the exterior of any historic buildings as part of the GUP development in Zones 1, 2, or 3. Therefore, the GUP development covered by the HCP would not result in adverse effects on historic resources.

The additional 150 acres of development contemplated beyond the GUP could occur in areas that contain cultural or historic resources, including historic buildings. Unless specifically exempt from review under the CEQA, the local land agencies would review any proposed future development. As part of CEQA review there would be an analysis of a future project's potential to impact cultural and historic resources and specific mitigation measures could be imposed. This review would be done when the specific nature and location of a project were known. Also, new development, including ongoing Covered Activities that result in the permanent conversion of habitat, would be subject to Stanford's protocols that protect cultural prehistoric, archeological, and historic resources. Therefore, known and anticipated resources would not be

affected, although some buried resources could be inadvertently damaged or destroyed by future development. At this time, the HCP does not include specific plans that involve remodeling or demolishing any historic buildings; however, if this were to occur during the 50-year permit term, there are feasible mitigation measures, including written and pictorial analysis of historic buildings, and exhibiting or reusing significant archeological features that would reduce the adverse effect of altering or demolishing historic buildings.

5.1.2.2 Effects of the No Action Alternative

Under the No Action alternative, the ITPs would not be issued and the HCP including a comprehensive Conservation Program would not be implemented. Future development and ongoing Stanford operations in Management Zones 1 and 2 that could impact federally listed species would require take authorization on a project-by-project basis, which is what happens now.

Conservation Program. Under this alternative, the activities in Zones 1 and 2 that require a permit are assumed to require minimization measures similar to those defined in the HCP for Zones 1 and 2. Several components of the HCP's Conservation Program would not occur under this alternative unless they were included in future individual projects to reduce or prevent incidental take of the listed species. The effects of any measures required by the Services through take authorization would be the same as the effects of the Conservation Program described in the HCP, although at a smaller scale in keeping with the level of impact that has to be mitigated. The effects on cultural and historic resources would be similar to the No Action alternative as described for the Proposed Action, because the resources would be protected by existing protocols used by the University Archaeologist.

Ongoing Stanford Operations. Under the No Action alternative, Stanford would continue to operate. Ongoing operations and maintenance work conducted throughout Stanford would continue to be done under Stanford's protocols for avoiding impacts to cultural and historic resources. As a result, the effects of the ongoing operation would be the same under the No Action alternative as those described for the Proposed Action. Thus, under the No Action alternative ongoing university operations would have no adverse effects on cultural or historic resources, the same as the Proposed Action.

Future Development. Under the No Action alternative, new development would occur. Future development would be subject to the GUP, and any new development that has not already been permitted by the GUP would require project-specific CEQA review that could include measures to reduce potential impacts to cultural and historic resources. As a result, the effects of future development would be the same under the No Action alternative as those described for the Proposed Action. Under the No Action alternative, future development would have no adverse effects on cultural or historic resources if Stanford continues its current practices to protect cultural or historic resources.

5.1.2.3 Effects of the HCP for CTS Only Alternative

Under this alternative, the HCP area would be geographically limited to the CTS Basin, which includes the area around Lagunita (90 acres) and the CTS Reserve in the foothills south of JSB (315 acres). Stanford activities that would result in the take of listed species other than tiger salamander would require project-specific incidental take permits.

Conservation Program. The activities in the CTS Reserve Monitoring and Management Plan, such as vegetation mowing and species monitoring, would result in little, if any, ground disturbance, and would not affect cultural or historic resources. The Conservation Program

prohibits development in the CTS Reserve. Similarly, the activities in the Central Campus CTS Management Plan address methods of vegetation and ground animal management, worker education, restriction of off-road vehicles, and monitoring. These activities would not require large-scale earth moving that might adversely affect a cultural or historic resource. In addition, resources would be protected by protocols used by the University Archaeologist and the alternative would have no adverse effect on historic or cultural resources.

Ongoing Stanford Operations. Under this scenario, ongoing activities that could not avoid take of red-legged frog, garter snake and/or steelhead would require take authorization from the USFWS or NMFS on a project-by-project basis. The authorization would likely require the same minimization measures as proposed in the HCP.

Under the HCP for CTS Only alternative, Stanford would continue to operate. The effects of the ongoing operation of the Stanford would be the same as described for the Proposed Action.

Future Development. Under this alternative, future development that could not avoid take of red-legged frog, garter snake or steelhead would require take authorization from the USFWS or NMFS on a project-by-project basis. The authorization would likely require the same minimization measures as proposed in the HCP, and possibly a conservation easement managed to benefit the species. Under the HCP for CTS Only alternative, future development would occur. Future development would be subject to the existing GUP, and any new development that has not already been permitted by the GUP would require project-specific CEQA review that could include measures to reduce potential impacts to cultural and historic resources. The effects from future development would be the same as described for the Proposed Action and the No Action alternative. The size of the easement would depend on the effects of the project.

5.1.2.4 Comparison of Alternatives

The Proposed Action or the alternatives would not result in significant adverse effects to cultural resources. Under the proposed action, the PPCHR would specify the process and protocols for avoiding, minimizing, and treatment of potential effects to historic properties and cultural resources during implementation of Conservation Program actions for CCC steelhead. The USFWS would include as a condition of its ITP that Stanford's conservation activities avoid or minimize potential effects and comply with the Secretary of Interior's standards for archeology and historic preservation. Protocols already in place would minimize the risk of damaging or destroying known cultural or historic resources under the Proposed Action or alternatives. The Proposed Action or alternatives do not significantly differ in effects on cultural and historic resources.

5.1.3 Hydrology and Water Quality

This section addresses potential effects of the Proposed Action and alternatives on surface drainage, flooding, water diversions, groundwater hydrology, and surface and groundwater quality. The effects related to hydrology and water quality are based on a review of the hydrology and water quality information for the affected environment (Section 4.1.3) and an assessment of the activities associated with the Proposed Action and alternatives, including an estimation of the future amount of impervious surfaces. Effects associated with the Proposed Action or alternatives are analyzed in light of whether they would lead to an increase in run-off that could adversely affect surface or groundwater quality, modify groundwater recharge, increase the risk of damage caused by flooding, or lead to the violation of applicable Federal, state or local laws.

5.1.3.1 Effects of the Proposed Action

Conservation Program. Under the Proposed Action, permanent conservation easements would be recorded over the most biologically sensitive portions of San Francisquito, Los Trancos, Matadero, and Deer creeks on Stanford's lands. These easements would restrict activities within and adjacent to the creeks, and the easements would be monitored and managed in accordance with a San Francisquito/Los Trancos Easement Monitoring and Management Plan and Matadero/Deer Easement Monitoring and Management Plan. The easements and associated Monitoring and Management Plans would contribute to the protection of surface water quality by preserving existing streamside vegetation. Riparian vegetation filters out fine sediments and other contaminants as they are washed toward streams during rainstorms. Maintenance of existing riparian vegetation and future riparian restoration/bioengineered projects by the HCP's Conservation Program are expected to increase shading along creeks and assist with keeping water temperature conditions cool for native aquatic species. Riparian vegetation in the permanent conservation easements would also contribute to channel stability by holding soil in place and deflecting water away from the banks.

As part of the Monitoring and Management Plans for the riparian easements, Stanford would maintain water quality monitoring stations in Los Trancos, Bear, and San Francisquito creeks for 5 years to determine if the data are valuable for conservation purposes. If useful, the monitoring stations could be used beyond 5 years. Stanford would also investigate the feasibility of installing water quality monitoring stations on Matadero and Deer creeks. Installation of additional water quality monitoring stations would not adversely affect the creeks' flow or water quality.

The Monitoring and Management Plans for the riparian easements also call for control of existing erosion in riparian areas. This includes using bioengineering methods to stabilize stream banks and adjacent upland areas, and revegetating areas where erosion is an existing problem. In addition, when it is feasible, Stanford would remove man-made structures in San Francisquito Creek (e.g., riprap, gabions) to improve fish passage. The removal methods would be subject to review by the Conservation Program Manager to reduce impacts to water quality and Covered Species. These actions would improve water quality by reducing erosion.

Any actions undertaken pursuant to the conservation easements' Monitoring and Management Plans would be done in accordance with the Clean Water Act and applicable state water resource laws, including the California Fish and Game Code. The easements and Monitoring and Management Plans do not anticipate filling any wetlands or other aquatic resources; however, permits could be required from Federal, state or local agencies before stream stabilization activities were undertaken or any structures were removed from the creeks.

The Conservation Program in the HCP also includes several minimization measures to protect water quality to benefit Covered Species. These measures are included in Section 4 of the HCP, apply to work in Management Zones 1 and 2, and include:

- performing maintenance or other construction in the creeks without heavy equipment and coffer dams;
- limiting maintenance activities in Lagunita and Felt reservoirs to the summer months or "dry season" when water levels are low or dry;
- conducting all activities associated with the operation, maintenance, and installation of infrastructure improvements in an environmentally responsible manner in accordance with practices outlined in current industry published manuals;

- monitoring of service roads periodically for structural integrity and erosion;
- placing riparian areas "out-of-play" at the Stanford Golf Course;
- minimizing the use of biocides and fertilizers at the Golf Course;
- prohibiting public access to creek channels;
- keeping new recreational routes out of Management Zones 1 and 2 and at least 150 feet away from the creek bank;
- removing structures, crop fields, stables and paddocks associated with the equestrian and agricultural leases in Zone 1;
- requiring fuels stored in Zone 1 and 2 to be double contained; and
- oversight of all work in Zone 1 and 2 by the Conservation Program Manager.

Overall, the proposed HCP's Conservation Program would improve surface water quality, and would not lead to the violation of any Federal or state water quality standards. No structures or enhancements are proposed by the HCP that would place impermeable surfaces over the unconfined zone and affect groundwater recharge. Likewise, the HCP's proposed Conservation Program would not increase the amount of impermeable surfaces, which could increase runoff and the risk of flooding. To the extent that the underlying activities that are subject to the minimization measures or the proposed conservation activities require Federal, state, or local permits, the HCP would not affect the need to obtain such permits.[10] Thus, the HCP would not lead to the violation of any Federal, state, or local water laws. Because it prohibits development in the creek corridor in perpetuity, the Proposed Action provides greater protection of water quality than the No Action or HCP for CTS Only alternatives (described later below).

The HCP protects 270 acres of the most biologically valuable portions of San Francisquito and Los Trancos creeks by placing conservation easements over them. This is a small fraction of the 45-square-mile watershed, and would not preclude the USACE and JPA from identifying viable, and possibly less environmentally sensitive, places to build flood reduction improvements. While the HCP does not expressly cover any future regional flood reduction activities, the establishment of conservation easements does not inhibit planning for future regional flood reduction activities, such as modifications to Searsville Dam, the construction of off-stream detention sites, or widening of San Francisquito Creek.

The proposed Conservation Program would not have a significant adverse effect on water quality, flooding, or hydrology. The Conservation Program would not require changes to operations and maintenance that would result in an increase in withdrawal of groundwater, or pose a threat to groundwater quality.

Ongoing Stanford Operations. Ongoing operations are described in Section 3 of the HCP (Appendix B) and include water management, academic activities, infrastructure installation and maintenance (utilities, roads and bridges, fences, detention basins), residential land use,

[10] For example, the HCP does not authorize the fill of any wetlands or alteration of a creek or creek bed. These activities would still require permits under the CWA, Porter-Cologne Water Quality Control Act, or Fish and Game Code.

recreation and athletics, grounds and vegetation management, agricultural and equestrian leaseholds, and commercial and institutional leaseholds.

Several measures are currently in place to ensure ongoing Stanford operations do not adversely affect surface or groundwater quality, modify groundwater recharge, increase the risk of damage caused by flooding, or lead to the violation of applicable Federal, state, or local laws. Stanford is required to comply with Palo Alto's Sewer Use Ordinance, which includes storm water requirements. Though not required by law, Stanford operates under its own campus SWPPP for ongoing operations. All new contracts for development at Stanford are required to include the BMPs and requirements set forth in Stanford University's SWPPP (Stanford University 2005b). The City of Palo Alto also conducts inspections each year to identify storm water issues. Stanford's 2005 "Proposed Campus-wide Plan for Groundwater Recharge" establishes an approach for the conveyance of water from Stanford's irrigation water supply to Lagunita for percolation to groundwater.

With regard to Stanford's water diversions on Los Trancos and San Francisquito creeks (Los Trancos Creek Diversion Facility and San Francisquito Creek Pump Station); both of these facilities currently operate in a manner to protect steelhead and aquatic habitat downstream through minimum bypass flow requirements adopted in 2009 by the SHEP. The proposed HCP would incorporate the SHEP operational protocols. Specific operational measures for the Los Trancos Creek Diversion Facility and San Francisquito Creek Pump Station are described in Section 4.1.3.5, Water Diversions and Searsville Dam, and presented in Tables 3-2 and 3-3. The bypass flow requirements for the Los Trancos Creek Diversion Facility and the San Francisquito Creek Pump Station maintain base stream flows and prevent the downstream channel from drying out when the diversions are operating. Bypass flows are also sufficient to prevent water withdrawals from degrading water quality.

Ongoing operations include maintenance activities to reduce obstructions in the creeks that could contribute to flooding. Debris removal is intended to reduce the risk of flooding. Additionally, the Proposed Action includes excavation of accumulated sediments from the channel of Corte Madera Creek upstream of Searsville Reservoir to prevent flooding of adjacent roads and properties. Approximately once per decade, heavy equipment would be used to remove sediments from Corte Madera Creek and place these materials as a berm alongside the channel. Within a work area of up to 2,000 feet in length and 50 feet wide, the channel and creekbed would be temporarily disturbed by sediment excavation. Work would be performed when the channel reach is seasonally dry to avoid impacts to aquatic species, and no degradation of water quality is expected. Stream banks within the affected reach would be stabilized with riparian plantings and the placement of boulders. Restoration of the channel's water conveyance capacity would reduce the risk of localized flooding in the vicinity of Family Farm Road. The action would also stabilize the banks and reduce the potential for erosion.

Ongoing Stanford operations are regulated and conducted in a manner that protects surface and groundwater quality and several measures are in place to reduce the risk of flooding. The continuation of these activities would not adversely affect hydrology or water quality. Ongoing operations would not require changes that would result in an increase in withdrawal of groundwater, or pose a threat to groundwater quality.

Future Development. Future development anticipated to occur during the 50-year term of the HCP/ITPs includes development permitted by the existing GUP, and development estimated to occur beyond the GUP. Development allowed under the existing GUP in Management Zones 1, 2 and 3 consists of 30 acres, and the impacts were addressed in the GUP EIR. Development

anticipated in the HCP to possibly occur beyond what is currently allowed under the GUP is estimated to be between 50 and 150 acres. The HCP includes the following future development as a Covered Activity that could occur in Management Zones 1, 2 and 3: 1 to 3 million gross square feet of academic development, or 200 to 750 single family homes, or a combination of the two (e.g., 1 million gross square feet academic and 400 to 500 single family homes).[11]

The total amount of development addressed in the GUP EIR, including that in Zone 4, was 2,035,000 gross square feet of academic development and up to 3,018 housing units. Some of the development was proposed for vacant land and some was redevelopment. The GUP EIR found that the entire proposed development under the GUP would add an estimated 39 acres of impervious surfaces. Mitigation was required to prevent significant impacts related to flooding, groundwater supply and groundwater quality. Future development beyond the GUP would be reviewed by the county or city in which the development is proposed, and it likely would be subject to similar mitigation measures. The effects of future development beyond the GUP likely would have similar effects, but at a much smaller scale because of the level of development, and would be subject to similar mitigation measures.

Flooding. The GUP EIR determined that the entire proposed GUP development would result in a 39-acre increase in impervious surfaces, which could result in increased downstream flooding. During the EIR process, the Santa Clara Valley Water District indicated that any additional impervious area could increase downstream flooding. Thus, the 2000 Santa Clara County GUP required Stanford to prepare a hydrology and drainage study for anticipated GUP development and make storm drainage system improvements sufficient to assure that the peak storm runoff leaving the campus does not increase, and that any increased runoff does not cause downstream flooding (i.e., hydromodification). Measures to avoid increased runoff levels include construction and operation of storm water detention facilities. The SCVURPPP and the SMCWPPP also include similar requirements to manage hydromodification.

It is estimated that 75 percent of future developed acreage beyond the GUP would be impervious surface (building, parking lots, and other paving). The remaining 25 percent would be permeable surfaces, such as landscaping. Therefore, the future development (50 to 150 acres) anticipated as part of the proposed action could result in an additional 37 to 113 acres of impervious surfaces over the 50-year term of the ITPs. This analysis assumes that all of the development would occur on vacant land and not include redevelopment of areas that already contain impervious surfaces. Since any increase in impervious surface could increase the risk of flooding, the future development anticipated in the HCP could increase the risk of flooding. Specific impacts would depend on the scope and nature of the future development, and would be addressed under CEQA review at the time that the development was proposed. Development that could result in an increased risk of downstream or local flooding would require improvements, such as detention basins or other storm water runoff controls to mitigate the effect. Based on the results of the current GUP, there are feasible measures that Stanford could implement so that the future development anticipated under the Proposed Action would not increase the risk of flooding. As required by the existing Santa Clara County GUP, Stanford will design future development projects in a manner that assures peak storm water runoff leaving the

[11]This example of future development beyond the GUP assumes 150 acres of urban type development, and does not attribute any of this development to small conversions of habitat associated with the ongoing Covered Activities.

developed site does not increase, and that any increased runoff does not cause downstream flooding.

Groundwater Supply. Impacts to groundwater supply from the development analyzed in the GUP EIR were found to be significant because 20 acres of new impervious area could occur in the unconfined zone (where groundwater recharge can occur) and could reduce groundwater volumes. Mitigation for this impact was the implementation of a groundwater recharge plan. The approach for groundwater recharge mitigation relies on the conveyance of a quantifiable amount of water from Stanford's irrigation water supply to Lagunita. Lagunita has a very permeable bottom and the water rapidly percolates to groundwater. Stanford's groundwater consultants have developed a calculation methodology for quantifying the amount of recharge lost to new impervious surface area and a monitoring program is in place to ensure the cumulative amount of water conveyed to Lagunita is greater than the cumulative amount of recharge lost to new development on campus.

A small area of future GUP development included in the HCP as a Covered Activity is in the unconfined zone, primarily around Lagunita. The effects of development allowed under the GUP in this area would be mitigated as described above. The effects on groundwater of a specific development project that has not already been permitted by the GUP would be addressed in future environmental review under CEQA. Based on the results of the current GUP, the existing mitigation approach could be implemented so that future development anticipated under the HCP would not adversely affect groundwater recharge.

Groundwater Quality. The GUP EIR found that construction in the vicinity of improperly abandoned wells could result in adverse impacts to groundwater quality. This is because the wells could serve as a conduit for pollutants, such as oil and gasoline from construction equipment, into groundwater. The EIR and the Final Conditions of Approval require wells to be properly abandoned prior to construction. Because the location of development that has not already been permitted by the GUP is not known, future development could also adversely impact groundwater quality in this way. Groundwater quality protection and abandonment of wells would be addressed in future environmental review of specific development proposals on Stanford's lands under CEQA. If necessary, wells would be abandoned properly, and as demonstrated by the GUP conditions of approval, there are feasible water quality measures that Stanford could implement so that development anticipated under the HCP would not pollute groundwater.

Storm Water/Surface Water Quality. Storm water pollution in San Mateo and Santa Clara counties is controlled through the National Pollutant Discharge Elimination System (NPDES) permits issued by the San Francisco Bay RWQCB and implemented through the SCVURPPP and SMCWPPP. To comply with the NPDES permit, local agencies address the protection of storm water quality during the development review process. All projects in Santa Clara and San Mateo counties must consider the incorporation of appropriate site design and source control measures. SWPPPs with BMPs are adopted to reduce the impacts of construction and storm water runoff. Future development under the GUP, and that anticipated in the HCP, would be required to include BMPs in project design. This would prevent adverse impacts to storm and surface water quality.

All construction sites that are open October through April are included in Stanford's Notice of Intent to qualify for the state's General Storm Water Construction Permit, with a SWPPP prepared for each project. All sites are monitored regularly by Stanford staff and site project

managers. Stanford project managers receive annual training regarding storm water pollution prevention at construction sites.

The analysis done for the GUP development demonstrates that there are feasible mitigation measures that could be imposed on site-specific future development that would minimize or avoid adverse effects on hydrological resources and prevent an increased risk of flooding.

Regulated Waters. Because the exact location of future development is still unknown, Stanford does not know if its future development might result in the fill of wetlands or other aquatic resources regulated under the CWA, Porter-Cologne Water Quality Control Act, or Fish and Game Code. Any fill would require a permit from the USACE, RWQCB, and possibly CDFG, and may also be subject to review under CEQA. Compensatory mitigation for the fill could be required as a condition of those permits. Thus, future development would not violate any Federal, state, or local laws.

5.1.3.2 Effects of the No Action Alternative

Conservation Program. There would be no comprehensive Conservation Program under the No Action Alternative, and the easements and associated Monitoring and Management Plans of the Proposed Action would not be recorded or implemented. Under this alternative, it is assumed that the activities in Zones 1 and 2 that require a permit would also require minimization measures similar to those defined in the HCP for Zones 1 and 2. Several components of the HCP's Conservation Program would not occur under this alternative unless they were included in future individual projects to reduce or prevent incidental take of listed species. Activities that result in ground disturbance would be subject to BMPs as required under the applicable SWPPP, and activities that affect waters or wetlands would be subject to protections required under the CWA and California Fish and Game Code. As with the Proposed Action, there would be no adverse effects on surface water quality, hydrology, surface or groundwater supply and quality, or regional flood reduction.

Ongoing Stanford Operations. Under the No Action alternative, ongoing Stanford operations would continue. These activities are subject to water quality protection requirements independent of any incidental take authorization, and would have the same effects on water quality as the Proposed Action.

Future Development. Future development under the No Action alternative is the same as that described for the Proposed Action. Future development would be subject to Federal, state and local water quality regulations, and any new development that is not already allowed under the 2000 GUP would require project-specific building permits, CEQA review and possibly take authorization. Depending on its size and location, future development may affect storm water runoff, surface or groundwater quality, groundwater supply, flooding, or regulated waters, as described above for the Proposed Action. However, because of the project-specific review that is required for new development, these effects could be avoided or reduced through standard mitigation measures that are generally applicable to new urban development. This is the same effect as under the Proposed Action. The difference between the No Action alternative and the Proposed Action is that the Proposed Action would establish permanent conservation easements within one year of ITP approval along the San Francisquito/Los Trancos and Matadero/Deer creek zones which would restrict development adjacent to sensitive water resources, and the Proposed Action includes a comprehensive Conservation Program that will reduce erosion and improve surface water quality in the creeks.

5.1.3.3 Effects of the HCP for CTS Only Alternative

Under this alternative, the HCP area would be geographically limited to the CTS Basin, which includes the area around Lagunita (90 acres) and the CTS Reserve in the foothills south of JSB (315 acres). Stanford activities that would result in the incidental take of listed species other than tiger salamander would require project-specific incidental take permits.

Conservation Program. The Conservation Program in the HCP for CTS Only alternative would not apply to the creek corridors, where water quality and hydrology issues are of greater concern. Conservation easements would not be immediately placed on the riparian corridors along San Francisquito/Los Trancos creeks and Matadero/Deer creeks although conservation easements could be placed as a result of future project-specific mitigation. The Conservation Program under the Proposed Action provides more comprehensive protection of water quality, including development restrictions in riparian corridors through conservation easements, and minimization measures that apply to activities occurring in and adjacent to the creeks.

The Conservation Program in the HCP for CTS Only alternative does not require activities near sensitive water resources and does not require ground disturbance that would adversely affect water quality or hydrology. In addition, measures to minimize ground disturbance, runoff, and erosion would be implemented in order to protect storm water quality. As with the Proposed Action and No Action alternative, there would be no adverse effects on surface water quality, hydrology, surface or groundwater supply and quality, or regional flood reduction.

Because it does not involve sensitive water resources, the Conservation Program in the HCP for CTS Only alternative has less potential for impact on water resources than the Proposed Action's Conservation Program, but it also does not have the beneficial effects of reducing erosion in the creek zones provided for in the Proposed Action's Conservation Program.

Ongoing Stanford Operations. Under the HCP for CTS Only alternative, Stanford would continue to operate. The same operations and maintenance activities would occur under the HCP for CTS Only alternative as for the Proposed Action. Thus, this alternative would have the same effects on hydrology and water quality as the Proposed Action.

Future Development. Future development under the HCP for CTS Only alternative is the same as that described for the Proposed Action. Future development would be subject to Federal, state and local water quality regulations, and any new development that is not already allowed under the 2000 GUP would require project-specific building permits, CEQA review and possibly incidental take authorization. Depending on its size and location, future development may affect storm water runoff, surface or groundwater quality, groundwater supply, flooding, or regulated waters, as described above for the Proposed Action. However, because of the project-specific review that is required for new development, these effects could be avoided or reduced through standard mitigation measures that are generally applicable to new urban development. This is the same effect as under the Proposed Action and the No Action alternative. The difference between the HCP for CTS Only alternative and the Proposed Action is that the Proposed Action would establish permanent conservation easements within one year of ITP approval along the San Francisquito/Los Trancos and Matadero/Deer creek zones which would restrict development adjacent to sensitive water resources, and the Proposed Action includes a comprehensive Conservation Program that will reduce erosion and improve surface water quality in the creeks. With regard to the impacts of future development, the HCP for CTS Only alternative has the same effects as the No Action alternative.

5.1.3.4 Comparison of Alternatives

The Proposed Action or the alternatives would not result in significant adverse effects to hydrology and water quality (Table 5-8). The Conservation Program under the Proposed Action provides bank stabilization that may not otherwise be required, and this would reduce erosion and benefit water quality. The easements proposed in the Conservation Program would also restrict development within the creek zones, in turn protecting surface water quality in the creeks. In comparing the alternatives, none pose a significant adverse effect, but the Proposed Action provides a benefit related to hydrology and water quality.

5.1.4 Air Quality

This section describes the impacts to air quality resulting from the implementation of the Proposed Action or the alternatives. The effects related to air quality are based on a review of air quality information for the affected environment and an assessment of the activities under the Proposed Action and alternatives that could affect air quality. Actions that result in violations of air quality standards or emissions that contribute substantially (as determined by the BAAQMD) to an existing or projected air quality violation would constitute a significant adverse effect on air quality.

5.1.4.1 Effects of the Proposed Action

Conservation Program. Some of the proposed HCP's habitat management and enhancement activities would involve ground disturbance or the use of construction equipment or vehicles causing air emissions. These activities may include the use of a backhoe or a bobcat tractor, and the ground disturbance would be minimized in order to protect biological resources. The equipment and type of work is similar to everyday activities that could occur in the air basin, and would not result in violations of air quality standards or emissions that would contribute substantially to an existing or projected air quality violation. Therefore, the implementation of the Conservation Program would not result in significant adverse effects on air quality.

Ongoing Stanford Operations. Stanford's ongoing activities would not markedly change due to the HCP. Therefore, the Proposed Action would not result in changes to air quality from ongoing university operations.

Future Development. The Stanford GUP EIR described the regional climate and physiographic, regional air quality, and state and Federal air quality standards. It was determined that the proposed development would result in significant impacts from diesel exhaust, a toxic air contaminant. These impacts were reduced to less than significant by implementing a mitigation measure requiring contractors to maintain properly their equipment and use "clean fuel" equipment and control technologies where feasible. All other impacts were considered less than significant.

Except for small projects that are exempt from CEQA, future development anticipated beyond that addressed in the GUP EIR would undergo independent environmental review and would be governed by the constraints set forth by state and Federal law, and local ordinances and air quality plan. The BAAQMD CEQA Guidelines outline feasible measures to reduce construction emissions of dust and diesel exhaust and establishes thresholds of significance for emissions from project operations including indirect sources of emissions from land use development (mobile emissions from cars at office parks, shopping centers, residential areas), and for plan (general, regional or air quality plan) impacts. Future development would have similar effects as the GUP development on air quality and based on the GUP CEQA analysis, there are feasible

mitigation measures to reduce emissions and avoid the violation of air quality standards. Future development anticipated in the Proposed Action would therefore not have any significant adverse effects on air quality.

5.1.4.2 Effects of the No Action Alternative

Conservation Program. Under the No Action alternative, the proposed ITPs would not be issued and the HCP, including a comprehensive Conservation Plan, would not be implemented. Future development and ongoing Stanford operations in Management Zones 1 and 2 that could result in take of federally listed species would require take authorization on a project-by-project basis, which is what happens now. Under this alternative, activities in Zones 1 and 2 that require a permit are assumed to also require minimization measures similar to those defined in the HCP for Zones 1 and 2. Several components of the HCP's Conservation Program would not occur under this alternative unless they were included in future individual projects to reduce or prevent incidental take of the listed species. Air quality effects would result from the use of construction equipment or vehicles, as described for the Proposed Action, but the amount of restoration work involving the equipment may be less under the No Action alternative. There could be fewer emissions generated under the No Action alternative than described for the Proposed Action, but neither would result in an adverse effect on air quality.

Ongoing Stanford Operations. Under the No Action alternative, Stanford would continue to operate and the No Action alternative would not result in additional emissions beyond current emissions from ongoing university operations. This is the same as under the Proposed Action.

Future Development. Under the No Action alternative, new development would occur. Future development would be subject to the GUP, and any new development that has not already been permitted by the GUP would require project-specific CEQA review that could include measures to reduce potential effects on air quality. As demonstrated by the GUP conditions of approval, there are feasible air quality mitigation measures that would reduce potential effects on air quality. The effect of future development would be the same as described for the Proposed Action.

5.1.4.3 Effects of the HCP for CTS Only Alternative

Under this alternative, the HCP area would be geographically limited to the CTS Basin, which includes the area around Lagunita (90 acres) and the CTS Reserve in the foothills south of JSB (315 acres). Stanford activities that would result in the take of listed species other than tiger salamander would require project-specific incidental take permits.

Conservation Program. The HCP for CTS Only alternative would have no effects on air quality. The conservation program for this alternative would be limited to activities outlined in the Central Campus CTS Management Plan and the CTS Reserve Monitoring and Management Plan. The activities in the CTS Reserve Monitoring and Management Plan are restricted to vegetation mowing and species monitoring, and except for the creation of new tiger salamander breeding ponds within the CTS Reserve, do not differ significantly from existing vegetation management activities. The HCP for CTS Only alternative's conservation program prohibits development in the CTS Reserve, and the creation of new breeding ponds would not have significant long-term effects on air quality by resulting in violations in National Ambient Air Quality Standards (AAQS). Similarly, the activities in the Central Campus CTS Management Plan address methods of vegetation and ground animal management, worker education, restriction of off-road vehicles, and monitoring and also would not affect air quality. These activities would not require soil disturbance or a significant change in equipment use that would

affect air quality. Activities outside of the CTS Basin would be subject to measures that protect air quality as described for the Proposed Action and No Action alternatives.

Ongoing Stanford Operations. Under the HCP for CTS Only alternative, Stanford would continue to operate, and the alternative would not result in changes to air quality from ongoing university operations. This is the same as described for the Proposed Action.

Future Development. Under the HCP for CTS Only alternative, new development would occur. Future development would be subject to existing state and local regulations pertaining to air quality, and any new development that has not already been permitted by the GUP could require project-specific CEQA review. The effects of future development would be the same as described for the Proposed Action.

5.1.4.4 Comparison of Alternatives

The Proposed Action or the alternatives would not result in significant adverse effects to air quality. Although the Proposed Action's Conservation Program may require more hours of equipment use than the other alternatives in order to implement restoration activities, the Proposed Action or alternatives do not significantly differ in effects on air quality.

5.1.5 Noise

This section describes the effects of the Proposed Action and alternatives on the existing noise environment. The assessment of the noise effects is based on local noise regulations, and whether local noise ordinances would be violated.

5.1.5.1 Effects of the Proposed Action

Conservation Program. The Conservation Program's monitoring, management, and enhancement activities would occur in Management Zones 1 and 2, which are located away from residential neighborhoods that contain sensitive noise receptors. Conservation activities would mostly take place in the foothills and along creek corridors. Such measures include creek restoration to remove impediments, bank stabilization, exotic vegetation removal, vegetation management through mowing, and pond management. These activities are discrete and short-term, and do not represent a new source of significant noise.

Existing noise ordinances regulate unwanted sound and prevent or minimize adverse noise effects. Conservation Program activities would not exceed the noise ordinance limitations and would not result in adverse noise effects.

Ongoing Stanford Operations. A few of the activities conducted for ongoing Stanford operations such as those related to the creeks, utilities, roads, bridges, and storm water detention and other general improvements could require the use of machinery or heavy equipment such as a backhoe, bobcat tractor and dump truck.

Noise from ongoing Stanford operations is subject to the restrictions in applicable city or county noise ordinances. The HCP would not result in a change in ongoing operations and maintenance and would not result in the violation of a noise ordinance.

Future Development. Development under the 2000 GUP was subject to environmental review by Santa Clara County. The Stanford GUP EIR addressed the impacts of GUP development on sensitive noise receptors for both construction-related noise and operational noise (ongoing use after construction). The Stanford GUP EIR found that the impacts of construction noise on residential locations outside of the campus (e.g., residences on Stanford Avenue) were significant because construction-related noise would exceed Santa Clara County noise standards.

Although the EIR included several mitigation measures to reduce construction-related noise impacts, the EIR concluded that the impacts were significant even with the mitigation measures. Mitigation measures included requiring the use of a noise-attenuating jacket around jackhammers; using state-of-the-art technology to mitigate construction equipment noise (i.e., engine enclosures, intake and exhaust silencers, etc.); constructing 8- to 10-foot-high temporary walls along the property lines of the project site adjacent to residential areas; and scheduling the construction such that the absolute minimum number of machines would be operating at the same time.

The GUP EIR found that operational noise impacts due to the GUP development were not significant with specific mitigation measures incorporated. The mitigation measures included requiring that mechanical equipment and new facilities incorporate state-of-the-art noise reduction components (mufflers, enclosures, parapets), that all operational noise sources comply with the County noise ordinance, that the project incorporate design measures to locate noise sources such as loading zones, trash bins, and mechanical equipment as far away from the noise sensitive receptor locations as possible, and that residential uses be separated from parking structures by at least 150 feet.

In addition to the development proposed in the Stanford University GUP, the development of up to 150 acres of Zone 1, 2 and 3 lands over the next 50 years is a Covered Activity in the HCP. Although the exact location of any future development, including small conversions of habitat from ongoing activities, is currently unknown, future development would have noise impacts similar to the GUP development. The specific impacts would depend on the exact location of the development and its proximity to land uses outside of Stanford with a high sensitivity to noise (e.g., residential). The areas that the GUP EIR concluded would experience unavoidable significant noise impacts are located in Management Zone 4, or in off-site locations adjacent to Zone 4. The EIR found that only sensitive noise receptors outside of Stanford could be significantly impacted by development activities that exceeded local noise ordinances. The same would be true for future development beyond the GUP. Any development that is located adjacent to sensitive off-site noise receptors could, even with mitigation, exceed a local noise ordinance. In addition, noise sensitive areas that are not directly affected by construction activities could experience elevated noise levels due to increased vehicular traffic and construction equipment transport, although these activities are not likely to exceed local noise ordinances or regulations.

Regardless of the location or source of the noise, any proposed new development could be subject to future CEQA review which would address both construction-related and operational noise. Future development could result in adverse effects related to noise even with mitigation measures, as evidenced by the GUP EIR findings, because noise ordinance violations during construction could still occur. Operational noise due to future development could be mitigated to prevent violation of a noise ordinance, and should not result in a significant adverse effect.

5.1.5.2 Effects of the No Action Alternative

Conservation Program. Under the No Action alternative, the proposed ITPs would not be issued and the HCP would not be implemented. Under this alternative, activities in Zones 1 and 2 that require a permit are assumed to also require minimization measures similar to those defined in the HCP for Zones 1 and 2. Several components of the HCP's Conservation Program would not occur under this alternative unless they were included in future individual projects to reduce or porevent incidental take of the listed species. Conservation activities would mostly take place along creek corridors, and in the foothills where tiger salamander are found. Such

measures could include creek restoration to remove man-made impediments, bank stabilization, exotic vegetation removal, vegetation management through mowing, and pond management. These activities are discrete and short-term, and do not represent a new source of significant noise. The noise effects of possible conservation activities under the No Action alternative would be similar to the noise that would be generated by the conservation activities under the Proposed Action.

Ongoing Stanford Operations. Under the No Action alternative, Stanford operations would continue and would be subject to existing and future noise ordinances. This alternative would not result in changes to noise from ongoing university operations. This is the same as described for the Proposed Action.

Future Development. Under the No Action alternative, new development would occur. Future development would be subject to existing state and local noise regulations, and any new development that has not already been permitted by the GUP could require project-specific building permits and CEQA review. Thus, the effects from future development would be the same under the No Action alternative as those described for the Proposed Action. Depending on the location of future development relative to sensitive receptors, construction noise could be significant even with mitigation measures. The operational noise should not be significant after mitigation is implemented.

5.1.5.3 Effects of the HCP for CTS Only Alternative

Under this alternative, the HCP area would be geographically limited to the CTS Basin, which includes the area around Lagunita (90 acres) and the CTS Reserve in the foothills south of JSB (315 acres). Stanford activities that would result in the take of listed species other than the tiger salamander would require project-specific incidental take permits.

Conservation Program. The specific activities that would be included in the conservation program for this alternative are described in Section 4 of the HCP (Appendix B). In general, they include surveys, mowing/grazing, monitoring, and education programs. None of these activities are significant sources of noise. The noise effects of the implementation of a conservation program under the HCP for CTS Only alternative would be similar to the noise associated with the Proposed Action.

Conservation activities similar to those identified in the Proposed Action could also occur as a result of individual take authorizations for projects affecting listed species outside of the CTS Basin (red-legged frog, garter snake and/or steelhead). Such measures include creek restoration to remove impediments, bank stabilization, exotic vegetation removal, vegetation management through mowing, and pond management. These activities are discrete and short-term, would not result in violations of applicable noise ordinances because they would be done by hand or with commonly-used construction machinery (such as a mower or bobcat, as opposed to a loud pile-driver), and do not represent a new source of significant noise.

Ongoing Stanford Operations. Under the HCP for CTS Only alternative, Stanford operations would continue as at present under existing noise ordinance restrictions. This alternative would not result in changes to noise from ongoing university operations. This is the same as described for the Proposed Action.

Future Development. The future development anticipated in the Proposed Action and the No Action alternatives could still occur under this alternative, although it may require individual take authorizations. Hence, this alternative would result in the same noise effects as the Proposed Action.

5.1.5.4 Comparison of Alternatives

The Proposed Action or the alternatives would not result in significant adverse effects to noise, with the exception of construction noise associated with future development. Depending on the location of future development relative to sensitive receptors, construction noise could be significant even with mitigation measures. The operational noise should not be significant after mitigation is implemented. The Proposed Action or alternatives do not significantly differ in effects on noise.

5.1.6 Traffic

This section describes the impacts to traffic resulting from implementation of the Proposed Action or the alternatives. Traffic effects were assessed by using the GUP EIR, reviewing the information in the affected environment, and by calculating the trips that could be generated by future development using standard trip rates published by the Institute of Transportation Engineers (ITE), which is described in more detail under the Proposed Action, below. Effects on traffic were assessed to see if the Proposed Action or alternatives would cause any intersection to fall below an accepted Level of Service (LOS). This depends on the intersection, and is usually LOS D or better. The LOS evaluation indicates the degree of congestion that occurs during peak travel periods and is the principal measure of roadway performance. LOS ranges from A (best) to F (worst).

5.1.6.1 Effects of the Proposed Action

Conservation Program. No activities are proposed in the Conservation Program that would permanently alter existing traffic patterns or result in an increase in vehicle trips. Conservation activities would mostly take place in the foothills and along creek corridors. Such measures include creek restoration to remove impediments, bank stabilization, exotic vegetation removal, vegetation management though mowing, pond management, and monitoring for the Covered Species. These activities could result in temporary traffic delays as personnel and equipment are moved to and from the sites, but would not affect long-term traffic levels or patterns by worsening intersection LOS.

Ongoing Stanford Operations. Existing traffic from the ongoing Covered Activities is part of the existing traffic affected environment (Section 4.1.6, Traffic). Continuation of the ongoing activities would not significantly affect existing traffic patterns by worsening intersection LOS.

Future Development. The traffic impact attributable to development beyond that covered by the GUP is uncertain because the exact locations, timing, and sizes of future developments are not known at this time. The trip generation potential was estimated for a range of future development (beyond the GUP) as specified in Section 3, Proposed Action and Alternatives. The estimate includes AM and PM peak hour vehicle trips. Standard trip rates published by the ITE were used to estimate trips associated with new housing development. This is a conservative estimate because potential housing development for Stanford employees on its lands would likely have an alternative transportation component included to reduce vehicular trips. The previously prepared trip generation estimates from the GUP traffic study were used to develop similar projections for traffic attributable to future academic development anticipated in the HCP.

As described in Section 3, Stanford provided estimates of the future development potential, beyond that already approved by the GUP, over the 50-year term of the ITPs and HCP. Their estimates are general projections based on current campus planning principles of density and

building efficiency. Assuming a typical suburban campus development density of 0.25 Ground Area Coverage and two-story buildings, 1 to 3 acres could support 20,000 to 60,000 square feet of academic development. Assuming a housing density of 4 to 5 single-family units per acre, 1 to 3 acres could support 4 to 15 housing units each year. Therefore, during the term of the ITPs up to approximately 1,000,000 to 3,000,000 square feet of academic development, or 200 to 750 single-family housing units, or some combination of the two (e.g., 1,000,000 square feet of academic development and 400-500 housing units) could occur.[12]

Under the maximum possible housing development scenario, there could be as many as 141 new inbound trips and 422 new outbound trips during the AM peak hour, and 477 new inbound trips and 280 new outbound trips during the PM peak hour. Under the maximum possible academic development, there could be as many as 190 new inbound trips and 268 new outbound trips during the AM peak hour, and 512 new inbound trips and 663 new outbound trips in the PM peak hour. Under the mid-range combination, there could be a total of 184 new inbound trips and 401 new outbound trips in the AM peak hour, and 558 new inbound trips and 510 new outbound trips in the PM peak hour. The low range combination could result in 133 new inbound trips and 247 new outbound trips in the AM peak hour and 383 new inbound trips and 407 new outbound trips in the PM peak hour (Tables 5-1 and 5-2).

The GUP traffic study concluded the projected traffic impacts from the GUP development were significant and unavoidable, because some local intersections would fall below acceptable levels of service (LOS D). This traffic analysis has determined that the anticipated future development that would occur during the life of the HCP would result in additional traffic that would presumably further impact these already congested intersections. Thus, traffic attributable to future development could result in traffic that would adversely affect traffic levels of service. However, it is important to note that a definitive determination of effects on traffic is not possible considering the uncertainty of changes that could affect traffic over the next 50 years. Improvements to the road system or transit in and around Stanford unrelated to Stanford development could change the affected environment compared to what is being evaluated here. Each new development that is proposed would undergo separate environmental review which would address traffic impacts and mitigation on a case-by-case basis.

[12] This example of future development beyond the GUP assumes 150 acres of urban type development, and does not attribute any of this development to small conversions of habitat associated with the ongoing Covered Activities.

Table 5-1. Traffic Projections for Stanford HCP Development Scenarios

Traffic Projections for Stanford HCP Development Scenarios

Land Use	Size	AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total
Housing Development							
Maximum Possible Development	750 sfdu's	141	422	563	477	280	758
Academic Development							
Maximum Possible Development	3,000,000 s.f.	190	268	458	512	663	1175
Low-Range Combination							
Housing Development	200 sfdu's	38	113	150	127	75	202
Academic Development	1,000,000 s.f.	95	134	229	256	332	588
Low-Range Totals		133	247	379	383	407	790
Mid-Range Combination							
Housing Development	475 sfdu's	89	267	356	302	178	480
Academic Development	1,500,000 s.f.	95	134	229	256	332	588
Mid-Range Totals		184	401	585	558	510	1,068

Notes:
/a/ Trip generation rates for single-family homes (ITE Land Use #210) used for housing development; taken from *ITE Trip Generation, Seventh Edition*.
/b/ Trip generation for academic development is based on the ratio of HCP development divided by GUP development.

Table 5-2. Traffic Rates Comparison between Stanford GUP and Habitat Conservation Plan

Comparision Between Stanford General Use Permit and Habitat Conservation Plan

Land Use	Size	AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total
Housing Development							
Maximum Possible Development	750 sfdu's	141	422	563	477	280	758
GUP Trips		129	182	311	347	450	797
Total Estimated Trips (GUP+HCP)		270	604	874	824	730	1555
Percent Increase		**52.16%**	**69.86%**	**64.40%**	**57.90%**	**38.38%**	**48.73%**
Academic Development							
Maximum Possible Development	3,000,000 s.f.	190	268	458	512	663	1175
GUP Trips		129	182	311	347	450	797
Total Estimated Trips (GUP+HCP)		319	450	769	859	1113	1972
Percent Increase		**59.58%**	**59.58%**	**59.58%**	**59.58%**	**59.58%**	**59.58%**
Low-Range Combination							
Housing Development	200 sfdu's	38	113	150	127	75	202
Academic Development	1,000,000 s.f.	95	134	229	256	332	587
Low-Range Totals		133	247	379	383	407	789
GUP Trips		129	182	311	347	450	797
Total Estimated Trips (GUP+HCP)		262	429	690	730	857	1,586
Percent Increase		**50.69%**	**57.54%**	**54.94%**	**52.47%**	**47.49%**	**49.76%**
Mid-Range Combination							
Housing Development	475 sfdu's	89	267	356	302	178	480
Academic Development	1,500,000 s.f.	95	134	229	256	332	587
Mid-Range Totals		184	401	585	558	510	1,067
GUP Trips		129	182	311	347	450	797
Total Estimated Trips (GUP+HCP)		313	583	896	905	960	1,864
Percent Increase		**58.81%**	**68.80%**	**65.31%**	**61.66%**	**53.11%**	**57.25%**

Notes:
/a/ Trip generation rates for single-family homes (ITE Land Use #210) used for housing development; taken from *ITE Trip Generation, Seventh Edition*.
/b/ Trip generation for academic development is based on the ratio of HCP development divided by GUP development.

5.1.6.2 Effects of the No Action Alternative

Conservation Program. Under the No Action Alternative, the HCP would not be implemented. Under this alternative, activities in Zones 1 and 2 that require a permit are assumed to also

require minimization measures similar to those defined in the HCP for Zones 1 and 2. Several components of the HCP's Conservation Program would not occur under this alternative unless they were included in future individual project to reduce or prevent incidental take of the listed species. As with the Proposed Action, these activities could result in temporary traffic delays as personnel and equipment are moved to and from the sites during conservation activities. No long-term effects to traffic levels or patterns would occur.

Ongoing Stanford Operations. Under the No Action alternative, Stanford operations would continue. This alternative would not result in changes to traffic from ongoing university operations, which is the same as described for the Proposed Action. Existing traffic from the ongoing Covered Activities is part of the existing traffic affected environment (Section 4.1.6, Traffic). Continuation of the ongoing activities would not significantly affect existing traffic patterns by worsening intersection Levels of Service.

Future Development. Under the No Action alternative the projected future development described for the Proposed Action would still occur, but incidental take authorization would be granted on a project-specific basis. Thus, the effects on traffic from the ongoing activities and future development would be the same under the No Action alternative as described for the Proposed Action. Mitigation for future development currently anticipated in the GUP is in place, and future development anticipated in the HCP would be subject to project-specific environmental review; however, future mitigation may not be enough to prevent adverse traffic effects from new development.

5.1.6.3 Effects of the HCP for CTS Only Alternative

Under this alternative, the HCP area would be geographically limited to the CTS Basin, which includes the area around Lagunita (90 acres) and the CTS Reserve in the foothills south of JSB (315 acres). Stanford activities that would result in take of listed species other than tiger salamander would require project-specific incidental take permits.

Conservation Program. The conservation program for the HCP for CTS Only alternative would be limited to activities in the CTS Basin that entail short-term construction or maintenance and do not result in long-term traffic impacts. The individual incidental take authorizations issued on a project-specific basis for red-legged frog, garter snake or steelhead would likely require minimization measures and mitigation such as conservation easements and creek restoration. These would be similar to those proposed in the HCP, but probably more limited in scope in accordance with the impacts of the individual project. The traffic effects of the HCP for CTS Only alternative would be the same as the Proposed Action, because the conservation activities are similarly short-term, cover a small area, and like everyday construction activities in the area.

Ongoing Stanford Operations. The HCP for CTS Only alternative would not result in changes to ongoing Stanford operations, or to traffic associated with ongoing operations, which is the same as described for the Proposed Action. Existing traffic from the ongoing Stanford operations is part of the existing traffic affected environment (Section 4.1.6, Traffic). Continuation of these activities would not significantly affect existing traffic patterns by worsening intersection LOS.

Future Development. The projected future development described for the Proposed Action would still occur under the HCP for CTS Only alternative. Thus, the effects on traffic from future development would be the same under the HCP for CTS Only alternative as for the Proposed Action. Mitigation for future development currently anticipated in the GUP is in place,

and future development anticipated in the HCP would be subject to project-specific environmental review; however, future mitigation may not be enough to prevent adverse traffic effects caused by new development.

5.1.6.4 Comparison of Alternatives

The Proposed Action or the alternatives would not result in significant adverse effects to traffic, with the exception of traffic associated with future development. Because development under the GUP EIR was found to have an unavoidable traffic impact by adversely affecting the LOS at some intersections, the analysis in this DEIS assumes that any future development under the Proposed Action or alternatives would also have an unavoidable adverse effect on traffic. However, a definitive determination of effects on traffic is not possible considering the uncertainty of changes that could affect traffic over the next 50 years. Improvements to the road system around Stanford or project-specific mitigation may prevent adverse traffic effects. The Proposed Action or alternatives do not significantly differ in effects on traffic.

5.1.7 Hazardous Materials/Waste

This section describes the hazardous materials and hazardous waste impacts resulting from the implementation of the Proposed Action or the alternatives. Effects related to hazardous materials and wastes are analyzed qualitatively, and are based on Stanford's current hazardous materials and waste protocols and policies, and the nature of the activities that would occur. The analysis focuses on the potential for public and environmental exposure to hazardous materials as a result of the implementation of the Proposed Action or alternatives or from the continuation of the ongoing Covered Activities and new development anticipated in the HCP.

The Stanford GUP EIR determined that requiring the preparation of a Risk Management Plan for projects under the GUP that trigger the California Accidental Release Prevention Law would reduce significant impacts to less than significant for future projects. The California Accidental Release Prevention Law is triggered when chemicals are held in certain quantities, generally such quantities that would affect areas beyond the room or building where an accidental release occurred.

5.1.7.1 Effects of the Proposed Action

Conservation Program. There are no hazardous waste sites within Management Zones 1, 2, and 3. Conservation Program activities such as bank stabilization and instream structure removal which could require the use of heavy equipment would involve the use of small amounts of hazardous materials (fuels, motor oils, lubricants, antifreeze etc.) in order to run the equipment. In these instances, Stanford would employ standard operating procedures such as using equipment that is regularly maintained and refueling in safe areas. Compliance with applicable laws and regulations pertaining to handling of heavy equipment and associated hazardous materials substantially reduce the risk of accidental release of hazardous materials or exposure to hazardous materials, and the implementation of the Conservation Program would not have an adverse effect related to hazardous materials or waste. Potential effects on water quality from activities that require the use of hazardous materials in the creek zones are also not significant, and are addressed in Section 5.1.3, Hydrology and Water Quality.

Ongoing Stanford Operations. Hazardous materials and hazardous waste use, handling, storage, and disposal occur only in Management Zone 4, and are done according to state, Federal, county and local laws as implemented through various Stanford environmental health and safety department programs and policies. Hazardous materials that could be used in

Management Zones 1, 2, and 3 include materials associated with mechanical equipment, such as fuels, motor oils, antifreeze, etc. There are no effects from ongoing operations complying with all applicable laws and regulations, and the risk of an accidental release or hazardous materials exposure is very small. Therefore, the ongoing operation of Stanford under the HCP would not have a significant adverse effect related to hazardous materials and waste.

Future Development. There are no known hazardous waste sites at Stanford within Management Zones 1, 2, or 3. Thus, future development in these areas would have no effect on known hazardous waste sites. Future development in any Management Zone would be subject to state, Federal, county and local laws regarding the storage, handling, and use of hazardous materials and waste. Hence, the risk of accidentally releasing hazardous materials or hazardous waste is very small and would not result in significant adverse effects.

If future development at Stanford involved the construction of a building that would store, use or dispose of hazardous materials in quantities great enough to trigger the California Accidental Release Prevention law, the law would require the preparation of a Risk Management Plan. The Risk Management Plan would include a hazard assessment, and specify preventative measures and emergency response procedures. Therefore, the risk for accidental release of hazardous materials would be minimized, and the potential adverse effect would not be significant.

5.1.7.2 Effects of the No Action Alternative

Conservation Program. There would be no comprehensive Conservation Program under the No Action Alternative. Under this alternative, activities in Zones 1 and 2 that require a permit are assumed to also require minimization measures similar to those defined in the HCP for Zones 1 and 2. Several components of the HCP's Conservation Program would not occur under this alternative unless they were included in future individual projects to reduce or prevent incidental take of the listed species. Such measures do not generally require handling of hazardous materials although some hazardous materials (e.g., fuel) could be associated with heavy equipment used to implement some of the activities. As long as the equipment and materials are handled according to applicable laws, adverse effects would not occur. There are no known hazardous waste sites that could be disturbed. Because the activities under any alternative must comply with applicable laws, the effects of the No Action alternative are the same as the Proposed Action.

Ongoing Stanford Operations. Under the No Action alternative, Stanford would continue to operate in compliance with state, Federal, county and local laws as implemented through various Stanford environmental health and safety department programs and policies. Hazardous materials that could be used include materials associated with mechanical equipment, such as fuels, motor oils, antifreeze, etc. There are no effects from ongoing operations complying with all applicable laws and regulations, and the risk of an accidental release or hazardous materials exposure is very small. Therefore, the ongoing operation of Stanford under the No Action alternative would not have a significant adverse effect related to hazardous materials and waste. Since the ongoing operations are the same under each alternative, the effects on hazardous materials and waste under the No Action alternative are the same as the Proposed Action.

Future Development. Future development would be subject to existing state and local regulations, and any new development that has not already been permitted by the 2000 GUP would require project-specific CEQA review. The anticipated future development would be the same under the Proposed Action and the alternatives. Thus, the effects of the ongoing operation of Stanford and future development would be the same under the No Action alternative as described for the Proposed Action.

5.1.7.3 Effects of the HCP for CTS Only Alternative

Under this alternative, the HCP area would be geographically limited to the CTS Basin, which includes the area around Lagunita (90 acres) and the CTS Reserve in the foothills south of JSB (315 acres). Stanford activities that would result in take of listed species other than tiger salamander would require project-specific incidental take permits.

Conservation Program. The conservation program under this alternative would be limited to activities outlined in the Central Campus CTS Management Plan and the CTS Reserve Monitoring and Management Plan. That includes vegetation mowing, pond building and species monitoring, and the plan prohibits development in the CTS Reserve. Similarly, the activities in the Central Campus CTS Management Plan address methods of vegetation and ground animal management, worker education, restriction of off-road vehicles, and monitoring. The HCP for CTS Only alternative conservation program activities such as mowing and pond building could involve the use of mechanical equipment that requires fuel, oil, etc. As with the Proposed Action, the risk of an accidental release or hazardous materials exposure is very small through the use of standard operating procedures when handling these materials. The risk to waterways is less than the Proposed Action because the conservation activities would be limited to grassland areas away from riparian zones.

The effects of conservation activities under the HCP for CTS Only alternative would have the same effects related to hazardous materials as the Proposed Action. As long as the equipment and materials are handled according to applicable laws, adverse effects would not occur.

Ongoing Stanford Operations. Under the HCP for CTS Only alternative, Stanford would continue to operate. Stanford operates according to all state, Federal, and local laws related to hazardous materials and hazardous waste as implemented through various Stanford environmental health and safety department programs and policies. There are no adverse effects from ongoing operations complying with all applicable laws and regulations, and the risk of an accidental release or hazardous materials exposure is very small. The effects of ongoing operations of Stanford under the HCP for CTS Only alternative would be the same as those described for the Proposed Action.

Future Development. Development in the CTS Basin would be covered by the HCP for CTS Only alternative, whereas other development that adversely affects red-legged frog, garter snake, or steelhead would need separate incidental take authorization. Regardless, future development would be subject to existing state and local regulations pertaining to handling of hazardous materials, and any new development that has not already been permitted by the GUP could require project-specific CEQA review. The amount of future development would be the same under each of the alternatives and the effects of future development on hazardous materials and hazardous waste under this alternative would be the same as the Proposed Action.

5.1.7.4 Comparison of Alternatives

The Proposed Action or the alternatives would not result in significant adverse effects to hazardous materials/waste. Protocols already in place by Stanford would minimize the risk of exposure to hazardous materials/waste under the Proposed Action or alternatives. The Proposed Action or alternatives do not significantly differ in effects on hazardous materials/waste.

5.1.8 Public Services

This section describes the potential effects of the Proposed Action and the alternatives on public services such as police, fire, schools, solid waste, water, wastewater services, and electricity/gas.

The effects related to public services are based on a review of information about the affected environment and the activities associated with the Proposed Action or alternatives that could require public services. This assessment analyzes whether the Proposed Action or alternatives would result in a need for public services that could not be met by existing providers or entitlements, or require an expansion of services that would adversely affect the environment (such as a new wastewater plant).

5.1.8.1 Effects of the Proposed Action

Conservation Program. The activities relate to protection and management of habitat for the Covered Species and do not require additional police, fire, schools, solid waste, water, wastewater services, or electricity/gas services.

Ongoing Stanford Operations. The ongoing Covered Activities are already covered by existing public services and would not require additional public services.

Future Development. Development under the GUP was subject to environmental review by Santa Clara County. The EIR required Stanford to provide the funding or negotiate services to provide adequate levels of fire and police services. Stanford was also required to upgrade waste water collection system infrastructure if additional development required additional capacity. Solid waste disposal capacity was determined adequate for the proposed GUP development given an existing comprehensive and successful recycling program. By law, the only mitigation that can be required to maintain school capacities is to impose statutory school fees for additional development.

In addition to the development proposed in the Stanford University GUP, the ITPs cover the development of up to an additional 150 acres of Stanford's lands over the next 50 years. Future development could undergo independent environmental review under CEQA and would be governed by state and Federal law, city and county General Plans, and local ordinances. It is unknown if levels of police, fire, school, and similar public services would be adversely affected by future development. The need and type of mitigation would depend on the conditions existing at the time of future development and on the type of project that was proposed. It is anticipated that the precise impacts of future development would be assessed when it is proposed. Future development could be constrained by inadequate capacity or level of service if additional funding, physical improvements, or negotiations of service are not made. Small conversions of habitat associated with the ongoing Covered Activities may be exempt from CEQA, but these would not affect public services.

As noted in Section 4, Affected Environment, Stanford uses water from several sources, and currently operates under a water conservation plan. The maximum future development anticipated in the HCP could require as much as 0.33 mgd of water[13]. This number does not take into account possible conservation measures. However, current conservation efforts under the Water Reuse and Conservation Plan have reduced average campus domestic water use by 0.5 mgd from 2.6 mgd in 2000-2001 (Stanford 2003) to 2.14 mgd in 2009-2010 (Santa Clara County, June 2011), leaving future usage for the GUP development of up to 0.89 mgd, to be within the SFPUC's current water allocation.

[13] This is calculated by multiplying 3,000,000 sf of academic space (the maximum anticipated in the HCP) by 0.11 gpd/sf (the amount of water consumed per square foot for existing campus academic and other space per the 2000 GUP EIR).

Development beyond the GUP could raise Stanford's demand for water from the SFPUC up to 3.08[14] mgd which would slightly exceed the SFPUC's current allocation of 3.033 mgd. Currently, the SFPUC could not meet Stanford's expected water demand for development beyond the GUP. If the SFPUC's water allocation does not increase, future development beyond the GUP would need to include water conservation measures in order to remain within the SFPUC's allocation, or Stanford would need to either augment its water allocation or acquire other sources of water. Whether Stanford could sufficiently reduce its water use through additional water conservation measures or augment its water supply is not known at this time. However, Stanford could not require the SFPUC to exceed its allocation or build new facilities to provide additional water supplies. Rather, Stanford's ability to develop would be constrained, and Stanford would be required to stay within the SFPUC's water allocation. Thus, future development could be limited by the availability of potable water supplies, but future development would not adversely affect any public services.

5.1.8.2 Effects of the No Action Alternative

Under the No Action alternative, the proposed ITPs would not be issued and the HCP, including a comprehensive Conservation Program would not be implemented. Separate incidental take authorization would be required for each activity resulting in take of a federally listed species.

Conservation Program. Under this alternative, activities in Zones 1 and 2 that require a permit are assumed to also require minimization measures similar to those defined in the HCP for Zones 1 and 2. Several components of the HCP's Conservation Program would not occur under this alternative unless they were included in future individual projects to reduce or prevent incidental take of the listed species. These would not require new public services which is the same as the Proposed Action.

Ongoing Stanford Operations. Under the No Action alternative, Stanford would continue to operate. Ongoing operations do not alter the need for public services; therefore the effect would be the same as the Proposed Action.

Future Development. Future development would be subject to existing state and local regulations, and any new development that has not already been permitted by the GUP could require project-specific building permits and CEQA review. Regardless of the issuance or non-issuance of the ITPs, maintaining adequate public services would be required of all future activities and development on Stanford's lands. The effects of the ongoing operation of Stanford and of future development would be the same under the No Action alternative as those described for the Proposed Action.

5.1.8.3 Effects of the HCP for CTS Only Alternative

Under this alternative, the HCP area would be geographically limited to the CTS Basin, which includes the area around Lagunita (90 acres) and the CTS Reserve in the foothills south of JSB (315 acres). Stanford activities that would result in the take of listed species other than the tiger salamander would require project-specific incidental take permits.

[14] This is calculated by adding the current 2009-2010 water usage (2.14 mgd), plus water use anticipated under GUP development (0.609 mgd) (Parsons 2000), plus water use anticipated under future development defined in the HCP.

Conservation Program. Impacts to public services under the HCP for CTS Only alternative are the same as the Proposed Action because the conservation activities proposed would not require new public services. The implementation of any conservation program would have no effect on public services.

Ongoing Stanford Operations. Under the HCP for CTS Only alternative, Stanford would continue to operate. Ongoing operations do not alter the need for public services; therefore the effect would be the same as the Proposed Action.

Future Development. As noted above, future development could not occur without adequate levels of public services, and any new development that has not already been permitted by the GUP would require project-specific CEQA review that would address public service impacts. The effects of future development on public services would be the same as described for the Proposed Action.

5.1.8.4 Comparison of Alternatives

The Proposed Action or the alternatives would not result in significant adverse effects to public services. Future development could be limited by the availability of a potable water supply, but future development would not adversely affect any public services. The Proposed Action or alternatives do not differ in effects on public services.

5.1.9 Land Use

This section addresses the effects of the Proposed Action and alternatives on land use, and analyzes whether the HCP would conflict with existing land uses or land use designations. The effects of the Proposed Action and alternatives were assessed by analyzing whether the Proposed Action or alternatives are consistent with existing General Plan designations and zoning ordinances. If implementation of the Proposed Action or an alternative would be inconsistent with the land uses anticipated by the applicable General Plans and zoning ordinances, it could have a significant adverse effect on land use.

5.1.9.1 Effects of the Proposed Action

Conservation Program. The Conservation Program includes the establishment of permanent conservation easements along creek corridors and restrictions on the development of upland tiger salamander habitat.

The HCP would prohibit the development of tiger salamander habitat and would place permanent conservation easements over a portion of the most biologically sensitive Zone 1 lands in the San Francisquito/Los Trancos Creek Basin (Figure 3-2) and the Matadero/Deer Creek Basin (Figure 3-3). These easements would generally preclude any new development. Because these lands are adjacent to the creeks their development potential is already limited by local zoning that protects riparian corridors. For example, the Special Conservation Area in Santa Clara County covers portions of Zone 1 lands along Los Trancos, San Francisquito, Matadero and Deer creeks and portions of the CTS Reserve. This designation generally prohibits development. The conservation easements would not change existing land use, and would be consistent with the Special Conservation Area designation.

The area designated in the HCP as the CTS Reserve is designated by the County of Santa Clara in the Stanford Community Plan as a Special Conservation Area, and the surrounding area is Open Space/Field Research. Stanford's restriction of development in this area during the life of the HCP and recording permanent easements in the CTS Reserve would not conflict with existing General Plans or Stanford Community Plan designations.

Areas in Santa Clara County adjacent to the proposed conservation easements for Zone 1 are designated as Open Space and Field Research. Expansion of the easement areas, which could occur under the HCP, would not conflict with this land use designation. Conservation Program activities which primarily promote habitat restoration are also compatible with the land use designation.

In addition to the conservation easements, Section 4.2 of the HCP includes a number of measures that would minimize potentially adverse effects of the Covered Activities in Zones 1 and 2 and sometimes in Zone 3. These measures restrict or condition activities allowed in the Management Zones, but do not modify the land use designations. These minimization measures guide activities pertaining to the land use, but do not change the underlying use.

The minimization measures would regulate the Covered Activities when they occur in certain Management Zones. None of the measures change existing land uses or affect the applicable General Plan designations or zoning. Restrictions set by the HCP reflect the protection of sensitive species, and similar restrictions would apply to the land regardless of the HCP/ITPs. Thus, the implementation of the HCP would not adversely affect land use.

Ongoing Stanford Operations. Ongoing operation of Stanford, including maintenance, academic activities, recreation, athletics, residential, agricultural, equestrian, commercial and institutional land uses are already established land uses that would not be changed by the Proposed Action, and would therefore not adversely affect land use.

Future Development. Stanford anticipates future development that is included in the existing GUP and other development that could also reasonably occur within the 50-year term of the HCP/ITPs. Future development is anticipated to include academic and residential uses. There are lands available with the appropriate land use designation for these uses.

If in the future Stanford proposes a development that is not consistent with the local land use designations or zoning, the proposed development would require a general plan amendment and a change in zoning. If a General Plan amendment or zoning amendment were denied, the future development would not be permitted. Thus, any future development would have to be consistent with the applicable General Plan designation and zoning before it is approved. Hence, any future development would be consistent with the applicable land use designation and zoning, and would not have an adverse effect on land use.

5.1.9.2 Effects of the No Action Alternative

Under the No Action alternative, the proposed ITPs would not be issued and the HCP would not be implemented along with a comprehensive Conservation Program. Activities at Stanford that result in take of federally listed species (red-legged frog, tiger salamander, garter snake, or steelhead), would require take authorization issued on a project-by-project basis.

Conservation Program. Under this alternative, activities in Zones 1 and 2 that require a permit are assumed to also require minimization measures similar to those defined in the HCP for Zones 1 and 2. Several components of the HCP's Conservation Program would not occur under this alternative unless they were included in future individual projects to reduce or prevent incidental take of the listed species. Future development in Zones 1 and 2 would also be subject to mitigation, such as dedication of conservation easements, to offset permanent losses of habitat in Zones 1 and 2. The extent of conservation activities would likely be less than that in the proposed HCP, in keeping with the level of project-specific impact. With regard to land use, this means that less area would likely be placed under permanent conservation easements, so there would be less area subject to the additional land use restriction of a conservation easement than

under the Proposed Action. Otherwise, the No Action alternative would have the same effects as the Proposed Action, and there would not be an adverse effect on land use.

Ongoing Stanford Operations. Under the No Action alternative, Stanford would continue to operate. The effect on land use under the No Action alternative resulting from ongoing activities would be the same as the Proposed Action, and there would not be an adverse effect on land use.

Future Development. Future development is anticipated to include academic and residential uses. Land with the appropriate land use designation for these uses is available for development. If in the future Stanford proposes a development that is not consistent with the local land use designations or zoning, the proposed development would require a General Plan amendment and a change in zoning. If a General Plan amendment or zoning amendment were denied, the future development would not be permitted. Thus, any future development would have to be consistent with the applicable General Plan designation and zoning before it is approved. Hence, any future development would be consistent with the applicable land use designation and zoning, and would not have an adverse effect on land use. This is the same under each of the alternatives, so the effects of the No Action alternative on future development are the same as the Proposed Action, and would not cause an adverse effect on land use.

5.1.9.3 Effects of the HCP for CTS Only Alternative

Under this alternative, the HCP area would be geographically limited to the CTS Basin, which includes the area around Lagunita (90 acres) and the CTS Reserve in the foothills south of JSB (315 acres). Stanford activities that would result in the take of listed species other than tiger salamander would require project-specific incidental take permits.

Conservation Program. The conservation program under this alternative would be limited to activities outlined in the Central Campus CTS Management Plan and the CTS Reserve Monitoring and Management Plan, which are summarized in Section 3, Proposed Action and Alternatives, and detailed in HCP Section 4 (Appendix B). These activities would not conflict with the future land uses that are reflected in Santa Clara County's current General Plan designations and zoning. Areas of tiger salamander habitat are designated by Santa Clara County as Campus Open Space and Special Conservation Areas. The HCP for CTS Only conservation program would prohibit residential, commercial, and land altering academic land uses in the CTS Reserve. These restrictions on future development would not conflict with the applicable land use designations or zoning, and would not cause adverse land use effects.

Under this alternative, projects that affect red-legged frog, garter snake, or steelhead would obtain separate take authorization. Such authorization could require conservation actions similar to those proposed in the HCP, but would likely be more limited in scope than the Proposed Action, in keeping with the scale of the specific project. It is likely that less area would be placed under permanent conservation easements, so there would be less area subject to the additional land use restriction of a conservation easement than under the Proposed Action. Otherwise, the HCP for CTS Only alternative would have the same effects as the Proposed Action on land use.

Ongoing Stanford Operations. Under this alternative, Stanford would continue to operate. This is the same for each of the alternatives. Continued operations do not require changes in land use, therefore the HCP for CTS Only alternative would have the same effects as the Proposed Action, and there would not be an adverse effect on land use.

Future Development. Future development would be subject to the General Plans and zoning regulations of the six jurisdictions that regulate Stanford's land uses. Any new development that

has not already been permitted by the GUP would require project review for compliance with the applicable General Plans and zoning regulations. The effects of the ongoing operation of Stanford and from future development would be the same as described for the Proposed Action.

5.1.9.4 Comparison of Alternatives

The Proposed Action or the alternatives would not result in significant adverse effects to land use. Land use is governed by local General Plans and zoning ordinances, and any future changes in land use would comply with those or would require approval for a change in land use designation. The Proposed Action or alternatives do not significantly differ in effects on land use.

5.2 BIOLOGICAL ENVIRONMENT

This section of the EIS analyzes the potential effects of the Proposed Action and alternatives on biological resources. The analysis addresses the effects of implementing the Conservation Program, of ongoing operations and maintenance, and of future development on biological resources. The analysis identifies the potential effects on plant communities, the Covered Species, non-listed plant and animal special-status species that are likely to be present and on biological resources in general. The effects on biological resources were evaluated both qualitatively and quantitatively, including potential effects on species' populations, long-term survival, and the quality and quantity of habitat. The analysis is based on a review of biological resources information for the affected environment (Section 4), analysis provided in the HCP, including the HCP's quantitative analysis of take, and professional judgment.

The issuance of ITPs is a Federal action subject to the requirements of section 7 of the ESA. NMFS and FWS have conducted internal section 7 consultations on the effects of the Stanford HCP's Covered Activities and Conservation Program on ESA-listed species and designated critical habitat. NMFS issued a biological opinion on October 19, 2012 which addresses the potential effects of the action on CCC steelhead and designated critical habitat. USFWS has prepared a draft biological opinion which addresses the effects of the proposed action on California tiger salamander, California red-legged frog, and San Francisco garter snake. The USFWS will finalize the draft biological opinion prior to the issuance of their ROD. The analysis presented below conforms with the NMFS biological opinion of (October 19, 2012) and the USFWS' draft biological opinion.

5.2.1 Effects of the Proposed Action Alternative

The Proposed Action is described in Section 3, Proposed Action and Alternatives. It is the issuance of ITPs and the implementation of a Conservation Program that is intended to meet the following biological goals stated in Section 1 of the HCP (Appendix B):

- Maintain and enhance natural communities so that they benefit the Covered Species;
- Stabilize the local tiger salamander population and increase its chance of long-term persistence at Stanford;
- Maintain ponds to promote tiger salamander reproduction in the Foothills;
- Increase the local red-legged frog population and its chance of long-term persistence at Stanford;
- Maintain or improve hydrologic and terrestrial conditions that presently support steelhead and increase the chance of long-term persistence for the local steelhead population;

- Maintain and improve habitat for pond turtle to increase its chance of long-term persistence at Stanford;
- Maintain or improve habitat that could support the San Francisco garter snake and continue to contribute to the body of information about garter snakes at Stanford.

5.2.1.1 Conservation Program

Plant Communities. Conservation Program activities under the San Francisquito/Los Trancos Easement Monitoring and Management Plan, Matadero/Deer Easement Monitoring and Management Plan, CTS Reserve Monitoring and Management Plan and Central Campus CTS Management Plan would occur in Zones 1 and 2, where they could affect riparian, oak woodland, and grassland plant communities, however, none of the effects would be adverse, and most would be beneficial effects. In addition, the proposed conservation easements would permanently protect and provide management for the riparian zones and could provide permanent protection and management of grassland habitat south of JSB in the CTS Reserve.

Some native vegetation could be removed during non-native plant species removal, enhancement projects, or creek bank stabilization activities, however, the amount of native vegetation removed is expected to be minor as the Conservation Program is intended to protect and retain native vegetation. This non-native plant removal could permanently reduce the amount of non-native plant species and provide the opportunity to restore native plant species so that there could be a net increase in native plant cover. For example non-native Scotch broom shrubs removed along the creeks could be replaced with native shrub vegetation, such as willows. Enhancement and bank stabilization completed under the Conservation Program could result in a small amount of native plant removal. However, no significant changes in vegetation type would occur as a result of the Monitoring and Management Plans. No jurisdictional wetlands would be affected by the Conservation Program because the activities would not remove or fill existing wetlands. Temporary effects on waters of the U.S. (e.g., increased turbidity) may occur during bank stabilization work.

The creation of new tiger salamander breeding ponds as part of the CTS Reserve Monitoring and Management Plan would not affect native grasslands because the CTS Reserve does not contain native grasslands; however, it may convert a small amount of non-native grassland to wetland habitat. This would not result in a significant adverse effect on the vegetation community.

Covered Species. The implementation of the Management and Monitoring Plans in the HCP's Conservation Program could result in the take, or impacts to, some of the Covered Species and could temporarily disturb some of their habitat, but the long-term effects would be minor (Table 5-3). The Conservation Program is a comprehensive program that would have an overall benefit to the Covered Species. The following activities under the Conservation Program could result in take of the Covered Species. For example:

- Monitoring activities, including the use of electrofishing, block netting, hand nets, funnel/fyke traps or rotary screw traps, minnow traps, turtle traps, snorkeling, hand capture, walking in the habitat, dipnets, metering equipment, trapping and visual methods. Monitoring could harm or harass the Covered Species and temporarily disturb their habitat and some of these activities could kill a small number of individual steelhead, red-legged frogs, tiger salamanders, or pond turtles.
- Mowing to improve habitat. Mowing may harass or harm grassland species that are present during the mowing, but the timing is controlled to minimize the likelihood that a

species is present during mowing. In addition, the mower height is adjusted such that animals will not be caught up in the mower if they are present (see below).

- Constructing new breeding ponds. Construction activities could kill, harm or harass a small number of tiger salamanders or red-legged frogs that are not detected in underground burrows and relocated prior to construction.
- Relocating salvaged individuals from urbanized areas to suitable habitat. Relocating salvaged tiger salamanders, red-legged frogs, or pond turtles would require capture of individuals (harassment) and could result in the harm or death of individual frogs, pond turtles, or salamanders.
- Surveys for non-native species. These activities may disrupt breeding or foraging behavior of a small number of Covered Species.
- Removal of in-stream barriers. This activity could kill a small number of individual steelhead when equipment is in the stream or when the stream is dewatered. Likewise relocating steelhead prior to dewatering could harm, harass, or kill individual steelhead, and dewatering would temporarily impact steelhead as a result of habitat disturbance.
- Revegetation and stabilization of stream banks for erosion control or to improve shade. This activity could kill or disrupt breeding or foraging behavior of a small number of steelhead or red-legged frogs when equipment is in the creek and riparian zone.

The effects of these activities, which are described above, are generally temporary, and would not adversely affect the species' long-term persistence (Table 5-3). Moreover the effects would be minimized by:

- Combining surveys for Covered Species to reduce the amount of time spent in the habitat.
- Mowing during the dry season and during the time of day when tiger salamander and garter snake are least likely to be present.
- Oversight by the Conservation Program Manager.
- Conducting night surveys for red-legged frog every two years rather than annually.
- Electrofishing would only be used in reaches not historically occupied by red-legged frog, and would be done in accordance with NMFS guidelines (NMFS 2000).
- Conducting pre-activity surveys and relocating individuals in harm's way.

Although implementation of some Conservation Program actions would result in the incidental take of Covered Species, the Conservation Program is designed to provide a long-term benefit to Covered Species and enhance natural habitat functions on Stanford's lands. For example, removal of the existing barrier to steelhead passage at the non-operating Lagunita Diversion could temporarily disturb steelhead during construction activities, but improved passage would provide a long-term benefit to steelhead migration, which could increase spawning opportunities and reproductive success. Similarly, constructing new tiger salamander breeding ponds in the foothills could temporarily disturb upland tiger salamander habitat, but providing additional breeding opportunities in the foothills could reduce the importance of Lagunita (which is hazardous for tiger salamanders to reach because of JSB), and increase the likelihood of the persistence of the tiger salamander population at Stanford. Estimates of incidental take of

Covered Species associated with construction of habitat enhancements and fish passage improvements are presented in Section 5.2.1.2, Ongoing Stanford Operations.

Similarly, the HCP's monitoring program would result in the take of Covered Species, but monitoring would provide important data on the success of the Conservation Program, whether adaptive management is needed to improve the Conservation Program, and contribute to the general body of scientific knowledge about the species. For steelhead, the proposed monitoring program includes surveys of no less than 10 percent of available habitat on Stanford's lands three times a year by electrofishing, snorkeling, and walking surveys. The HCP also includes a pilot program of downstream migrant trapping for steelhead smolts over a period of 5 years at 4 days per week. Based on the results of experienced fishery biologists, juvenile steelhead mortality rates are expected to range from 1 to 3 percent during electrofishing and downstream trapping by the HCP's monitoring program. Stanford estimates the annual electrofishing will capture a maximum of 2,000 juvenile steelhead. With mortality rates ranging from 1 to 3 percent, an estimated 20 to 60 juvenile steelhead may killed during the annual electrofishing surveys (Table 5-4). For downstream migrant trapping, Stanford estimates up to 1,000 steelhead smolts may be captured. Based on a 1 to 3 percent rate of mortality, an estimated 10 to 30 additional juvenile steelhead may be lost to incidental mortality during the downstream migrant trapping program (Table 5-4). The number of fish estimated to be caught annually during monitoring is based on the observed maximum steelhead densities in San Francisquito and Los Trancos creek over the past decade. Appendix G summarizes the available information on steelhead collections and observations in the San Francisquito Creek Watershed. Steelhead densities in San Francisquito and Los Trancos creeks generally vary between 0 and 20 fish per 100 linear feet of stream. In years that the steelhead population level is high, the monitoring program is expected to collect higher numbers of fish (20 fish per 100 linear feet of stream). In years that the population is low, fish collections and the associated number of mortalities would be lower (as low as 0 fish per 100 linear feet of stream). The number of steelhead that may be collected and/or incidentally killed that is listed in Table 5-4 is based on researchers encountering high numbers of fish (20 fish per 100 feet) during monitoring, and the actual number of steelhead that may be collected or incidentally killed during monitoring will like be less in most years. General handling of juvenile steelhead collected by electrofishing and trapping is expected to result in stress, injury and mortality. The effects of stress are generally short-lived and full recovery is anticipated within a few hours of release. Based on other steelhead monitoring efforts with similar sampling methods, injury and mortalities associated with the proposed monitoring program are anticipated to be less than 3 percent of the steelhead that are collected by electrofishing and smolt trapping. Electrofishing and smolt trapping activities would not be undertaken when adult steelhead or redds are present in San Francisquito or Los Trancos creeks. Therefore, no effects will occur to adult steelhead, eggs or larval fish as a result of electrofishing or trapping. Due to the small number of individual juvenile steelhead lost during monitoring activities and the relatively large number of juveniles produced by each spawning pair, the steelhead population in the San Francisquito Creek watershed is anticipated to be able to replace any juveniles lost during monitoring and be able to take advantage of the habitat improvements expected from implementation of the Conservation Program. In the long run, the proposed monitoring program would provide valuable data that are currently lacking from the San Francisquito watershed. This information will be used to monitor trends in the population abundance, evaluate the effectiveness of the HCP's conservation actions, and adaptively manage Stanford's activities to reduce impacts and benefit the natural environment.

Table 5-3. Effects of Implementation of the Monitoring and Management Plans on Covered Species

Activity	Net Effect
1.0 San Francisquito/Los Trancos Easement Monitoring and Management Plan[15]	
1.1 Surveys for steelhead, red-legged frogs, garter snakes and pond turtles and of their habitat, will be conducted in accordance with the monitoring program set forth in Section 4.6 for the term of the HCP.	1.1 Beneficial effect on steelhead, red-legged frogs, garter snakes and pond turtles. Surveys may harass steelhead, red-legged frogs, pond turtles, and garter snakes but would result in data that could improve species and habitat management. No effect on tiger salamanders.
1.2 If the monitoring program shows the presence of non-native animal species that could adversely affect Covered Species within the Easement area, the non-natives will be removed to the extent that Stanford can feasibly remove or control them. Before trapping is used to remove the non-natives in areas where Covered Species may occur, Stanford will submit a plan to the Services for approval.	1.2 Beneficial effect. Removal of non-native species that are adversely affecting the Covered Species would benefit Covered Species and other more common plants and animals. Dip-netting, trapping, or other invasive methods could harm or harass a small number of steelhead, red-legged frogs, pond turtles, or garter snakes, but would help to monitor and control competing, predator and habitat-damaging species.
1.3 If the monitoring program results show that non-native plant species could adversely affect Covered Species or their habitat within the Easement area, the non-natives will be removed, to the extent Stanford can feasibly remove or control them.	1.3 Beneficial effect. Could benefit Covered Species by fostering habitat diversity.
1.4 If steelhead surveys or habitat assessments identify sediment entering the creek from a point source, Stanford will try to identify the source of the sediment. If the sediment source is located on Stanford's lands, Stanford will notify the Services, and remediate the situation. If the sediment source is located off Stanford's lands, Stanford will notify the Services.	1.4 Beneficial effect on steelhead, red-legged frogs, pond turtles and garter snakes by improving water quality and on steelhead by reducing sediment impacts on spawning and rearing habitat. No effect on tiger salamanders.
1.5 If steelhead surveys or other information find that steelhead would benefit from a habitat enhancement such as the addition of woody debris and it can be done without increasing the potential for flooding, Stanford will place large woody debris into the creeks, anchored in place.	1.5 Beneficial effect. This action would be specifically designed to benefit steelhead by enhancing its habitat.
1.6 If creek surveys find that pond turtles would benefit from the addition of natural basking platforms, Stanford will place anchored platforms, if it can be done without increasing the potential for flooding.	1.6 Beneficial effect on pond turtles by enhancing its habitat. No effect on steelhead or tiger salamanders.
1.7 If surveys find that pond turtles would benefit from the addition of natural basking platforms, Stanford will place three anchored or artificial platforms each in Searsville Reservoir, Felt Reservoir and Skippers Pond.	1.7 Beneficial effect. This enhancement is specifically designed to benefit pond turtles.

[15] The implementation of the San Francisquito/Los Trancos Monitoring and Management Plan will not affect tiger salamanders.

Table 5-3. Effects of Implementation of the Monitoring and Management Plans on Covered Species

Activity	Net Effect
1.8 Maintain the three existing water quality monitoring stations located in Los Trancos, Bear, and San Francisquito creeks for the first five years of the ITP term and review the resulting data for its value in conservation efforts. If the stations produce data that are useful to conservation planning, operation of the monitoring stations will continue beyond five years. Stanford will ensure that one stream flow gaging station on San Francisquito Creek and one on Los Trancos Creek are operational year-round and that the daily flow data are made available to NMFS.	1.8 Beneficial effect. Water quality data could provide useful scientific information for management of steelhead, red-legged frogs, pond turtles, and garter snakes. Maintenance of the stations requires little incursion into the creek, but could harass a small number of steelhead, red-legged frogs, pond turtles, and garter snakes. Sharing of data would assist regional conservation efforts.
1.9 If water quality monitoring data are found to be valuable in conservation efforts, Stanford will perform a study on the feasibility of expanding the network of water monitoring stations in San Francisquito Creek and Los Trancos Creek, and will expand the network of water monitoring stations if feasible.	1.9 Beneficial effect. Would provide more data to inform management decisions that could affect steelhead, red-legged frog, pond turtle, and garter snake habitat. Expansion and maintenance of network may require short-term incursion into creek that could harass a small number of steelhead, red-legged frogs, pond turtles, and garter snakes.
1.10 Stanford will identify at least two areas where two new, off-channel red-legged frog breeding ponds may be constructed. Stanford will provide a specific design proposal to USFWS.	1.10 Beneficial effect. This enhancement is specifically designed to benefit red-legged frogs, and could provide habitat for pond turtles and tiger salamanders.
1.11 Stanford will remove undesirable items, such as trash, from the creeks.	1.11 Beneficial effect, although trash removal may have temporary water quality impacts over the long-term it could reduce the impacts of water pollution on the Covered Species.
1.12 Stanford will initiate stabilization efforts along stream banks and adjacent upland areas that are subject to erosion (use of bioengineered designs will be strongly encouraged), and create a pilot program on stream bank protection that could be used as a community resource.	1.12 Beneficial effect. Would reduce sediment load into creeks that adversely affects habitat for steelhead and red-legged frogs by causing turbidity. Work along the creek banks could temporarily harm or harass a small number of steelhead, red-legged frogs, pond turtles, or garter snakes.
1.13 Revegetate stream banks and adjacent upland areas that are subject to erosion.	1.13 Beneficial effect. Revegetation would improve streamside habitat for red-legged frogs, pond turtles, and garter snakes and maintain shade needed by steelhead. Revegetation activities could have short-term impacts on a small number of red-legged frogs, pond turtles, garter snakes and steelhead due to encroachment into habitat and possible take of red-legged frogs, pond turtles, and garter snakes.
1.14 Remove structures such as riprap and gabions, and in-stream structures that are impeding fish passage when feasible.	1.14 Beneficial effect. Would improve in-stream migration for steelhead, red-legged frogs, pond turtles, and garter snakes. Could temporarily harm or harass a small number of steelhead, red-legged frogs, pond turtles, and garter snakes, however the work would be monitored and take minimization measures used.

Table 5-3. Effects of Implementation of the Monitoring and Management Plans on Covered Species

Activity	Net Effect
1.15 Erect fences in the areas that the Conservation Program Manager determines they are needed to keep livestock and unauthorized persons out of the Easement.	1.15 Beneficial effect. Would protect riparian areas and water quality from the long-term effects of intruding cattle and humans that could harm or harass steelhead, red-legged frogs, pond turtles, or garter snakes. Fence installation could harm or harass a small number of red-legged frogs, pond turtles or garter snakes, but this would be short-term.
1.16 No new permanent structures may be erected on lands covered by the San Francisquito/Los Trancos Easement unless the structures are for the benefit of the Covered Species, are necessary for safety reasons, or are part of Stanford's existing water diversion system. The Conservation Program Manager will be consulted before any permanent structures are erected, and such structures will be designed to minimize or avoid impacts to the Covered Species.	1.16 Beneficial effect. Limiting development and minimizing the permanent loss of riparian habitat would benefit steelhead, red-legged frogs, pond turtles, and garter snakes.
1.17 Any new conservation easements within the San Francisquito/Los Trancos Creek Basin will be subject to the San Francisquito/Los Trancos Easement Monitoring and Management Plan. Stanford will consult with the Services before recording any new conservation easements within the basin.	1.17 Beneficial effect. This measure assures that all conservation easements that could affect steelhead, red-legged frogs, pond turtles and garter snakes are managed in a consistent way to benefit the Covered Species. No effect on tiger salamanders.
1.18 Five years before the expiration the ITPs, Stanford will prepare a long-term monitoring and management plan that incorporates management and monitoring techniques that have been demonstrated to be the most successful. This plan will survive the expiration of the ITPs and will be subject to review and approval by the Services.	1.18 Beneficial effect. Ensures that valid conservation practices would be carried out in perpetuity.
2.0 Matadero/Deer Easement Monitoring and Management Plan[16]	
2.1 Surveys for red-legged frogs and garter snakes their habitat will be conducted in accordance with the monitoring plan set forth in Section 4.6 of the HCP for the term of the ITP.	2.1 Beneficial effect. Surveys may harass red-legged frogs and garter snakes but would result in data that could improve species and habitat management.
2.2 If the monitoring program shows the presence of non-native animal species that could adversely affect Covered Species within the Easement area, the non-natives will be removed to the extent that Stanford can feasibly remove or control them.	2.2 Beneficial effect. Removal of non-native species that are adversely affecting the Covered Species would benefit both the Covered Species and other more common plants and animals. Dip-netting, trapping, or other invasive methods could harm or harass a small number of red-legged frogs or garter snakes, but would help to monitor and control competing, predator and habitat-damaging species.

[16] The implementation of the Matadero/Deer Easement Monitoring and Management Plan will not affect tiger salamanders.

Table 5-3. Effects of Implementation of the Monitoring and Management Plans on Covered Species

Activity	Net Effect
2.3 If the monitoring program results show that non-native plant species could adversely affect Covered Species or their habitat within the Easement area, the non-natives will be removed, to the extent that Stanford can feasibly remove or control them.	2.3 Beneficial effect. Could benefit red-legged frogs and garter snakes by fostering habitat diversity. No effect on tiger salamanders, pond turtles or steelhead.
2.4 Stanford will identify at least one area where two new, off-channel red-legged frog breeding ponds may be constructed. Stanford will provide a specific design proposal to USFWS.	2.4 Beneficial effect. This enhancement is specifically designed to benefit red-legged frog, and could provide habitat for pond turtle and tiger salamanders.
2.5 Stanford will initiate revegetation efforts along stream banks and adjacent upland areas that are subject to erosion.	2.5 Beneficial effect. Revegetation would improve streamside habitat for red-legged frogs, pond turtles, and garter snakes. Revegetation activities could result in short-term impacts on a small number of red-legged frogs, pond turtles, garter snakes due to encroachment into habitat and possible take of red-legged frogs, pond turtles, and garter snakes by impacting nesting or harboring sites. No effect on tiger salamanders or steelhead.
2.6 Erect fences in the areas where the Conservation Program Manager determines they are needed to keep livestock and unauthorized persons out of the Easement.	2.6 Beneficial effect. Would protect riparian areas from the long-term effects of intruding cattle and humans that could harm or harass red-legged frogs, pond turtles, or garter snakes. Fence installation could harm or harass a small number of red-legged frogs, pond turtles, or garter snakes, but this would be short-term.
2.7 Stabilize stream banks and adjacent upland areas that are subject to erosion (use of bioengineered designs will be strongly encouraged), and create a pilot program on streambank protection that could be used as a community resource.	2.7 Beneficial effect. Would reduce sediment load into creeks that adversely affects habitat for red-legged frog, pond turtle, and garter snake by causing turbidity. Work along the creek banks could harm or harass a small number of red-legged frogs, pond turtles, or garter snakes.
2.8 No new permanent structures may be erected on lands covered by the Matadero/Deer Easement unless the structures are for the benefit of the Covered Species or they are necessary for safety reasons. The Conservation Program Manager will be consulted before any permanent structures are erected, and such structures will be designed to minimize or avoid impacts to the Covered Species.	2.8 Beneficial effect. Limiting development and minimizing the permanent loss of riparian habitat would benefit red-legged frogs, pond turtles, and garter snakes.
2.9 Any new conservation easements within the Matadero/Deer Creek Basin will be subject to the Matadero/Deer Easement Monitoring and Management Plan. Stanford will consult with the Services before recording any new conservation easements within the basin.	2.9 Beneficial effect. This measure assures that the conservation easements that could affect the Covered Species are managed in a consistent way to benefit the Covered Species.
2.10 Five years before the expiration of the HCP and associated ITPs, Stanford will prepare a long-term monitoring and management plan that incorporates management and monitoring techniques that have been demonstrated to be the most successful. This plan will	2.10 Beneficial effect. Ensures valid conservation practices would be carried out in perpetuity.

Table 5-3. Effects of Implementation of the Monitoring and Management Plans on Covered Species

Activity	Net Effect
survive the expiration of the ITPs and HCP and will be subject to review and approval by the Services.	
3.0 CTS Reserve Monitoring and Management Plan [17]	
3.1 Annual tiger salamander and garter snake surveys in accordance with the monitoring program set forth in section 4.6 of the HCP.	3.1 Beneficial effect. Minnow traps could harass or harm tiger salamanders, and trapping (if implemented) could harass or harm garter snakes but would provide scientific data and inform management decisions.
3.2 If monitoring shows that non-native wildlife species are adversely affecting Covered Species, such as through direct kill or reduction of habitat suitability, the non-natives will be removed, as allowed by law and to the extent Stanford can feasibly remove or control them.	3.2 Beneficial effect. Removal of non-native species that are adversely affecting the Covered Species would benefit both the Covered Species and other more common plants and animals.
3.3 If monitoring shows that non-native plant species could adversely affect Covered Species or their habitat within the Reserve area, the non-natives will be removed, to the extent that Stanford can feasibly remove or control them.	3.3 Beneficial effect. Could benefit the Covered Species by fostering habitat diversity.
3.4 If the seasonal ponds are found to not facilitate tiger salamander breeding, the pond(s) will be modified or eliminated. Stanford will consult with the USFWS regarding any proposed pond modifications.	3.4 Beneficial effect. Would ensure that breeding ponds are facilitating breeding and are not creating population sinks.
3.5 If there are 3 consecutive years of inadequate rainfall to sustain larval development of tiger salamanders in the breeding ponds, Stanford will consult with the USFWS regarding ways to provide supplemental water to the constructed breeding ponds.	3.5 Beneficial effect. If supplemental water is provided as needed during a drought, breeding success is more likely, and the population may be sustained through a prolonged drought.
3.6 If surveys indicated that tiger salamanders would benefit from the addition of cover or egg-laying substrate in the created ponds, Stanford will place suitable material in the ponds.	3.6 Beneficial effect. Could increase population size by improving breeding success and providing cover that could protect tiger salamanders from predators.
3.7 Stanford will enhance dispersal for tiger salamanders and garter snakes by mowing or grazing up to 2 acres of grassland adjacent to each of the newly created tiger salamander breeding ponds annually during the summer. Mowing will be done when salamanders are least likely to be present, either in the morning when it is still cool or during the hottest part of the day.	3.7 Beneficial effect. Reducing the vegetation height would facilitate the dispersal of tiger salamanders and garter snakes. Would be completed when tiger salamanders and garter snakes are underground or water and would not be directly harmed.
3.8 If tiger salamander surveys find that tiger salamanders would benefit from additional burrows, Stanford will enhance upland habitat adjacent to the newly created breeding ponds by creating cover piles to attract ground squirrels. Cover piles will typically be made of natural	3.8 Beneficial effect of enhancing habitat for tiger salamanders and garter snakes. Physical manipulation of tiger salamander habitat, if required to study methods, has the remote possibility of harming tiger salamanders, but

[17] The implementation of the CTS Reserve Monitoring and Management Plan will not affect red-legged frogs, steelhead, or pond turtles.

Table 5-3. Effects of Implementation of the Monitoring and Management Plans on Covered Species

Activity	Net Effect
materials and will be up to 60 square feet in size and 4 feet deep. They will be located within 150 feet of the newly created breeding ponds and will be created during the dry season, between June and September.	would be done seasonally, when tiger salamanders are underground. Could also disturb garter snakes. No effect on red-legged frogs, pond turtles or steelhead.
3.9 Stanford will maintain oak woodland and savannah grasslands within 150 feet of the newly created breeding pond, and will minimize presence of chaparral grassland species in this area.	3.9 Beneficial to tiger salamanders. Maintains tiger salamander upland habitat. May facilitate dispersal of tiger salamanders and garter snakes.
3.10 Stanford will maintain at least three amphibian tunnels across JSB. If annual monitoring shows that additional tunnels would benefit dispersal of tiger salamanders, Stanford may install additional tunnels with USFWS concurrence.	3.10 Beneficial to tiger salamanders. Provides a safe route between upland habitat and the Lagunita breeding site. Unknown benefit to garter snakes, red-legged frogs, and pond turtles. No effect on steelhead.
3.11 Limit recreational access to existing service roads and restricted to daylight hours.	3.11 Beneficial effect. Would minimize human intrusion into tiger salamander habitat.
3.12 No dogs will be permitted in the CTS Reserve.	3.12 Beneficial effect. Would prevent impacts on tiger salamanders from dogs entering ponds.
3.13 The Conservation Program Manager will review any proposed academic uses within the CTS Reserve, and may impose conditions and restoration measures.	3.13 Beneficial effect. Would prevent adverse effects on tiger salamanders caused by academic uses.
3.14 Development, such as academic buildings, residential dwelling units, or commercial buildings, will be prohibited. Utilities and other general infrastructure improvements that would not adversely affect the tiger salamander habitat may be placed within the CTS Reserve. These improvements will be reviewed by the Conservation Program Manager, who may impose use conditions and restoration measures.	3.14 Beneficial effect. Would prevent adverse effects caused by loss of habitat to development or infrastructure.
3.15 A tiger salamander and garter snake education program will be developed by the Conservation Program Manager and presented to Stanford maintenance personnel and contractor personnel working in, or immediately adjacent to, the CTS Reserve.	3.15 Beneficial effect. Would increase worker awareness of tiger salamander and garter snake ecology and procedures if tiger salamanders or garter snakes are encountered.
3.16 All ground animal control programs will be discontinued in the CTS Reserve.	3.16 Beneficial effect. Lack of control of ground animals in Zone 1 would result in additional burrow habitat for tiger salamanders, garter snakes, and red-legged frogs. No effect on pond turtles or steelhead.
3.17 Vegetation management activities in the CTS Reserve will be conducted to achieve the goal of improving tiger salamander habitat.	3.17 Beneficial effect on tiger salamanders. Likely to also benefit garter snakes by facilitating dispersal. May benefit red-legged frogs. No effect on pond turtles or steelhead.
3.18 Prior to recording the first conservation easement within the CTS Reserve, Stanford will prepare a CTS Easement Monitoring and Management Plan that specifically describes (1) how suitable breeding habitat will be maintained, (2) measures to facilitate tiger salamander dispersal between preserved breeding and upland habitat,	3.18 Beneficial effect on tiger salamanders and garter snakes. Ensures that valid conservation practices would be carried out in perpetuity. Could also benefit red-legged frogs and pond turtles, if these species eventually occur in the CTS Reserve. No effect on steelhead.

Table 5-3. Effects of Implementation of the Monitoring and Management Plans on Covered Species

Activity	Net Effect
(3) measures to maintain a suitable number of ground squirrel burrows within preserved upland habitat areas, and (4) an adaptive management plan.	
3.19 Stanford will prepare a long-term monitoring and management plan for all habitats within the CTS Reserve that have been permanently preserved. It will include management and monitoring techniques that have proven protocols for monitoring tiger salamanders and garter snakes abundance and habitat quality, and an adaptive management provision. This plan will survive the expiration of the ITPs and will be subject to review and approval by the Services.	3.19 Beneficial effect on tiger salamanders and garter snakes. Ensures that valid conservation practices would be carried out in perpetuity. Could also benefit red-legged frogs and pond turtles, if these species eventually occur in the CTS Reserve. No effect on steelhead.
4.0 Central Campus CTS Management Plan[18]	
4.1 Surveys for California tiger salamanders and garter snakes and their habitat will be conducted in accordance with the monitoring program set forth in Section 4.6 of the HCP.	4.1 Beneficial effect. Minnow traps could harass or harm tiger salamanders, and trapping (if implemented) could harass or harm garter snakes but would provide scientific data and inform management decisions.
4.2 If monitoring shows that non-native species are adversely affecting Covered Species within the Central Campus CTS area, the non-natives will be removed to the extent that Stanford can feasibly remove or control them. Before trapping is used where it could affect Covered Species, Stanford will submit a plan to the USFWS for approval.	4.2 Beneficial effect on tiger salamanders and garter snakes, and on red-legged frogs if they occur in the Central Campus CTS area. Removal of non-native species that are adversely affecting the Covered Species would benefit both the Covered Species and other more common plants and animals. No effect on pond turtles or steelhead.
4.3 If monitoring shows that non-native plant species could adversely affect Covered Species or their habitat within the Reserve area, the non-natives will be removed, to the extent that Stanford can feasibly remove or control them.	4.3 Beneficial effect. Could benefit the Covered Species by fostering habitat diversity.
4.4 Lagunita will be operated consistent with the Lagunita operations plan which includes diverting water from San Francisquito Creek during years of substantial rains to provide aquatic habitat of suitable depth and duration for tiger salamanders to successfully breed.	4.4 Beneficial effect. Would provide management of water levels in important breeding habitat to benefit tiger salamanders. Balanced diversions would not adversely affect the habitat of the Covered Species in San Francisquito Creek.
4.5 No biocides will be applied to Lagunita for schistosome cercarial dermatitis ("swimmer's itch") without prior approval of the Conservation Program Manager.	4.5 Beneficial effect. Would prevent biocides from affecting tiger salamander reproduction. No effect on the other Covered Species.
4.6 The bed of Lagunita will be mowed to not less than 4 inches, instead of being disced, for fire protection in the summer after consultation with the Conservation Program Manager. Mowing will be done by the lightest vehicle	4.6 Beneficial effect. Mowing would occur when tiger salamanders are underground, safe from possible take, and when garter snakes are least likely to be present. Reducing the vegetation

[18] Except as specifically noted, the implementation of the Central Campus CTS Management Plan will not affect red-legged frogs, steelhead, or pond turtles.

Table 5-3. Effects of Implementation of the Monitoring and Management Plans on Covered Species	
Activity	**Net Effect**
capable of mowing the area and done either in the morning when it is still cool or during the hottest part of the day.	height would facilitate dispersal of tiger salamanders and garter snakes. The restriction on discing would reduce the chance of harm to tiger salamanders and garter snakes. Same beneficial effect on red-legged frogs if they occur at Lagunita. No effect on pond turtles or steelhead.
4.7 Ill-fitting utility box covers within 1500 feet of Lagunita will be retrofitted to exclude tiger salamanders.	4.7 Beneficial effect. Would prevent entrapment of tiger salamanders in utility boxes.
4.8 Prohibit off-road vehicles in Lagunita and the Conservation Program Manager will inspect Lagunita monthly to ensure compliance with the prohibition.	4.8 Beneficial effect. Would prevent take of tiger salamanders due to off-road vehicle use.

Table 5-4. Summary of Estimated Steelhead Take Associated with HCP Monitoring Program

Monitoring Activity	Method of Collection	Estimated # of Fish Collected (per year)	Estimated # of Incidental Mortality (per year)	Maximum Percent of Incidental Mortality (per year)
Annual Juvenile Surveys	Electrofishing	2,000	20-60	3 percent
Smolt Migrant Trapping	Funnel/fyke nets or screw traps	1,000	10-30	3 percent

Other Special-Status Species. The riparian Monitoring and Management Plans and the CTS Reserve Monitoring and Management Plan[19] include measures that could affect the Cooper's hawk, long-eared owl, yellow warbler, golden eagle, San Francisco dusky-footed woodrat, bats (long-eared myotis, Yuma myotis, and Townsend's big-eared bat), and the western leatherwood plant. Bank stabilization, restoration planting, and invasive species removal could temporarily reduce the amount of bird and bat habitat, and result in the removal of western leatherwood. It is estimated that 2 to 4 acres would be affected annually, and that the area would substantially recover from disturbance within a year.

Vegetation temporarily lost by bank stabilization measures could be replaced with native vegetation when the species are not nesting, so that nesting habitat is not lost. Similarly, invasive species removal and activities associated with revegetation, primarily in the riparian area, could result in the removal of woodrat houses, which would temporarily displace woodrats, but would not prevent them from building a new house or otherwise using the habitat. Likewise, there is sufficient potential bird and bat habitat available at Stanford that any loss of habitat resulting from the HCP's Conservation Program monitoring, management and enhancement

[19] The Central Campus CTS Management Plan would have no adverse effect on other special-status species.

activities would have a negligible effect on these species, primarily because it would be a temporary loss of a year or less.

Western leatherwood grows in foothill woodland and riparian forest, and exists at Jasper Ridge and on Los Trancos Creek upstream of Stanford-owned lands. Western leatherwood is expected to occur in suitable habitat in Zones 1 and 2 along the San Francisquito and Los Trancos creek corridors. Bank stabilization could result in the loss of individual stands of western leatherwood if it is located in or immediately adjacent to areas that require bank stabilization. Bank stabilization would require local permits and be subject to CEQA. If this plant is impacted by a specific bank stabilization project, mitigation to avoid or replace the western leatherwood would be required by local permits.

While the Conservation Program could have temporary adverse effects on other special-status species, the implementation of the Conservation Program would not result in permanent or long-term adverse effects on other special-status species because in the course of implementation, Stanford's Conservation Program would permanently preserve and improve the native habitat that supports these species. Thus, it is anticipated that the HCP's conservation activities would provide a long-term net benefit to other special-status species.

Other Biological Resources. The variety of plant communities within the Stanford HCP area provide suitable foraging, cover, and nesting habitat for a large number of common amphibians, reptiles, birds, and mammals. Many of these species are not specific to one vegetation community, especially for omnivorous and predacious species that utilize a variety of habitats.

The Conservation Program would establish conservation easements along San Francisquito/Los Trancos and Matadero/Deer creeks and the preserved habitat would be monitored and managed in perpetuity. The Conservation Program also encourages habitat enhancement actions that would benefit the local ecology. For example, mitigation credit can be earned for expanding riparian areas around the creeks by removing existing structures and planting riparian vegetation. Although there would be temporary construction impacts when the structures are removed, including re-grading the site and potentially removing native vegetation prior to re-planting, in the long-term such riparian restoration would benefit more species than just the Covered Species. Other enhancements, such as creating new off-channel red-legged frog breeding ponds, could result in the conversion of existing habitat into a new habitat type, depending on the selected location. For example, a patch of grassland might be excavated in order to build the pond, but the addition of the pond may enhance the habitat for other species by providing a new source of water and prey. The CTS Reserve Monitoring and Management Plan includes measures to maintain and enhance the tiger salamander breeding ponds, for example, which also benefits common wildlife that also uses the ponds. Areas within 150 feet of the ponds would be maintained in oak woodland and savannah grasslands, and chaparral plants would be removed. While this could reduce the overall amount of chaparral that could develop in the foothills, it also preserves oak woodland habitat that is important to plants and animals common to Stanford's lands.

5.2.1.2 Ongoing Stanford Operations

Plant Communities. Ongoing Stanford operations, including repairs, maintenance, and the construction of new infrastructure occur throughout Stanford in all habitat types. However, these activities would not remove or substantially affect a significant portion of native grassland, oak woodland, or riparian habitat because most of the infrastructure in undeveloped areas is located underground and its repair or maintenance only requires temporary disturbance of the ground. Moreover, under the HCP, areas that are temporarily disturbed by ongoing activities would be

restored in accordance with recommendations made by the Conservation Program Manager resulting in the permanent loss of very small areas of habitat.

Covered Species. Landscaping, vegetation management, utility repairs, agricultural activities, bank stabilization, golf course maintenance, academic field studies, water diversion, and other ongoing activities in Zones 1 and 2 could all affect the Covered Species, either by harming, harassing, or killing the species or temporarily removing their habitat. The impacts of the ongoing activities would be reduced by the HCP's minimization measures, which include preconstruction surveys, scheduling work outside of the breeding season, worker education, SHEP minimum bypass flow requirements, bioengineered bank stabilization structures, and habitat restoration for activities that temporarily disturb habitat areas (Section 4 of the HCP). As a result of these measures, the overall effect of Stanford operations on the Covered Species is significantly reduced. Estimated loss of habitat and estimated take of individuals from the ongoing Stanford operations and future development are provided in Tables 5-5 and 5-6, respectively.

Table 5-5. Summary of Estimated Loss of Habitat in Zones 1 and 2 for Ongoing Stanford Operations and Future Development

Covered Species	Annual estimated short-term habitat disruption	Total estimated short-term habitat disruption over 50-year permit term	Annual estimated permanent loss of habitat	Total estimated permanent loss of habitat over 50-year permit term
Steelhead	600 feet (maximum in one year)	30,000 feet	N/A[1]	N/A[1]
Red-legged frog	2.0 acres	100 acres	0.6 acres	30 acres
Tiger salamander	2.0 acres	100 acres	1.3 acres	68 acres
Garter snake	4.0 acres[2]	200 acres	1.9 acres	98 acres
Western pond turtle	1.6 acres	80 acres	0.3 acres	15 acres

[1] No permanent steelhead habitat loss is anticipated as a result of proposed Covered Activities. Habitat that is impacted by bank stabilization will continue to support some riparian vegetation, fish passage, juvenile rearing, and other habitat functions for steelhead.
[2] In addition, there would be approximately 75 acres of grassland that would be mowed each year for fire break and tiger salamander conservation purposes

Table 5-6. Summary of Estimated Incidental Take of Covered Species for Ongoing Stanford Operations and Future Development

Covered Species	Estimated annual population level[1]	Estimated annual incidental mortality (percent of population)	Estimated annual incidental mortality (individuals)[2]
Juvenile steelhead	1,500-9,000	0.04-0.26 percent	4
Red-legged frog	25-250	1-12 percent	3
Tiger salamander	400-4,000	1-5 percent	20
Garter snake	20-100	0 percent	0
Western pond turtle	10-40	0 percent	0

[1]Population estimates provided by Stanford based on studies conducted from 1992 to 2009.
[2]The number of individuals annually killed is dependent upon population level and shall not exceed the maximum percent of annual mortality that would be authorized by the ITPs.

California Tiger Salamander. Ongoing activities such as mowing, pipe repair, road maintenance, and other routine maintenance, would temporarily disturb an average of 2 acres of tiger salamander habitat each year, and could inadvertently harm, harass, or kill tiger salamanders (Table 5-5). Over the course of the 50-year permit term, up to 100 acres of tiger salamander habitat (about 10 percent) could be temporarily disturbed, but it would happen incrementally and would be restored following the disturbance. The Minimization Measures that require pre-activity surveys and prohibit non-emergency work during the breeding and migration season would substantially decrease the chance of incidental mortality of any tiger salamanders in the course of ongoing Covered Activities. Salamanders may be crushed or injured by earth-moving activities such as pipe repair and maintenance. The ongoing activities could result in the incidental mortality of up to 20 tiger salamanders per year, which is approximately 5 percent of the current tiger salamander population of 4,000 individuals (Table 5-6). The 20 individuals that might be lost annually represent a maximum incidental mortality rate of 5 percent and they are expected to be replaced as the local population remains stable or increases due to management actions under the HCP.

California Red-legged Frog. Agricultural activities, cattle grazing, academic field work, vegetation management, water diversion maintenance, and other ongoing Covered Activities in the riparian areas could disturb approximately 2 acres of red-legged frog habitat per year (Table 5-5). This disturbance could cause individual red-legged frogs to alter their behavior, which could temporarily increase the level of red-legged frog mortality. Ongoing activities also could inadvertently harm, harass, or kill red-legged frogs, although with the Minimization Measures that require pre-activity surveys and prohibit non-emergency work in the creeks or riparian areas during the breeding and migration season, fewer red-legged frogs would be directly impacted by these activities. The ongoing Covered Activities could result in the incidental mortality of 3 frogs per year, which would be up to 12 percent of the current red-legged frog population of 25 individuals (Table 5-6).

Steelhead. Maintenance and operation of Stanford's diversion facilities, bridge repairs, bank stabilization, and other instream Covered Activities, particularly those that require dewatering portions of the creeks, could temporarily disturb approximately 600 feet of the creek channels and adjacent riparian areas each year (Table 5-5). When dewatering is performed for instream

construction purposes, relocation of steelhead associated with these activities could harm, harass, or kill steelhead, even with the minimization measures. Based on information from other construction dewatering and fish relocation efforts in steelhead streams, injury and mortality of juvenile steelhead are anticipated to be less than 3 percent of the total number of steelhead encountered during dewatering activities. By limiting construction and dewatering activities to the period between June 15 and October 15, Stanford's ongoing operations and maintenance would avoid the migration seasons of steelhead adults and steelhead smolts. The HCP specifies that only qualified fisheries biologists with experience in handling steelhead would conduct fish relocation activities. Data on fish relocation efforts since 2004 show mortality rates are below 3 percent when performed by qualified fisheries biologists and the mean annual mortality rates are below 1 percent for steelhead (Collins 2004; CDFG 2005, 2006, 2007, 2008, 2009, 2010). Steelhead collected for ongoing maintenance activities that require dewatering are expected to experience a similar level of injury and mortality due to stress created by sampling gear and handling. Ongoing operations and maintenance activities could, therefore, result in the incidental mortality of up to 4 juvenile steelhead per year, which would represent 0.04 to 0.26 percent of the steelhead population (Table 5-6). The actual number of steelhead collected and relocated during dewatering events is expected to vary depending on the instream habitat characteristics of the project site and the current steelhead population level. The rate of mortality would not exceed 3 percent of the juvenile steelhead collected for stream dewatering and fish relocation. No adult steelhead are expected to be disturbed, captured, or killed by ongoing maintenance activities.

Stream bank stabilization projects conducted as part of ongoing Stanford operations and maintenance have the potential to temporarily and permanently degrade habitat conditions for steelhead along San Francisquito and Los Trancos creeks. Repair of eroding banks could temporarily disturb soils and the streambed. As discussed above, steelhead could be stressed and killed by fish collection and relocation activities if dewatering were required for construction purposes. If hardscape materials are used to stabilize the bank, riparian vegetation may be prevented from re-establishing the portion of bank covered with hardscape. The HCP specifies that Stanford would conduct bank stabilization projects with bioengineered structures that include no more than 50 percent hardscape materials. Bioengineering emphasizes the use of live plants and natural materials (e.g., wood and rock) as the basic components for bank stabilization. As such, willows, logs, and boulders would be used to protect and restore damaged stream banks. After about 3 to 4 years, this style of repair work generally becomes indistinguishable from the surrounding natural landscape and natural riparian habitat functions are restored. As a result of the use of bioengineered designs, the long-term effects of bank stabilization projects on steelhead and their habitat are expected to be insignificant. Stanford's proposed removal of accumulated sediments from the channel of Corte Madera Creek to prevent flooding in the vicinity of Family Farm Road will not affect steelhead due to its location upstream of the impassable barrier at Searsville Dam.

The habitat loss estimates for steelhead associated with bank stabilization activities presented in Table 5-5 differ from Stanford's HCP (HCP Table 5-2), because Stanford considered all riprap, rock, and other hardscape materials used for bank stabilization as a permanent habitat loss, even if the sites provide residual or future habitat value. While rock and other hardscape may prevent the re-establishment of riparian plants within the footprint of the hardscape material, Stanford is required to use a bioengineering approach and the overall site will continue to support some riparian vegetation, juvenile rearing, and other habitat functions for steelhead. Large rock used in bank stabilization projects would provide habitat value for steelhead through the creation of

instream cover and low water velocity refugia. Therefore, permanent habitat losses for steelhead are not expected from bank stabilization or any other ongoing Stanford operation and maintenance Covered Activity.

For the ongoing operation of Stanford's water diversions on Los Trancos Creek and San Francisquito Creek (Los Trancos Creek Diversion Facility and San Francisquito Creek Pump Station), incidental mortality was estimated by Stanford to be up to 20 juvenile steelhead annually. However, as described in the biological opinion issued by NMFS on April 21, 2008, for the SHEP (HCP Appendix A), upgrades to these facilities benefited steelhead and the ongoing operation of these facilities is not expected to injure or kill steelhead. Entrainment and impingement of steelhead fry and juveniles is unlikely to occur due to the new fish screens, which were designed in accordance to NMFS and CDFG standards. The new Los Trancos fishway was designed to provide adult and juvenile steelhead with full access to pass upstream under a wide range of flow conditions. Furthermore, the HCP adopts the SHEP's minimum bypass flow requirements which provide suitable stream flow conditions downstream of the water intakes whenever the diversion facilities are in operation. Bypass flows in both Los Trancos and San Francisquito creeks are expected to provide suitable conditions for adult steelhead upstream migration, spawning, egg incubation, fry and juvenile rearing, and downstream migration of smolts. For these reasons, ongoing water diversions on Los Trancos and San Francisquito creeks would not impair or harm steelhead and their habitat. Incidental mortality associated with routine maintenance at the Los Trancos Creek Diversion Facility and San Francisquito Creek Pump Station is included in the incidental take estimates associated with dewatering (discussed above). The operation and maintenance of Searsville Dam and Searsville Diversion are no longer included as Covered Activities in the HCP and no incidental take would be provided for these facilities in the proposed ITPs.

Western Pond Turtle. Maintenance of the Los Trancos Creek Diversion Facility and San Francisquito Creek Pump Station, bridge repairs, creek bank stabilization, and other instream activities could disturb approximately 1.6 acres of pond turtle habitat each year (Table 5-5). Only two pond turtles have been found at Stanford, and given the scarcity of the turtles, the ongoing Covered Activities should not come into direct contact with a turtle. Moreover, because of the turtle's scarcity at Stanford, the ITPs would not permit any incidental mortality because such take would be significant. Minimization measures that require pre-activity surveys and prohibit non-emergency work in the creeks or riparian areas during the breeding and migration season significantly reduce the chance of incidental mortality of pond turtle.

San Francisco Garter Snake. Ongoing ground maintenance activities, such as mowing and vegetation management, pipe repair, road maintenance, and other routine maintenance, would temporarily disturb an average of approximately 4 acres of potential garter snake habitat annually. In addition, about 75 acres of grassland are mowed each year for fire control and tiger salamander conservation purposes. Dry season mowing may harass any garter snake that happens to be present and the removal of grass cover may increase the likelihood of predation. Implementation of minimization measures such as time of day and height of mowing precludes the likelihood or incident of mortality of garter snakes.

Other Special-status Species. Habitat for the Cooper's hawk, long-eared owl, yellow warbler, golden eagle, San Francisco dusky-footed woodrat, bats (long-eared myotis, Yuma myotis, and Townsend's big-eared bat), and western leatherwood could be affected by some ongoing Stanford operations including academic research, infrastructure installation and maintenance, and vegetation management, even with the implementation of the minimization measures. For example, infrastructure installation and vegetation management could result in the removal of a

woodrat house, or could result in the removal of western leatherwood. The ongoing activities generally would not affect birds or bats that are protected during their nesting and roosting seasons by the MBTA, BGEPA (Bald and Golden Eagle Protection Act) and California wildlife laws. Continuation of the ongoing operations is not expected to reduce the local population of a wildlife special-status species or western leatherwood to a point that makes them eligible for listing under the Federal ESA or CESA because the minimization measures that are intended to reduce the amount of incidental take of the Covered Species would also prevent adverse effects on other special-status species.

Other Biological Resources. Landscaping, vegetation management, utility repairs and installation, road maintenance, agricultural activities, bank stabilization, golf course maintenance, academic field studies and other ongoing activities as well as maintenance of the water diversion facilities, bridge repairs, and other instream activities could affect other common wildlife species by removing vegetation or other habitat that is used for forage or nesting and potentially disrupting feeding or breeding behaviors that in turn cause a reduction in the population. For example, those activities that require dewatering portions of the creeks could temporarily disturb approximately 1.2 acres a year of the creek channels and adjacent riparian areas. This may disrupt local fish and amphibian movement and breeding success, or may reduce the amount of food available in the water habitat. Grounds-related work could destroy ground squirrel and other rodent burrows possibly killing any animals in the burrows, displace or kill lizards and snakes, and remove plants used by various insects. On occasion, grounds-related work could remove mature trees and shrubs used for nesting by various bird species.

In general, the minimization measures that are intended to reduce the amount of take of Covered Species, or that are standard requirements of wildlife agencies, such as active bird nest protections, would eliminate or minimize the effects of ongoing Covered Activities on other plants and animals common to Stanford's lands. In addition, the requirement to restore disturbed habitat with native plant species would replace habitat temporarily lost to construction activities.

5.2.1.3 Future Development

Plant Communities. The Covered Activities in the HCP include up to 30 acres of new development allowed under the current GUP generally located in the vicinity of Lagunita, and 50 to 150 acres of development in Management Zones 1, 2, and 3 beyond the GUP. Together, the GUP and additional future development would affect up to 180 acres of non-native grassland, oak woodland and riparian habitat. The specific location of the additional 50 to 150 acres of development is currently unknown because Stanford does not have any specific development plans beyond the GUP. Thus, it is only feasible to estimate the amount of impact for each habitat type.

Although the specific location of development is unknown, existing land use restrictions would affect where the development occurs (see the Land Use discussion in Section 4.1.9). For example, most of the riparian areas would be protected by easements under the Conservation Program, and local ordinances generally prohibit development in the riparian areas. Hence, the development likely would affect primarily non-native grassland or oak woodland habitat. While up to 15 acres of riparian habitat[20] could be affected if local ordinances change and all of the

[20] The ITPs will cover up to 30 acres of Zone 1 development, including GUP and beyond the GUP. The GUP development would affect 15 acres of non-riparian Zone 1 habitat, leaving 15 acres of Zone 1 that could be developed beyond the GUP and that could include riparian habitat.

anticipated Zone 1 development occurs in riparian areas, the HCP estimates that 7 acres of Zone 1 and 2 riparian habitat outside of the creek channels would be developed. The remaining acres of development would be in grassland or oak woodland. Although the exact location of future development beyond the GUP is not known, the HCP estimates the approximate amount of grassland, oak woodland, and riparian habitat that could be developed during the life of the HCP. These estimates are based on historical building patterns, infrastructure needs, and projected future Stanford needs. The amount of future development in each Zone is summarized in Table 3-1 (see Section 3). Future development could permanently impact 20 to 30 acres of the habitat in Zone 1; this zone contains most of the riparian habitat and some of the oak woodland and grassland habitat. In Zone 2, future development could permanently impact 25 to 45 acres of the habitat. This zone contains a smaller amount of riparian habitat and is mostly oak woodland. In Zone 3, future development could permanently impact 35 to 105 acres of habitat. Zone 3 contains some oak woodland and mostly grassland habitat. This is summarized in Table 5-7.

Table 5-7. Estimate of Permanent Impacts to Plant Communities

Zone	Plant Communities	Acres of Permanent Impact over 50 year permit term
1	Mostly riparian with some oak woodland and grassland	20 to 30
2	Mostly oak woodland with some riparian and some grassland	25 to 45
3	Mostly grassland with some oak woodland	35 to 105
Total		80 to 180

The 180 acres of potential development that would be subject to the ITPs and HCP represent a small fraction (0.04 percent) of the five thousand acres of grassland, oak woodland, and riparian habitat in Zones 1, 2, and 3. As such, the anticipated future development that would be subject to the HCP and associated ITPs would not remove or substantially modify a significant portion of habitat, including grassland, oak woodland, and riparian habitat; and therefore would not result in an adverse effect on the plant communities. Moreover, the permanent loss of Zone 1 and 2 habitat and land in Zone 3 would be mitigated through the HCP by permanently preserving higher quality riparian, oak woodland and grassland habitats. The set-aside ratios are 3-to-1 (3 acres preserved for each acre lost) for the permanent conversion of Management Zone 1 habitat, 2-to-1 for Zone 2, and 0.5-to-1 for Zone 3.

Covered Species. Permanent loss of habitat in Zones 1 and 2 is the primary effect that future development would have on the Covered Species. Before any construction activities begin, the HCP and ITPs require preconstruction surveys, the relocation of any Covered Species, placement of barriers to prevent Covered Species from re-entering a construction site, and worker education. It is, therefore, unlikely that future development would harm, harass, or kill any of

the Covered Species. However, on rare occasions, a Covered Species could be inadvertently crushed by equipment or work crews during the course of construction.[21]

Less than 1 percent of the habitat next to the creeks where steelhead occur would be developed. Approximately 1.6 percent (30 acres) of the total red-legged frog and garter snake habitat at Stanford would be developed. This includes the approximately 7 acres that overlap with steelhead riparian habitat, and grasslands that also provide habitat for tiger salamanders and garter snakes. Approximately 68 acres oak woodland and grassland habitat that could support tiger salamander in Zones 1 and 2 could be developed. This represents 0.2 percent and 9.9 percent respectively of tiger salamander habitat. Less than 1 percent (15 acres) of suitable pond turtle habitat would be developed. Approximately 98 acres of suitable garter snake habitat is anticipated to be developed during the life of the HCP. This is less than 10 percent of the total suitable habitat for garter snake at Stanford. Suitable habitat areas could support a larger garter snake population. These estimates are based on existing habitat for the Covered Species, and do not take into account new habitat that may be created during the life of the HCP. Thus, they represent the maximum acreage of habitat lost.

The HCP encourages development in Zones 3 and 4, which would minimize the effects of development on the Covered Species. The Covered Species do not normally occur in Zone 3 and Zone 2 provides a buffer between development in Zone 3, and the high quality Zone 1 habitat. Moreover, current state and local water quality regulations strictly regulate post- development water quality impacts, and new development would not be permitted if it does not comply with these regulations. With the enforcement of these regulations, new development would not result in adverse post-development water quality impacts on the creeks, or riparian areas, that support steelhead, red-legged frogs, pond turtles, or garter snakes.

There is sufficient habitat in Zones 1 and 2 to support the existing population of the Covered Species, and sufficient additional habitat exists to accommodate a population increase. Moreover, the value of the residual habitat could be higher than it is today because at least 360 acres of riparian habitat would be within a permanent conservation easement and managed in perpetuity for the benefit of the Covered Species that occur in the riparian zone, and development would be prohibited on over 300 acres of tiger salamander habitat for at least 50 years. The successful creation of new tiger salamander breeding ponds, and other habitat management measures, should increase the amount and quality of tiger salamander habitat, which would offset the overall loss of habitat.

Implementation of the HCP is expected to benefit the Covered Species even with the permanent loss of habitat. Despite the permanent loss of up to 180 acres of habitat, HCP implementation would provide a net benefit to Covered Species through permanent conservation easements and monitoring and management of the easements.

Other Special-status Species. Future development anticipated in the HCP in Zones 1, 2 and 3 could affect other special-status species, primarily through the permanent loss of habitat. An individual could be inadvertently killed or harmed, and habitat could be temporarily disturbed during the course of construction. The MBTA, BGEPA, and California Fish and Game Code protect birds and mammals. The HCP does not specifically address the potential impacts that

[21] This potential lethal loss of a Covered Species was included in the take estimates described for the ongoing Covered Activities shown in Table 5-6.

future development could have on other special-status species. However, the HCP includes a Conservation Program that would protect the habitat of the Covered Species, which in turn, would protect the habitat of other special-status species, and benefit these species.

Future development would result in the loss of up to approximately 150 acres of Zone 2 and 3 habitat which contains the annual grasslands and oak woodland/savanna habitats that provide potential foraging habitat for golden eagles. This would represent only 0.04 percent of the total 3,706 acres in Zones 2 and 3, which is a small amount of the total foraging habitat available to golden eagles at Stanford. Stanford is also not the only available forage in the nearby region. Therefore future development under the Proposed Action alternative would not result in a disturbance to golden eagles under BGEPA.

In addition, future development would be subject to environmental review under CEQA. While impacts to the Covered Species would be mitigated through the HCP, additional measures that address other special-status species could be incorporated into project conditions based on a project-specific environmental review. Measures that were included in the GUP Conditions of Approval are examples of measures that could be carried forward to development anticipated in the HCP beyond that identified in the GUP. As one example, special-status plants are protected by measures requiring focused surveys for all proposed building projects located in riparian and oak woodland areas, providing a fenced buffer of at least 30 feet from identified special-status plants during construction, and site-specific mitigation plans. Thus, if necessary, there are feasible mitigation measures to further reduce the effects of development on other special-status species.

Other Biological Resources. The primary effect that future development would have on common wildlife species is permanent habitat loss in Zones 1, 2, and 3. Management Zone 1 contains the riparian habitat used by several bird, mammal, amphibian, and reptile species found in the region. Management Zone 2 contains the riparian woodland and grassland habitat that could provide suitable nesting and foraging habitat for a variety of common species. Management Zone 3 contains the grassland and oak savannah habitat that could provide suitable nesting and foraging sites for birds, mammals, and reptiles. Permanent loss of habitat could lead to habitat fragmentation, encroachment by exotic weeds and plants, and area-wide changes in surface water flows due to an increase in impervious surfaces. The protection and management of riparian and grassland habitats under the HCP's Conservation Program would benefit other biological resources. As mentioned above, future development is subject to CEQA review and the mitigation provisions of CEQA would assure that the removal of mature trees and other valuable native vegetation such as woodlands, would mitigate impacts of future development on biological resources.

5.2.2 Effects of the No Action Alternative

5.2.2.1 Conservation Program

Under the No Action alternative the ITPs would not be issued and the HCP would not be implemented, so there would not be a Conservation Program. Activities that could result in the take of a federally listed species (i.e., red-legged frog, steelhead, garter snake or tiger salamander) would require incidental take authorization on a project-specific basis. Under this alternative it is assumed that the activities in Zones 1 and 2 that require a permit would also require minimization measures similar to those identified in the HCP for Zones 1 and 2. As part of project-specific take authorization, conservation easements could be placed over portions of the riparian corridors and tiger salamander habitat to mitigate for specific projects and project-

specific monitoring and mitigation plans could be required. These measures, including easements and monitoring, would happen when development occurs (not in advance of it) and would only be required to offset the biological effects of a specific project. Since federally listed species are not expected to be impacted by activities in Zone 3, these areas would probably not require take authorization.

Under the No Action alternative, the Covered Species, other special-status species, and plant communities in Zones 1, 2 and 3 would not benefit from the comprehensive approach and management provided in the HCP's Conservation Program. The riparian, oak woodland, and grassland communities would not be managed in a coordinated way to address issues of erosion and invasive non-native plant and animal species control. Consistent restoration planting would not occur. Any required conservation easements could be placed over these habitats in a piecemeal way. While it is feasible that the No Action alternative may not have more adverse effects on the Covered Species, other special-status species, or plant communities, than the Proposed Action, the No Action alternative is inferior to the Proposed Action with regard to protection of biological resources because it is less comprehensive.

5.2.2.2 Ongoing Stanford Operations

Under the No Action alternative, Stanford would continue to operate. While most ongoing operations are located in Zones 3 and 4 and would not require a permit for take of the Covered Species, activities in Zones 1 and 2 that could result in take of a federally listed species would require project-specific take authorization. It is assumed that such take authorization would require measures to protect the federally listed species that are similar to those listed in the HCP. These measures could benefit plant communities and other special-status species, but not to the same extent as the Proposed Action because they would not be as comprehensive. For the diversion of water at the Los Trancos Creek Diversion Facility and the San Francisquito Creek Pump Station, operations would occur in compliance with the fish bypass flow requirements established by the SHEP. However, monitoring and evaluation of the effects of these water diversions on steelhead would not occur.

5.2.2.3 Future Development

Under the No Action alternative, future development would occur. Future development that would result in take of federally listed species would require take authorization issued on a project-by-project basis. As discussed above, project-specific take authorization would require measures to protect federally listed species, similar to the HCP. These measures could benefit plant communities and other special-status species, but not to the same extent as the Proposed Action because they would be project-based and would not provide comprehensive protection.

Future development is estimated to result in the loss of up to approximately 150 acres of Zone 2 and 3 habitat which contains the annual grasslands and oak woodland/savanna habitats that provide potential foraging habitat for golden eagles. This would represent only 0.04 percent of the total 3,706 acres in Zones 2 and 3, which is a small amount of the total foraging habitat available to golden eagles at Stanford. Stanford is also not the only available forage in the nearby region. Therefore future development under the No Action alternative would not result in a disturbance to golden eagles under BGEPA.

5.2.3 Effects of the HCP for CTS Only Alternative

Under this alternative, the HCP area would be geographically limited to the CTS Basin, which includes the area around Lagunita (90 acres) and the CTS Reserve in the foothills south of JSB

(315 acres). Stanford activities that would result in take of listed species other than tiger salamander would require project-specific incidental take permits.

5.2.3.1 Conservation Program

Under this alternative, the geographic scope of the HCP would be limited to the CTS Basin that includes the Lagunita area, golf course and driving range, and CTS Reserve in the foothills south of JSB. The HCP for CTS Only alternative conservation program would be limited to the monitoring and management activities outlined in the Central Campus CTS Management Plan and the CTS Reserve Monitoring and Management Plan, and the tiger salamander-related minimization measures and enhancements. Ongoing activities and new development in Zones 1 and 2 that could result in the take of steelhead and red-legged frog would need to obtain take authorization on a project-by-project basis. The conservation activities would include vegetation and ground animal management, worker education, restriction on off-road vehicles, and monitoring. These activities would have very little, if any, effect on plant communities, the Covered Species, or special-status species because they involve very little ground disturbance.

The HCP for CTS Only alternative would not include conservation easements over the riparian habitat along San Francisquito, Los Trancos, Matadero, and Deer creeks because tiger salamander does not occur in these areas. These riparian communities would be protected on a piecemeal basis through mitigation required under project-specific take authorization or environmental review. The mitigation would likely include minimization measures like those in the Conservation Program and mitigation for loss of habitat. The mitigation would occur later in time than proposed in the HCP and would only address the impacts of specific projects.

In general, the effects of this alternative on biological resources would be the same as the Proposed Action except that it is not likely to result in conservation easements as big as proposed in the HCP and would not have the same monitoring and management plans overseen by a conservation program manager. This alternative is inferior to the Proposed Action with regard to protection of the red-legged frog, steelhead, pond turtle, and garter snake because it is less comprehensive.

5.2.3.2 Ongoing Stanford Operations

Under the HCP for CTS Only alternative Stanford would continue to operate. While conservation activities in the CTS Basin would be the same as the Proposed Action, as noted above, the riparian habitat would not be protected as comprehensively as under the Proposed Action. Most of the ongoing Stanford operations occur in Zones 3 and 4 and are unlikely to require project-specific take authorization or be subject to minimization measures or other mitigation. This in turn would provide less protection than the Proposed Action for biological resources, including plant communities and other special-status species.

For operation of the Los Trancos Creek Diversion Facility and the San Francisquito Creek Pump Station, water diversions would occur in compliance with the fish bypass flow requirements established by the SHEP. However, monitoring and evaluation of the effects of these water diversions on steelhead would not occur.

5.2.3.3 Future Development

Under the HCP for CTS Only alternative, future development would occur as described for the Proposed Action, but any development in Zones 1 or 2 outside of the CTS Basin would likely require project-specific take authorization and mitigation. Future development would also be subject to CEQA review. This alternative would result in the same protection of tiger

salamander as the Proposed Action, but piecemeal protection in Zones 1 and 2 of steelhead, red-legged frog, garter snake, other special-status species (such as pond turtle), and biological resources in general. Smaller fragments of habitat would be protected and may not be contiguous, offering less benefit to biological resources than the Proposed Action. The Proposed Action provides more comprehensive and coordinated protection of the biological resources affected by future development.

Future development is estimated to result in the loss of up to approximately 150 acres of Zone 2 and 3 habitat which contains the annual grasslands and oak woodland/savanna habitats that provide potential foraging habitat for golden eagles. This would represent only 0.04 percent of the total 3,706 acres in Zones 2 and 3 which is a small amount of the total foraging habitat available to golden eagles at Stanford. Stanford is also not the only available forage in the nearby region. Therefore future development under the HCP for CTS Only alternative would not result in a disturbance to golden eagles under BGEPA.

5.2.4 Comparison of Alternatives

The Proposed Action or alternatives would not result in a significant adverse effect on biological resources. The Proposed Action provides greater benefit to biological resources than the alternatives because it provides a comprehensive Conservation Program and Monitoring and Management Plans that would be implemented in perpetuity over at least 360 acres of the highest quality habitat. The No Action and HCP for CTS Only alternatives do not provide either a comprehensive Conservation Program or perpetual management of biological resources over as large an area of Stanford's lands. Under the Proposed Action and both alternatives, operation of the Los Trancos Creek Diversion Facility and the San Francisquito Creek Pump Station would continue to occur in compliance with the fish bypass flow requirements established by the SHEP.

5.3 SOCIOECONOMIC ENVIRONMENT

This section addresses the effects of the Proposed Action and alternatives on the socioeconomic environment, including jobs, housing, and commercial activities that generate revenue. Effects on the socioeconomic environment are analyzed qualitatively, taking into consideration the affected environment and the activities described in the HCP. The Proposed Action and the alternatives would have a significant adverse socioeconomic effect that could result in physical changes to the environment if it were to result in a substantial loss of employment opportunities, housing opportunities, or income-producing activities.

5.3.1 Effects of the Proposed Action

The Proposed Action (implementation of the proposed HCP and issuance of incidental take permits) would not adversely affect employment, housing, or income producing activities. With or without the HCP in place, Stanford would continue to employ the staff (both teaching and non-teaching) needed to operate Stanford. The proposed HCP would not affect the regional economy, displace workers, jobs, farms or other agricultural uses, or permanently change the conditions that affect individual businesses or the local economic climate (land use, transportation systems, customer base, etc.).

5.3.1.1 Conservation Program

The Proposed Action includes a Conservation Program that would establish conservation easements that would permanently remove lands from potential development that could provide housing or generate revenue. These easements include the riparian zones along Los Trancos,

San Francisquito, Matadero, and Deer creeks (360 acres total), and could include lands in the CTS Reserve south of JSB. The initial easement areas and CTS Reserve represent about 8 percent of Stanford's total land and development in much of this area is already limited by current general plan designations and zoning.

The Conservation Program also regulates leasehold uses in Management Zones 1 and 2 by requiring buffers, set backs from riparian areas, and the implementation of BMPs to protect water quality and habitat. Establishment of the easements would not eliminate any existing equestrian/agricultural leased uses.

Activities carried out under the HCP and the position of Conservation Program Manager would be funded by Stanford. Stanford is financially solid and has sufficient revenue to cover the cost of implementing the measures proposed in the HCP, without affecting housing or employment opportunities at Stanford or adversely affecting income-generating assets.

Implementation of the Conservation Program would not result in a loss of employment, housing or income-producing activities, and would not have an adverse socioeconomic effect.

5.3.1.2 Ongoing Stanford Operations

Ongoing Stanford operations would continue under the Proposed Action. The HCP would not affect the current revenue-producing activities at Stanford. Most of the revenues are generated by uses that are in Zone 4, such as the Medical Center, Shopping Center, and Stanford Business Park, and are not affected by the HCP.

5.3.1.3 Future Development

The Proposed Action would not change future development anticipated to be needed by Stanford and would have no adverse socioeconomic effect relative to housing. The HCP would replace the need to obtain project-specific take authorization for each project that could result in take of the Covered Species. It would streamline the permit process under the ESA by clearly defining the Conservation Program activities required to mitigate project-specific impacts to the Covered Species.

The HCP would not rezone any parcels, introduce any new or substantially different uses, or alter or expand any support infrastructure to these areas (e.g., expand water service, improve transportation network) such that the value of surrounding lands would be affected.

5.3.2 Effects of the No Action Alternative

5.3.2.1 Conservation Program

Under the No Action alternative, incidental take authorization would be required for each activity that results in take of a federally listed species (i.e., red-legged frog, steelhead, garter snake and tiger salamander), on a project-specific basis. Under this alternative, it is assumed that the activities in Zones 1 and 2 that require a permit would also require minimization measures similar to those defined in the HCP for Zones 1 and 2. Several components of the HCP's Conservation Program would not occur under this alternative unless they were included in future individual projects to reduce or prevent incidental take of the listed species. While conservation easements could be placed over portions of the riparian corridors to mitigate for specific projects, the 360 acres of conservation easements proposed in the HCP would not be established. The permanent conservation easements that would be placed over at least 360 acres of land along the creek corridors, and possibly more in high quality tiger salamander habitat, would prohibit permanent structures unless they benefit the Covered Species. Under the No Action alternative,

these restrictions would not be present, but other restrictions imposed by general plan and zoning designations already inhibit development in areas adjacent to the creek zone and in high quality tiger salamander habitat. Due to these restrictions, the No Action alternative would not have significant socioeconomic effects associated with conservation.

5.3.2.2 Ongoing Stanford Operations

Under the No Action alternative, Stanford would continue to operate, and separate take authorization would be needed for any maintenance or repair project that could result in take of the Covered Species. The efficiency and predictability in being able to carry out normal Stanford operations that is offered by the Proposed Action would not exist under the No Action alternative. However, this alternative would not result in a loss of housing, employment, or revenue and would not result in significant socioeconomic effects associated with ongoing Stanford operations.

5.3.2.3 Future Development

Future development under the No Action alternative is the same as that described for the Proposed Action. Any new development that is not already allowed under the 2000 GUP would require project-specific building permits, CEQA review and possibly take authorization.

Under the No Action alternative, conservation easements could be placed over portions of the riparian corridors to mitigate for specific projects, but the conservation easements proposed in the HCP would not be established. The initial easement areas and CTS Reserve that would be set aside under the Proposed Action represent about 8 percent of Stanford's total land and development in much of this area is already limited by current general plan designations and zoning, thus the socioeconomic effects would be minor. The No Action alternative would not result in adverse socioeconomic effects, and does not significantly differ from the Proposed Action.

5.3.3 Effects of the HCP for CTS Only Alternative

Under this alternative, the HCP area would be geographically limited to the CTS Basin, which includes the area around Lagunita (90 acres) and the CTS Reserve in the foothills south of JSB (315 acres). Stanford activities that would result in the take of listed species other than tiger salamander would require project-specific incidental take permits.

5.3.3.1 Conservation Program

Under the HCP for CTS Only alternative, Stanford would implement a Conservation Program in the CTS Basin that includes the Lagunita area, golf course and driving range, and the CTS Reserve in the foothills south of JSB. Conservation may entail establishing permanent easements over tiger salamander habitat in the future that would prohibit permanent structures unless they benefit tiger salamander. Development on the lands south of JSB is already restricted by general plan and zoning designations, so the conservation measures under this alternative would not result in significant socioeconomic effects.

Conservation activities for red-legged frog, garter snake and steelhead would be addressed separately, on a project-specific basis. While conservation easements could be placed over portions of the riparian corridors to mitigate for specific projects, the 360 acres or more of conservation easements proposed in the HCP would not be established. The extent of conservation activities would likely be less than the Proposed Action and more land could remain available for development. However, development of most of this land is currently constrained by general plan and zoning designations, so the socioeconomic effects do not

significantly differ from the Proposed Action. This alternative would not have significant socioeconomic effects associated with conservation.

5.3.3.2 Ongoing Stanford Operations

Under the HCP for CTS Only alternative, Stanford would continue to operate, but any operations outside of the CTS Basin that could result in take of a federally listed species would require project-specific incidental take authorization. This could delay some operations, but would not result in a substantial loss of employment opportunities, housing opportunities, or income-producing activities, and would not have a significant socioeconomic effect associated with ongoing Stanford operations.

5.3.3.3 Future Development

Under the HCP for CTS Only alternative, the future development anticipated in the HCP would still occur. If a future project could result in take of a federally -listed species other than tiger salamander, a project-specific take authorization would be needed. This reduces the efficiency and predictability of completing future development outside of the CTS Basin, but does not preclude development. It would not result in a substantial loss of employment opportunities, housing opportunities, or income-producing activities and would not have a significant socioeconomic effect associated with future development.

5.3.4 Comparison of Alternatives

The Proposed Action or the alternatives would not result in significant adverse effects to socioeconomics. Future conservation easements under the Proposed Action or alternatives will restrict the ability to develop the land for economic benefit. However development on most of these lands is currently restricted by local land use regulations. The Proposed Action or alternatives do not significantly differ in effects on socioeconomics.

5.4 ENVIRONMENTAL JUSTICE

This section assesses the effects of the Proposed Action and alternatives on environmental justice. The analysis is qualitative, and is based on consideration of the affected environment and the activities proposed in the HCP. An adverse effect would be disproportionately high and adverse for a minority or low income population if it would predominantly result in an adverse effect on a minority or low income area; or result in an adverse effect on a minority or low income area that is appreciably more severe or of greater magnitude than the adverse effect experienced by non-minority and non-low-income areas.

There are no minority or low income areas on the lands where the HCP would be implemented. Issuance of the ITPs and implementation of the HCP would not affect any minority or low income areas, and thus would not have a disproportionately high adverse effect on minority or low-income populations. It would not significantly affect household, or per capita, incomes within the study area and would not have any human health effects.

Likewise, the alternative actions would not have a disproportionately high adverse effect on minority or low-income populations. The alternatives, like the Proposed Action, would not significantly affect incomes within the study are and would not have any human health effects. Therefore, the Proposed Action, the No Action alternative and the HCP for CTS Only alternative would not have a disproportionately high or adverse effect on these populations.

5.4.1 Comparison of Alternatives

The Proposed Action or alternatives would not have adverse effects related to environmental justice. The Proposed Action and alternatives do not differ in their effects on environmental justice.

5.5 CUMULATIVE EFFECTS

Cumulative impacts are defined as the "impact on the environment that results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions." (40 C.F.R. § 1508.7). In this section, the incremental impact of the Proposed Action and the alternatives are assessed in light of other past, present and reasonably foreseeable future Federal, state, local government, and private actions. The study area for cumulative effects generally includes San Mateo and Santa Clara counties. However, the geographic scope does vary for some of the resources addressed in this analysis. As such, the relevant geographic scope is identified for each resource in the resource specific discussions below. For example, the geographic scope was expanded for air quality to include the San Francisco Air Basin, and is narrower for traffic impacts since such impacts tend to be localized. For evaluation of CCC steelhead, the geographic scope of the cumulative effects analysis includes the Coastal San Francisco Bay Diversity Stratum of the CCC steelhead DPS. This steelhead diversity stratum extends from Novato Creek in Marin County south to the Guadalupe River in Santa Clara County. This geographic scope was selected for analyzing cumulative effects on CCC steelhead, because this grouping offers a useful framework for accounting for diversity and spatial structure in evaluation of population viability (Bjorkstedt et al. 2005). As such, the relevant geographic scope is identified for each resource in the resource specific discussions below.

5.5.1 Past, Present, and Reasonably Foreseeable Future Actions

The San Francisco Peninsula has been highly altered by human generated actions, including substantial residential, commercial, institutional, industrial, and recreational development, along with a vast transportation network and other infrastructure to support these land uses. These alterations to the natural landscape have all contributed to the current environmental conditions, which are described in Section 4, Affected Environment.

Population growth in the study area will continue over the 50-year timeframe of the ITPs. As such, urban development is likely to continue. In addition to future development, there are a number of environmental programs underway that also may be implemented. These present and reasonably foreseeable future actions that could affect the resources in the study areas are described below.

5.5.1.1 Urban Development

The City of Palo Alto, Town of Portola Valley, City of Menlo Park, and Town of Woodside (collectively, "cities") and San Mateo and Santa Clara counties will continue to urbanize. Based on the cities' and counties' general plans, new shopping centers, commercial and institutional buildings, and housing will be built during the next 50 years. This development would be accompanied by public and private infrastructure improvements, such as new roads, utilities, and recreational facilities, and maintenance of new and existing facilities, such as street and sidewalk repairs.

Urban development includes regional transportation, and a number of regional transportation improvements will occur during the next 50 years. (See, e.g., Santa Clara County 2008). Although the scope of regional transportation improvement projects is not known, and is subject

to a number of considerations, including funding availability, changes in population and employment centers, and future environmental reviews, currently anticipated transportation projects include the U.S. 101/University Avenue Interchange Reconstruction, U.S. 101 northbound and southbound auxiliary lanes from Marsh Road to Santa Clara County line, Hwy 280/Page Mill Intersection modification, and Oregon Expressway operational and pedestrian improvements, which are underway. Future development would consist of all types of urban development and would result in a wide range of environmental impacts that would contribute to cumulative conditions in the region.

5.5.1.2 Regional Flood Control

In 2006, the USACE and San Francisquito Creek JPA initiated a feasibility study for the San Francisquito Flood Protection and Ecosystem Restoration Project that is intended to identify and evaluate ways to alleviate flooding, address environmental degradation, and identify recreational opportunities in the San Francisquito Creek watershed. The USACE anticipates that the feasibility study will take several more years to complete and any project selected for implementation would require Congressional approval and further NEPA review. The NOI for the feasibility study identified several potential alternatives, including the construction of new detention basins and other structural and non-structural improvements within the San Francisquito Creek watershed. Although flooding occurs primarily downstream of El Camino Real, actions upstream may be implemented to reduce flows downstream. At this time, the feasibility study has not identified a preferred alternative or determined whether any of the alternatives identified in the NOI are feasible.

In September 2010, the San Francisquito Creek JPA announced the preparation of an Environmental Impact Report (EIR) for the first major initial capital project to increase flood protection for the communities of East Palo Alto and Palo Alto. The goal of this initial flood project is to reduce flood risks during storm events along the reach of San Francisquito Creek between Highway 101 and San Francisco Bay. The project would be designed to accommodate future flood protection measures farther upstream on San Francisquito Creek and the San Francisquito Creek JPA continues to work with the USACE on a long-term and large-scale, comprehensive flood management and ecosystem restoration plan for the entire watershed.

Flood projects along San Francisquito Creek are anticipated to eliminate the need for thousands of properties to contribute to the National Flood Insurance Program. Channel widening, bridge replacement, floodwall construction, bypass culverts, and detention basins would likely be used to increase creek capacity and address flooding. Channel widening would likely be designed to improve conditions for native plants and wildlife on the floodplain adjacent to San Francisquito Creek. In addition to flood damage reduction, the USACE's San Francisquito Creek General Investigations Study includes restoration of the natural environment as a project goal. Project construction would result in location-specific impacts from ground disturbance; however, mitigation and enhancement activities would benefit native species and their habitat.

5.5.1.3 Environmental/Conservation Projects

A number of regional and local environmental improvement projects are currently underway or anticipated during the next 50 years. These include the following projects.

Local Environmental Improvement Projects. Local cities and the Town of Woodside anticipate implementing a number of small scale environmental improvement projects including stabilization of degraded banks along San Francisquito creek and tree reforestation.

Several efforts have been made to evaluate the San Francisquito Creek watershed, including numerous tributaries, for potential barriers to steelhead passage (Cleugh and McKnight 2002; Smith and Harden 2001; Stoecker 2010). Smith and Harden (2001) identified modification of the Bonde Weir on San Francisquito Creek in order to improve steelhead passage as a high priority. The weir presents a passage barrier for both in-migrating adult steelhead and out-migrating steelhead smolts. The barrier is the farthest one downstream in the watershed and is located just downstream of the Caltrain tracks adjacent to Bonde Park, El Palo Alto Park, and the Alma Street Bicycle Bridge. The project is currently undergoing re-design and the City of Menlo Park is seeking additional funding for construction. Implementation of the project would benefit steelhead by improving adult and juvenile passage over the weir during periods of low flow in San Francisquito Creek.

Three Creeks Habitat Conservation Plan. The Santa Clara Valley Water District (SCVWD) is preparing an HCP (Three Creeks HCP) to support an application for a 50-year Incidental Take Permit. At present, SCVWD's HCP addresses CCC steelhead and fall-run Chinook salmon, a federally listed Species of Concern. The permit would cover the District on-going operations and maintenance activities, as well as future major construction activities for dam safety upgrades and other non-routine maintenance projects at District facilities within Stevens Creek, Guadalupe River, and Coyote Creek watersheds. The working draft conservation program includes measures to improve stream flow and stream temperatures below District reservoirs on steelhead and salmon streams, fish habitat restoration and enhancement projects, removal of existing barriers to fish passage, and biological monitoring.

The Three Creeks HCP also addresses a 1996 complaint challenging SCVWD's water rights filed with the State Water Resources Control Board. In response to the water rights complaint, a collaborative effort, called the Fisheries and Aquatic Habitat Collaborative Effort (FAHCE), developed a settlement between the complainants and resource agencies for SCVWD operations. The Three Creeks HCP's conservation program is designed to protect and enhance habitats for Chinook and steelhead impacted by SCVWD's on-going water-supply operations in northern Santa Clara Valley. SCVWD anticipates submitting the draft HCP to NMFS for review in mid-2012.

Santa Clara Valley Habitat Conservation Plan/Natural Communities Conservation Plan (SCV Habitat Plan). The SCV Habitat Plan is a regional partnership between the County of Santa Clara, Santa Clara Valley Transportation Authority, Santa Clara Valley Water District, Santa Clara County Open Space Authority, and the cities of San Jose, Gilroy and Morgan Hill and the CDFG and USFWS. The SCV Habitat Plan was submitted as part of incidental take permit applications to USFWS and CDFG in 2010. The public Draft HCP, Draft Environmental Impact Report/Environmental Impact Statement, and draft Implementing Agreement were released on December 17, 2010. The release of these documents initiated a 120-day public review and comment period closed on April 18, 2011. The SCV Habitat Plan covers approximately 520,000 acres in Santa Clara County, and addresses 21 listed and non-listed species (i.e., covered species) including the tiger salamander, red-legged frog, pond turtle, western burrowing owl, Bay checkerspot butterfly, and other plant and animal species. It does not include the San Francisco garter snake as they are not present within the SCV Habitat Plan area. Listed steelhead are present in the SCV Habitat Plan area, but they are not included as a covered species in the plan. The covered activities include urban development, major capital improvements, and in-stream operations, maintenance, and flood protection projects.

The proposed SCV Habitat Plan includes a conservation strategy that provides for the protection and enhancement of natural resources at landscape, natural community, and species specific levels. The conservation strategy consists of the following major components:

- the acquisition of land and the creation of a Reserve System, including regional connections between protected areas;
- the long-term management, enhancement, and in some cases restoration of the Reserve System;
- development of a comprehensive aquatic conservation strategy to address the needs of covered amphibians and aquatic reptiles;
- implementation of a comprehensive, long-term adaptive management and monitoring program; and
- implementation of avoidance and minimization measures on covered activities (called conditions on covered activities).

The plan would create a Reserve System with an estimated 58,000 acres of upland, creek, and riparian habitat for the benefit of covered species, natural communities, biological diversity, and ecosystem function. All terrestrial and aquatic land-cover types in the Reserve System would be enhanced to benefit covered and other native species. The SCV Plan would provide a framework for the protection of natural resources while streamlining and improving the environmental permitting process for both private and public development including activities such as road, water, and other infrastructure construction and maintenance work. New habitat reserves created by the SCV Habitat Plan would be larger in scale and more ecologically valuable than the fragmented, piecemeal habitats currently yielded by mitigating projects on an individual basis.

The proposed SCV Habitat Plan overlaps a portion of the Three Creeks HCP. The covered activities and conservation actions in the Three Creeks HCP for Coyote Creek and the Guadalupe River watersheds are also included in the SCV Habitat Plan, so the plans are consistent with one another for the overlapping areas.

RWQCB Basin Plan Amendment regarding the Guadalupe River Watershed Mercury Contamination. The RWQCB has adopted a Basin Plan amendment that specifies the total maximum daily load (TMDL) for mercury in the Guadalupe River watershed. The amendment addresses seven mercury-impaired waters: Guadalupe Reservoir, Calero Reservoir, Guadalupe Creek, Alamitos Creek, the Guadalupe River upstream of tidal influence, Almaden Reservoir and Lake Almaden. As of 2004, Guadalupe Reservoir had the highest recorded fish mercury concentrations in California-about 20 times higher than the U.S. EPA methylmercury criterion. Beneficial uses of waters in the watershed that are impaired by mercury are water contact recreation (due to human consumption of fish), wildlife habitat, and preservation of rare and endangered species.

This plan recommends specific freshwater water quality objectives. Implementation started in January 2009 and targets are to be attained before 2029. The goals of the first phase of implementation include implementing effective source control measures for mining waste at mine sites; completing studies to reduce discharge of mining waste accumulated in Alamitos Creek; and completing studies of methylmercury and bioaccumulation controls in reservoirs and lakes, by December 31, 2018. The goals for the second 10-year phase of implementation are to attain the watershed fish tissue targets and the San Francisco Bay mercury TMDL allocations to urban storm water runoff and legacy mercury sources in the Guadalupe River watershed, by

December 31, 2028. Mercury reduction in the watershed would benefit both aquatic and terrestrial wildlife, including steelhead, red-legged frog, and pond turtle. Tiger salamander and the San Francisco garter snake are not known to occur in the Guadalupe River watershed.

Grady Ranch Development and Restoration Project. Miller Creek in Marin County is within the Coastal San Francisco Bay Diversity Stratum of the CCC steelhead DPS and the stream was identified by Leidy et al. (2003) as important because it has no large impassable dams, and is considered "a small but important part of regional production". The only planned project in the Miller Creek watershed is the Grady Ranch Development. The Grady Ranch Precise Development Plan includes two sets of actions: 1) stream restoration within the Miller Creek watershed; and 2) building and construction within 52 acres of the Grady Ranch Property. Building and road construction would include two new buildings (Main Building and Gate House Building), new main entry roadway, re-alignment of existing Lucas Valley Road, improvements and replacements of existing fire roads, nine new bridges and other related improvements such as water tanks. The "footprint" of the Main Building would be approximately 123,000 square feet and the Gate House Building's footprint would be 900 square feet. Storm water will be managed through the construction of two new detention basins and a drainage system that is coordinated with the restoration of streamside riparian areas. In total, 52 acres of the property would be developed and the remaining 187 acres would be left in its natural state as private open space. Restoration and enhancement of Miller Creek, Grady Creek, Landmark Creek and other tributary streams on the property would be conducted to address problems created by the deeply incised channel of Miller Creek. Log and boulder weirs would be constructed to stabilize channel bed materials and improve upstream passage for steelhead. Existing vertical stream banks would be laid back to increase the floodplain area and allow for the planting of riparian vegetation. Channel restoration actions are anticipated to increase shade, raise creekbed elevations, increase aquifer storage thereby increasing spring and summer base flows, and eliminate existing passage impediments. Upon completion, the project would restore access to over 2 miles of upstream habitat for steelhead. The project is not expected to increase pollutant loads or modify peak flood flows associated with increases in impervious surfaces, because the project includes a multi-tiered approach for storm water management. To protect water quality, the project would capture runoff with detention basins designed as wetlands in combination with bioretention areas and swales. Roof runoff collectors will provide water for later use as irrigation during the dry season. These actions are expected to avoid hydromodification of Miller Creek and improve aquifer storage. The EIR for this project was certified in 1996 and a CWA Section 404 permit application was submitted to the USACE in August 2011. In May 2012, the applicant announced his plans to cancel the project and the future of the Grady Ranch project is uncertain at this time.

San Anselmo Creek Saunders Avenue Crossing Fish Ladder Retrofit. San Anselmo Creek, tributary to Corte Madera Creek in Marin County is also within the Coastal San Francisco Bay Diversity Stratum of the CCC steelhead DPS. The existing road crossing of San Anselmo Creek at Saunders Avenue is an upstream passage impediment for steelhead. The stream crossing consists of a concrete bridge on concrete abutments and concrete pilings. A large concrete apron spans the abutments and was likely constructed to protect the bridge as the downstream channel incised. It maintains a drop of over 4 feet. There are also two weirs that encase sewer lines.

In the 1980's an Alaskan Steeppass fish ladder was installed and a low-flow channel was built to provide for steelhead passage. However, the Steeppass ladder is poorly suited for providing adult passage at this site (Michael Love and Associates 2006). Under flow conditions that generally support the upstream migration of steelhead in the watershed, the hydraulic capacity of

the Steeppass is overwhelmed, and there is inadequate attraction flow for fish to find the downstream end of the ladder. At lower flows there is inadequate depth in the low-flow channel for adult steelhead to swim through. Additionally, an Alaskan Steeppass does not provide passage for juvenile salmonids and is highly susceptible to plugging by debris.

A recent fish passage assessment of road-stream crossings in Marin County identified the Saunders Avenue site as a high priority for treatment due to more than 8 miles of potential habitat affected, and presence of an ineffective fish ladder (Ross Taylor and Associates, 2003). The Friends of Corte Madera Creek Watershed received grant funding to develop design alternatives for improving fish passage at the site. The selected alternative is intended to improve passage conditions for both adult and juvenile salmonids, and to meet the design criteria of both NMFS and the CDFG. Current design plans for the Saunders Avenue crossing of San Anselmo Creek is a roughened channel alternative. A roughened channel would create a hydraulic environment within a fishway that does not challenge the swimming and leaping abilities of juvenile and adult steelhead. A basis of design memorandum for a roughened channel fish passage alternative was prepared in July 2010, and the project is seeking funding to proceed with further evaluation and implementation.

5.5.1.4 Searsville Dam and Reservoir

Searsville Dam was built by Spring Valley Water Company in 1892 and is located on lower Corte Madera Creek on Stanford's lands. The dam is approximately 0.3 mile upstream of the confluence of Corte Madera and Bear creeks, where they join to become San Francisquito Creek. About one-third of the San Francisquito Creek watershed (14.6 square miles) is located upstream of Searsville Dam, which drains the eastern slopes of the Santa Cruz mountains between Kings Mountain and Russian Ridge (Balance Hydrologics, Inc. 1996). The four principal creeks draining to Searsville Reservoir are Corte Madera Creek, Dennis Martin Creek, Sausal Creek, and Alambique Creek. 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. When it was built 1892, Searsville Reservoir's capacity was 1,055 acre-feet (Balance Hydrologics, Inc. 1996). In 1920, the dam's spillway was raised by about 6 feet which increased the reservoir's capacity to 1,365 acre-feet (Balance Hydrologics, Inc. 1996). Due to sedimentation, the volume of the reservoir was roughly 192 acre-feet in 2000 (Rebecca Young as cited in Freyberg and Cohen 2001). However, a more recent report (Wang et al. 2006) describes the historical capacity of the reservoir to be 1,500 acre-feet in 1892 and capacity to be 150 acre-feet in 2006. Water from Searsville Reservoir is periodically diverted by Stanford with a 3 cubic feet per second capacity intake pipe located in the reservoir and the water is used to irrigate the campus and leased lands, and for fire protection.

The Searsville Reservoir basin is now delineated as three reservoir areas (lower, middle and upper reservoirs), with a complex mosaic of aquatic and terrestrial habitats. This habitat mosaic is produced and maintained by the dynamic nature of stream channels, sediments, and water levels in the floodplain upstream of Searsville Dam. The "lower reservoir" includes the current open water area of Searsville Reservoir and extends approximately 0.3 mile immediately upstream of the dam. In addition to the open water habitat of the lake itself, the basin supports freshwater emergent wetland habitat surrounded by Valley Foothill Riparian habitat (H.T. Harvey and Associates 2001). Non-native aquatic species such as catfish, crayfish, bullfrog, mosquito fish, green sunfish, bluegill, pumpkinseed, black crappie, largemouth bass, and red-eared sunfish have been found in Searsville Reservoir and downstream areas in lower Corte Madera and San Francisquito creeks (Launer and Holtgrieve 2000; Launer and Spain 1998; Fee et al. 1996). These non-native species are predators of and competitors with steelhead and other

species native to the watershed. Searsville Reservoir is likely the main source of non-native species to creek areas below Searsville Dam (Launer and Holtgrieve 2000; Launer and Spain 1998; Fee et al. 1996).

Searsville Maintenance Activities. To maintain Searsville Reservoir in good operating condition and comply with California Division of Safety of Dams (DSOD) regulations, periodic maintenance activities are conducted by Stanford and will likely continue to be conducted in the future. These actions consist of the following activities:

Intake Valves. Activate, maintain, and periodically (i.e., every 5 to 10 years) replace intake valves on the tower in the reservoir adjacent to the dam.

Flashboard System. Install and remove timber boards that fit into slots along the top of the dam, raising the effective height of the dam and increasing water storage capacity when installed.

Dam Face. Annually, physically clean the 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.

Pipeline Flushing. Annually, activate intake valves and perform blow-off testing to flush sediment from the pipelines.

Appurtenances and Hardware. Repair and replacement of structure appurtenances such as railings, valve towers, and other hardware.

Dam Foundation. Inspect and make small local repairs of the dam foundation. Periodic visual inspections of the foundation by underwater divers, and dewatering the downstream plunge pool (estimated to occur 1-2 times during the next 50 years) pursuant to DSOD requirements.

In general, the above maintenance activities would result in localized and temporary effects on water quality. At the base of Searsville Dam, a 16-inch outlet pipeline is periodically opened as part of regular inspections by DSOD to ensure that the dam could be drained in case of an emergency. The opening of this valve and pipeline discharges sediment from Searsville Reservoir with water releases and results in increases of turbidity and suspended sediment in Corte Madera and San Francisquito creeks below the dam. Levels of turbidity and suspended sediment associated with this activity have not been measured, but Stanford reports this activity only occurs for a few minutes and it is conducted when creek flows are substantial, so that flushed water is diluted with the creek's flow.

At the in-line booster pump station approximately 2 miles downstream of Searsville Dam, flushing of the valves and pipeline are typically conducted one or twice a year at the beginning of the wet season and during the wet season. Discharges of sediment-laden water enter an area on the bank above San Francisquito Creek, so that sediments can settle out before the water re-enters the stream. This activity is generally conducted by Stanford when creek flows are high in order to dilute suspended sediment levels. Discharges and the associated water quality impacts are typically completed within a few minutes although some discharge may extend at lower levels for up to 2+ hours at this location.

An additional discharge of sediment-laden water occurs at this location when the in-line booster pump is operating. Water originating from Searsville Reservoir is conveyed through a filter and this filter is cleaned frequently (i.e. daily, and sometimes hourly) with an automatic backwash system. The facility's backwash water is discharged through a perforated pipe to an area on the bank above San Francisquito Creek, so that sediments can settle out before the water re-enters the stream. These routine maintenance activities may impact California red-legged frogs, garter snakes, western pond turtles, and steelhead through disturbance by maintenance work crews and

steelhead through temporary discharges of sediment-laden water on the bank of San Francisquito Creek.

Water Diversions at Searsville Reservoir (Searsville Diversion). When completed in 1892, Searsville Reservoir was intended to supply water to Stanford University (H.T. Harvey and Associates 2001) and water diversions from the reservoir continue for irrigation and fire suppression. The Searsville Diversion is a gravity-fed pipeline utilizing valved intakes at three elevations in a standpipe within the reservoir. The maximum diversion capacity is 3 cubic feet per second due to the limited diameter of the pipeline and its partially corroded condition. Stanford has a pre-1914 appropriative water right and riparian rights to divert water at Searsville year-round and diversions are expected to continue in the future in a manner similar to past operations.

Monthly diversion records from 1996-2010 indicate that Stanford primarily diverts water from Searsville Reservoir between the months of December and June. According to historical annual diversion volumes at Searsville Reservoir from 1931-2009, the maximum amount of water diverted from Searsville Reservoir was 1,021 acre feet in 1977 (WY 1978). The minimum amount of water diverted from the reservoir was zero during a period of non-use in the mid-1990s. This period of non-use was associated with maintenance activities at the reservoir to address sedimentation issues that resulted after the 1989 Loma Prieta earthquake. The average volume diverted from Searsville Reservoir since 1931 is 366 acre-feet. However, between the late 1990's and 2009 the average annual amount of water diverted from Searsville Reservoir has decreased significantly to about 127 acre-feet with a maximum of about 350 acre-feet during this period. There is no pattern of use that indicates the annual diversion amount varies according to water year type (i.e., higher diversions during wet years and less during dry years) or in coordination with Stanford's other water diversions in San Francisquito and Los Trancos creeks.

Operation of the Searsville Diversion affects stream flow conditions in Corte Madera and San Francisquito creeks below the dam. However, due to its small diversion capacity and location upstream of the confluence with Bear Creek, operation of the Searsville Diversion has a relatively minor effect on stream flows in San Francisquito Creek. Effects of water withdrawals at the Searsville Diversion are primarily limited to the 0.3 mile reach of Corte Madera Creek immediately downstream of Searsville Dam and these effects vary significantly by season. During the winter wet season, the dam and water diversion at Searsville has little impact on flows in Corte Madera Creek because the current holding capacity of the reservoir is less than 200 acre-feet. A moderate storm event in the winter fills the reservoir and the dam begins to spill to downstream. When Searsville Reservoir has reached storage capacity and spills, the flow in lower Corte Madera Creek during the winter months closely matches the rate of inflow to the reservoir. Water withdrawals at the Searsville Diversion can reduce stream flows by up to 3 cubic feet per second (the maximum capacity of the diversion) in lower Corte Madera Creek below the dam, but stream flows are typically not limiting for aquatic species during the winter period in this reach of channel.

During the period between mid-April and mid-June of most years, reservoir inflow from Corte Madera Creek drops off and the water surface elevation in Searsville Reservoir drops below the crest of the spillway. In wet years, water may continue to spill from the crest of the dam until mid-summer. When the reservoir's water surface elevation drops below the crest, water passing down the spillway from the reservoir to lower Corte Madera Creek ceases. During this spring period, water withdrawals at the Searsville Diversion impact lower Corte Madera Creek by causing spills to the channel downstream to cease earlier in the year. As flow data from past years are not available, it is estimated that the amount of time spills would cease prematurely

ranges between a few days to 3 weeks. This estimate is based on the fact that inflow volumes from Corte Madera Creek naturally drop off quickly during the late spring and the diversion rate does not exceed 3 cubic feet per second. As the diversion rate is equal to, or greater than, the inflow at this time, the reservoir level falls below the spillway likely causing Corte Madera Creek to dry out 2-3 weeks earlier in the spring and early summer than would occur without Stanford's operation of the Diversion. When spills cease at Searsville Dam, the channel of lower Corte Madera Creek begins to dry out and aquatic species, including steelhead and red-legged frog, are impacted. Steelhead fry and juveniles may become stranded and killed in isolated pools as the channel dries. If adult steelhead have spawned late in the season (i.e., March and April) in the 0.3 mile reach of Corte Madera Creek below the dam, incubating eggs and larva would be killed by the dewatering of steelhead redds.

During the summer and fall months, lower Corte Madera Creek is generally dry with intermittent shallow pools of water. Crippen and Waananen (1969), as cited in Jones and Stokes (2006), report many small tributaries in the foothills and plains that drain into San Francisquito Creek were ephemeral prior to development. Based on the current rate of reservoir inflow during the summer and early fall months, lower Corte Madera Creek likely experienced similar intermittent flow conditions prior to construction of Searsville Dam. Once spills at the dam crest have ceased, the typical low amount of water withdrawn by the Searsville Diversion during the summer months has little impact on flow rates in Corte Madera and San Francisquito creeks.

Sedimentation of Searsville Reservoir. Searsville Reservoir is rapidly filling with sediment due to historical and current episodes of erosion. The upper watershed is prone to natural landslides and slope failures that produce much of the sediment entering Searsville Reservoir (Balance Hydrologics, Inc. 1996). As a result, since its construction in 1892, the reservoir has lost approximately 90 percent of its water storage capacity to sediment accumulation (Wang et al. 2006). It is estimated that the reservoir, left alone, will be fully filled with sediment in approximately 5 to 40 years, depending on the frequency of large-scale sedimentation events (Balance Hydrologics, Inc. 1996). For 2 or 3 years following the occurrence of major wildfires, landslides, floods, earthquakes and other episodic events in the watershed, Balance Hydrologics, Inc. (1996) predict Searsville Reservoir will experience higher rates of sedimentation. It appears inevitable that the reservoir will be completely filled at some point in the near future (H.T. Harvey and Associates 2001).

Sedimentation of the reservoir and flooding upstream has led Stanford to initiate assessments on the effects of management alternatives at Searsville Reservoir. Most notable, are two assessments: the *Searsville Sediment Impact Study* (Northwest Hydraulic Consultants, Inc. et al. 2002) and *Sedimentation and Channel Dynamics of the Searsville Lake Watershed and Jasper Ridge Biological Preserve* report (Balance Hydrologics, Inc. 1996). These two studies focused on assessing the effects of the reservoir filling with sediment and the feasibility and effects of lowering Searsville Dam. In 2001, H.T. Harvey and Associates completed the *Searsville Lake Sediment Impact Study: Biotic Resources Synthesis Report* which presents a forecast of future biotic conditions in Searsville Reservoir and in San Francisquito Creek below the Dam given no intervention, or under a scenario that includes lowering of Searsville Dam (H.T. Harvey and Associates 2001).

Subsequent to these reports, the Jasper Ridge Advisory Committee released a brief report discussing the Committee's position on "five general management options" for the future of Searsville Reservoir and Dam. The five options identified by the Committee were: 1) allow the reservoir to fill with sediment and transition to meadow habitat; 2) remove the dam and restore Corte Madera Creek to steelhead habitat; 3) alter the dam and dredge the reservoir to maintain

open water in a smaller reservoir at lower water surface elevations; 4) alter the dam to provide downstream flood mitigation; or 5) leave the dam, but remove sediments to maintain open water (Jasper Ridge Advisory Committee 2007). The Committee's report was focused on assessing the impacts of future management options on the JRBP's mission, and determined that dredging the reservoir to maintain open water would "sustain many dimensions of the Preserve's mission" (Jasper Ridge Advisory Committee 2007).

In January 2011, Stanford announced the initiation of a process to study the long-term future of Searsville Dam and Reservoir. The proposed process to address Searsville Dam and Reservoir is presented in a January 6, 2011, document titled "The Future of Searsville Dam and Reservoir", which is included in Appendix E of Volume I of the FEIS. In May 2011, the Searsville Study Steering Committee was created which includes six Stanford faculty members specializing in environmental science, history, and law, and other senior Stanford administrators. This effort will be aided by other Stanford staff and faculty members specializing in such areas as engineering, hydrology, risk management, biology, land use, environmental planning, and environmental law. Over the next 2 years, the committee will study the dam and consider the needs of Stanford, the surrounding community, and the environment in order to recommend a course of action for its future. Potential future courses of action include allowing the reservoir to silt in, maintaining the existing facilities, installing a fish ladder, removing or lowering of the dam, or other currently unidentified actions. If Stanford pursues one or more of these potential actions, Stanford and the relevant local, state, and Federal permitting agencies would perform a comprehensive environmental review of the proposed action.

In the absence of future actions by Stanford, the natural filling of Searsville Reservoir will continue until equilibrium between sediment inflow and sediment outflow is reached (Northwest Hydraulic Consultants, Inc. et al. 2002). As this occurs, H.T. Harvey and Associates (2001) anticipate a steady increase in the extent of riparian habitats in the former lakebed, and a progressive decline in aquatic habitats. The open water habitat of the existing reservoir would, over time, convert to a mosaic of lentic, lotic and terrestrial habitats until a single-thread efficient stream channel evolves (H.T. Harvey and Associates 2001). Filling of the reservoir with sediment would likely reduce annual water diversion amounts by Stanford which would in turn reduce the duration of the Corte Madera Creek channel drying out downstream of Searsville Dam. As the reservoir fills, Corte Madera Creek flows would move towards a run-of-the-river condition where the creek flow entering the reservoir closely approximates the volume and timing of creek flow spilling at the dam crest. Native aquatic species, including steelhead and red-legged frog, would likely benefit from improved stream flow conditions below the dam particularly during the spring and early summer period. Northwest Hydraulic Consultants, Inc. et al. (2002) concluded that the natural filling of Searsville Lake should have a net beneficial impact on steelhead below the dam by reducing the frequency and timing of drying of the streambed. Filling of the reservoir with sediment would also reduce the extent of man-made, warm-water habitat for non-native fishes which prey on native species including steelhead and red-legged frog.

Northwest Hydraulic Consultants, Inc. et al. (2002) predict that temperatures will increase in the open marshes upstream of the dam as the lake gets shallower and the delta sediment front approaches the dam. On hot days when Corte Madera Creek flows are spilling at the dam, water temperatures downstream of the dam may rise to levels stressful for steelhead and other aquatic biota. Over time, marsh vegetation (i.e. willows) would grow along the channel, provide shading, and thermal warming in this reach of Corte Madera Creek would be reduced (Northwest Hydraulic Consultants, Inc. et al. 2002). When the delta sediment front has reached the dam,

incoming sediment will build stream bank height and form a more efficient channel for passing water, sediment, and woody debris. Eventually, the channel will begin to meander back and forth across the Searsville Valley, and small pockets of wetland areas will remain (Northwest Hydraulic Consultants, Inc. 2002).

Once Searsville Reservoir fills with sediment, Northwest Hydraulic Consultants, Inc. et al (2002) predict bedload consisting primarily of sand will be transported over the dam for the first time in more than 100 years. Bedload, which currently is captured in the lake, will increase over time from 0 tons per day to 4,500 tons per day passing over the spillway (Balance Hydrologics, Inc. 2001, as cited in Northwest Hydraulic Consultants Inc.,et al. 2002 [Appendix C, p.66]). Deposition of this sediment in the channel of Corte Madera Creek below the dam and in San Francisquito Creek could affect the composition and quality of substrate for steelhead spawning and rearing. In general, the addition of gravel and cobble would benefit steelhead. There currently is a low abundance of substrate suitable for spawning in the 0.3 mile reach of Corte Madera Creek below the dam (H.T. Harvey and Associates 2001). In San Francisquito Creek, spawning habitat is similarly scarce due to high levels of fine sediment (Jones and Stokes Associates 2006). The coarsening of the bed with gravel and cobble would improve conditions for steelhead spawning and provide additional cover for rearing juvenile steelhead. Alternatively, the deposition of fine sediment in the downstream channel due to the filling of Searsville Reservoir would further degrade substrate conditions for steelhead spawning and rearing.

As discussed above, changes to the channel substrate below Searsville Dam would affect habitat conditions for steelhead, but modeling conducted by Northwest Hydraulic Inc. et al (2002) predict there will be little change to San Francisquito Creek from the filling of Searsville Reservoir with sediment. The HEC-6T model was applied by Northwest Hydraulic Consultants, Inc. et al. (2002) to quantify 50-year trends in sediment transport, erosion, and deposition in San Francisquito Creek associated with filling of Searsville Lake. The results indicate that changes in stage-discharge dynamics of San Francisquito Creek are relatively insensitive (plus or minus 0.2 feet) to changes in sedimentation regime resulting from the filling of Searsville Reservoir, or from episodic increases in sediment delivery from the watershed. This insensitivity to sediment loadings from Searsville Dam is because the majority of sediments being trapped behind Searsville Dam are relatively fine-grained sands, silts, and clays. Modeling predicts the bulk of sediment will pass over Searsville Dam and would be transported through the system to San Francisco Bay during winter storms (Northwest Hydraulic Consultants, Inc. et al. 2002).

If the reservoir is allowed to fill and the dam left in place, steelhead would continue to be blocked at Searsville Dam from approximately one-third of the San Francisquito Creek watershed. This upper one-third of the watershed (the Corte Madera Creek sub-basin) is estimated to contain about 9 miles of suitable habitat (Bjorkstedt et al. 2005; Spence et al. 2012). The contemporary occurrence of resident *O. mykiss* (Leidy 1984) and the presence of suitable habitat conditions in the Corte Madera Creek sub-basin, suggests that the dam has removed a significant portion of steelhead spawning and rearing habitat from the watershed. The existing levels of steelhead abundance and productivity in the watershed are likely reduced from historical levels due to the range restriction created by Searsville Dam, and the natural filling of the reservoir with sediment would maintain this impaired condition for steelhead.

5.5.2 Cumulative Effects by Resource Area

As stated at the beginning of this section, a cumulative impact is an “impact on the environment that results from the incremental impact of the action when added to other past, present and

reasonably foreseeable future actions." (40 CFR 1508.7). Cumulative impacts can result from individually minor but collectively significant actions taking place over time, and may be additive, countervailing, or synergistic. This section identifies potential cumulative impacts from the Proposed Action as a single action, along with the potential cumulative impacts that may result from a combination of the Proposed Action and other actions that overlap with those of the Proposed Action, and/or whose impact zones overlap areas occupied by resources affected by the Proposed Action.

The cumulative effects for each environmental resource are described below. Both adverse and beneficial cumulative effects are considered in the context of other local, state, and Federal actions. In most cases there is no cumulative effect, either existing or caused by the Proposed Action or alternatives. However, continued urban development would likely increase traffic and cause a further decline in air quality. The air basin continues to exceed emission standards for fine particulate matter, and several intersections are currently below acceptable levels of service. These resources are therefore already impacted and current and reasonably foreseeable future development would impact them further because any future development would contribute additional particulate matter into the air basin, and potentially increase levels of traffic, which would exacerbate these conditions. The Proposed Action and alternatives would all have a relatively minimal incremental contribution to these already impacted traffic and air quality conditions. These are indirect effects of the Proposed Action and alternatives that would occur as a result of anticipated future development.

As a single action, the Proposed Action is not likely to have additive cumulative adverse effects on the environment. The HCP and Conservation Program would take immediate effect upon its implementation and be applied consistently thereafter for a period of 50 years. Many beneficial aspects of the HCP would be achieved immediately; however, some additional benefits to Covered Species and their habitat would continue to accrue, such as instream habitat enhancements and construction of additional tiger salamander breeding ponds. In addition, the Proposed Action as a single action has the potential for interactive cumulative effects on Stanford's lands which are anticipated to be beneficial in nature. The individual beneficial impacts of components of the HCP's Conservation Program in combination with adaptive management may cumulatively yield an even greater benefit to the environment and Covered Species as a whole. For example, annual surveys of streams would identify damaged stream bank areas and potential fish passage impediments. With the adoption of a bioengineering approach to bank stabilization, construction of stream habitat enhancement structures, and improved bypass flows downstream of Stanford's water diversion on Los Trancos and San Francisquito Creeks, the Proposed Action would create overall healthier aquatic habitat conditions and, in turn, foster beneficial effects on steelhead and other native aquatic species.

5.5.2.1 Geology and Seismicity

The study area used for the analysis of cumulative effects on geology and seismicity is Santa Clara and San Mateo counties. Most future urban development in the study area would be subject to similar geologic or seismic hazards and these hazards are generally mitigated through a combination of engineering design and site-specific geotechnical measures that address each project's needs as required by applicable local and state codes. The geologic hazards within the study area are considered typical and are normally addressed through appropriate engineering. Therefore, no regional cumulative effect exists. As described in Section 5.1.1, Geologic Hazards and Soils, habitat restoration actions and construction activities in the Proposed Action and alternatives would result in ground disturbance, but not to a level which creates a geologic or seismic hazard. The Proposed Action would not contribute to a substantial cumulative impact to

soils and erosion. The Proposed Action or alternatives would not have any independent adverse effect on geologic resources or pose a seismic hazard, and would not have an additive effect on geology or seismicity.

5.5.2.2 Cultural and Historic Resources

Historically, development in Santa Clara and San Mateo counties has resulted in a cumulative loss of cultural (including archaeological and paleontological) and historic information because these resources have not been consistently identified, documented, assessed and protected. Currently, cultural and historic resources in the study area are protected by state and Federal laws to avoid significant adverse impacts to these resources, so that the cumulative effect is mitigated. In addition, as described in Section 4, Affected Environment, Stanford has adopted policies to protect archaeological resources on Stanford's lands, and maintains a professional staff position (University Archaeologist), collections, and archives on its archaeological resources. Procedures are in place to assure that all ground-disturbing activities are done in a manner that avoids impacts to known cultural resources. When previously unknown cultural resources are discovered, they are documented and assessed for the need to preserve them, sometimes in consultation with the California State Historic Preservation Officer. Because cultural and historical resources are protected in the region and at Stanford through state and Federal laws, and also at Stanford with site-specific Stanford policies, no cumulative impact is anticipated and the Proposed Action or alternatives would therefore not contribute to a study area cumulative effect.

5.5.2.3 Hydrology and Water Quality

The study area used for the analysis of cumulative effects on hydrology and water quality is the San Francisquito Creek and Matadero/Deer Creek watersheds, as past development in these watersheds has contributed to current hydrologic and water quality conditions (Figure 2-2, Primary Watershed Basins).

Construction activities associated with future urban development under the HCP have the potential to impact water quality from erosion and sedimentation. These projects must comply with the NPDES permit requirements of the SCVURPPP and SMCWPPP to control pollution in storm water runoff. These plans are expected to prevent study area cumulative effects on water quality. Likewise, the HCP's conservation activities and future development under the Proposed Action and alternatives would be subject to NPDES permit requirements that minimize water pollution. Additional water quality protections would be afforded by Stanford's creation of conservation easements with vegetative buffers surrounding streams. Riparian vegetation along creek banks filter out fine sediments and other contaminants as they are washed toward streams during rainstorms. Stanford's actions to remedy active erosion sites with bioengineered bank stabilizations would further benefit water quality in the watersheds of San Francisquito and Matadero creeks. Therefore, no cumulative impact to water quality is anticipated and the Proposed Action or alternatives would not contribute to a study area cumulative effect.

The gradual increase in impervious surfaces due to development in the watersheds has resulted in flooding problems in portions of the San Francisquito Creek watershed, although current and future urban development projects, including Stanford projects, are required to control storm water runoff through development of a Hydromodification Plan. The USACE and JPA initiated the San Francisquito Flood Protection and Ecosystem Restoration Project feasibility study in an effort to reduce existing flood risk in the San Francisquito Creek watershed. The study is still underway and has not identified any preferred flood reduction options. The JPA, however, is proceeding with a flood reduction project for San Francisquito Creek between Highway 101 and

San Francisco Bay. Conservation easements created as part of the HCP could complicate, but not prevent, the acquisition of Stanford's land by the USACE or JPA if proven necessary as part of a flood reduction project. Such acquisition is already difficult because, Stanford's Founding Grant prohibits Stanford from selling its lands donated by the Stanford family. Thus, if the USACE and JPA pursue a preferred flood reduction project on Stanford owned lands, the land would have to be condemned through the power of eminent domain. Property subject to a conservation easement is generally more difficult to acquire by eminent domain, but could be condemned if sufficient need for the property is shown. Once condemned, Stanford would no longer control the land and it would no longer be subject to the HCP and associated ITPs.

As part of the HCP, Stanford may excavate accumulated sediments from a reach of Corte Madera Creek up to 2,000 feet in length. This action would be designed to restore the channel's ability to convey high stream flows and prevent localized flooding of roads and adjacent properties.

The Proposed Action or alternatives would not have any independent adverse effect on hydrology or water quality. With respect to flooding, the Proposed Action or alternatives would not have any independent adverse effect on flooding, and would not preclude regional flood reduction improvements. No cumulative flooding impact is anticipated in the watersheds, and therefore, neither the Proposed Action nor the alternatives would have an additive effect on flooding.

5.5.2.4 Air Quality

The study area for the air quality analysis is the San Francisco Bay Area Air Basin. The San Francisco Bay Area Air Basin is managed by the Bay Area Air Quality Management District. It is made up of nine counties including, Alameda, Contra Costa, Marin, San Mateo, San Francisco, Santa Clara, Napa, southern Sonoma and western Solano counties.

As explained in Section 4, although overall emissions have improved over time, the air basin remains out of compliance for certain fine particulate matter and ozone emissions. This is primarily due to construction and an increase in vehicle miles traveled. Although there are plans in place to reduce these emissions (e.g., the 2001 Regional Transportation Plan for the San Francisco Bay Area and the Transportation Air Quality Conformity Analysis [MTC 2002]), the region is currently out of compliance.

Continued urban development in the study area would affect air quality. Specific projects in the study area would be subject to environmental review under CEQA or NEPA and would generally be required to implement feasible mitigation measures to mitigate the impacts to air quality. However, the impacts, and type of mitigation available to mitigate such impacts is currently not known. The Proposed Action and alternatives would result in localized air emissions caused by Conservation Program activities that require heavy equipment use for habitat restoration, as well as from future development anticipated in the 50-year term of the ITPs and the traffic associated with that development. These sources are similar to everyday activities that already occur in the air basin, and would not be a significant new source of air pollution, either stationary or mobile.

The San Francisco Bay Area Air Basin is currently in non-attainment for California's ambient air quality standards for fine particulate matter resulting in a regional cumulative effect on air qaulity. The Air Basin will likely remain in non-attainment as particulate matter (PM10 and PM2.5) emissions are expected to increase slightly in the future. All reasonably foreseeable future urban development would likely contribute fine particulate matter. The Proposed Action

or alternatives would not be a significant source of particulate matter emissions; therefore, their incremental contribution is minimal.

The San Francisco Bay Area Air Basin is also currently in non-attainment for the National 8-hour ozone standard and California 1-hour ozone standard, so there is an existing regional cumulative effect. The BAAQMD's 2005 Ozone Strategy contains policies and regulations that outline how the San Francisco Air Basin will achieve compliance with the state 1-hour ozone standard. The Bay Area Air Basin has already shown a dramatic improvement in ozone conditions over the years (quantified in number of days over the threshold), and ozone precursor emissions are expected to continue to decline over the next 15 years due to the implementation of 1) stationary source control measures through BAAQMD's regulations, 2) mobile source control measures through incentive programs and 3) other activities and transportation control measures in regionally coordinated transportation programs. Because of the expected continued decline in ozone due to these measures, this cumulative impact is likely to be reduced or eliminated during the next 50 years, even with reasonably foreseeable future urban development. As such, the Proposed Action or alternatives are not likely to contribute to a cumulative effect relative to ozone.

The San Francisco Bay Area Air Basin is currently in attainment for California and national ambient air quality standards for CO, NOx, SOx, and lead. Future emissions of ROG and NOx (ozone precursors), TOG, SOx, and CO from activities in the Air Basin have been forecast to continue decreasing or level off in the future, and this takes into account future population growth. Thus, no other future cumulative air quality impacts are anticipated.

The effects related to global climate change are discussed in Section 5.5.3, Global Climate Change.

5.5.2.5 Noise

Noise in the study area (Santa Clara and San Mateo counties) is regulated through the noise element of a city or county general plan and local noise ordinances. Appropriate land use planning locates compatible land uses next to each other and requires mitigation to protect receiving sites from new noise sources or protects new development from existing noise sources. Therefore, there is no existing regional cumulative effect on noise. The Proposed Action and alternatives include conservation activities, ongoing activities, and future development that are normal activities that are anticipated in the region. Implementation of the Proposed Action or alternatives, in conjunction with other reasonably foreseeable actions would not result in a significant amount of new sources of noise. Therefore, no cumulative effects are anticipated, and neither the Proposed Action nor alternatives would have an adverse cumulative effect on noise levels, either alone or in combination with other noise sources in the study area.

5.5.2.6 Traffic

The cumulative analysis for traffic includes an overview of trends in the San Francisco Bay Area region, as well as conditions at Stanford and in the adjoining communities of Portola Valley, Menlo Park, Palo Alto and Woodside. While regional trends provide a historic context and sense of the future, the cumulative effect of development on traffic level of service is typically more severe at the local level. The study area is therefore limited to Stanford, Woodside, Portola Valley, Menlo Park, and Palo Alto.

Traffic in the San Francisco Bay Area has progressively increased over time as population and vehicle ownership has increased. Vehicles per capita in the Bay Area increased from 0.29 in 1930 to 0.64 in 2000, and population increased by over 5 million people. This trend is

anticipated to continue. Past and future population growth combined with an increased number of cars and miles traveled contributes to worsening levels of service at intersections and roads in the region. While measures to improve roadways and reduce traffic are continually implemented, there is an existing adverse study area cumulative effect from past and current development on traffic levels, both regionally and locally within Stanford, Woodside, Portola Valley, Menlo Park, and Palo Alto.

Continued urban development in the study area may lead to more traffic. Future local growth and land use change that could affect traffic is predicted in the general plans for Palo Alto and Menlo Park. Both plans foresee future growth through infill and redevelopment. While these communities are built out in terms of vacant lots, there is potential for population growth through increased density.

The City of Palo Alto Comprehensive Plan (1998-2010) directs future growth in the City "in appropriate locations within the urban area, particularly along transit corridors and near employment centers." It identifies future growth through infill and redevelopment as there is less than 1 percent of vacant developable land in the City.

Menlo Park is mostly built-out, and future development is expected to consist of infill and redevelopment. The development projects recently approved or pending include residential units as well as retail and commercial uses on El Camino Real.

Future growth in Woodside, Portola Valley and unincorporated Santa Clara/San Mateo counties is limited by available parcels and density restrictions, and would include primarily residential development. No large subdivisions are contemplated in the general plans.

The cumulative impact analysis in the GUP EIR included a series of projects that could take place by Year 2010 in the vicinity of Stanford. The analysis concluded that the impacts would be less than significant on public transit, bicycle/pedestrian traffic, parking, and freeways. However, the analysis concluded that by 2010 intersection impacts would be significant along five intersections in the City of Palo Alto, eight in the City of Menlo Park, two in Stanford, and two in Santa Clara County. A series of mitigation measures were included in the GUP EIR; however, despite the program of intersection improvements and trip reduction measures proposed, the EIR stated that "it is not possible to conclude definitively that intersection levels of service would be reduced to less than significant levels. Therefore, although it is likely that intersection impacts would be adequately mitigated for GUP related traffic, this impact is considered to be significant and unavoidable." The traffic impact analysis provided in Section 5.1.6, Traffic also concluded that the future development anticipated in the HCP could adversely affect traffic levels of service.

Generally, conservation related actions, either those related to the Proposed Action, alternatives or other reasonably foreseeable environmental/conservation projects would not permanently alter existing traffic patterns or result in a permanent increase in vehicle trips. Conservation activities include creek restoration to remove fish passage impediments, bank stabilization, non-native species removal, vegetation management/tree planting, and similar activities. These activities could result in minor temporary traffic delays when personnel and equipment are maneuvered to and from project sites. Thus, conservation related actions associated with the Proposed Action or alternatives would contribute minor and temporary traffic to the existing adverse condition.

Reasonably foreseeable urban development, along with the Proposed Action or alternatives could result in increased localized traffic. Future development that would be subject to the ITPs would result in additional traffic during the next 50 years. Cumulative growth in the surrounding

communities, including population density and the per capita vehicle ownership, would also result in increased traffic levels.

The reasonably anticipated future development could adversely affect traffic levels of service at local intersections, both individually and cumulatively with other projects. The specific intersections are not known because the specific location of the development is not yet known. A definitive determination of effects on traffic is not possible considering the uncertainty of changes that could occur over the next 50 years. Improvements to the road system or transit in and around Stanford unrelated to Stanford development could change the projected future traffic environment compared to what is being evaluated here. Even so, it is assumed that the cumulative traffic effect in the study area would be adverse, and that the Proposed Action or alternatives would have an additive effect.

5.5.2.7 Hazardous Materials

The study area for hazardous materials (and hazardous waste) is San Mateo and Santa Clara counties. Hazardous materials are regulated by state and Federal law to protect health and safety. As a result, there is no existing regional cumulative effect related to hazards and toxic materials or waste in the study area. The Proposed Action and alternatives, and other reasonably foreseeable actions would not require the use of hazardous materials other than those normally used in construction (e.g., machinery fuels, antifreeze, etc.), and these would be managed in order to prevent adverse effects. No hazardous waste sites would be affected by these actions, and no cumulative adverse effect is anticipated. The Proposed Action or alternatives would not result in an adverse cumulative effect related to hazardous materials/waste in the absence of a regional cumulative effect.

5.5.2.8 Public Services

The study area for public services (schools, police, fire, wastewater, and solid waste) includes San Mateo and Santa Clara counties. It is anticipated that minimum adequate levels of service would be maintained for future urban development within the study area as mitigation for projects, if necessary, would be required at the time of project approval. Such mitigation could include fees for the expansion of public services including fire and police protection, and schools. Available capacity at regional landfill facilities is anticipated to extend beyond the 50-year time frame of the Proposed Action, given current waste reduction programs mandated by state law. Therefore, there is no study area cumulative effect for schools, police, fire, wastewater, and solid waste services, and the Proposed Action or alternatives would not have an additive effect.

The study area for water supply in the analysis of cumulative effects is the service area for the San Francisco Public Utilities Commission (SFPUC). The SFPUC is the third largest municipal utility in California and the SFPUC Regional Water System currently supplies 2.4 million residential, commercial, and industrial customers. Approximately one-third of delivered water is supplied to retail customers in San Francisco, while the remaining two-thirds are wholesale deliveries to 238 suburban agencies in Alameda, Santa Clara, and San Mateo counties, including Stanford.

SFPUC water demand fell sharply following the drought-induced conservation efforts between 1987 and 1992 and despite increasing population, current water demand remains below pre-drought use. Greater efficiency realized through changes in the plumbing code, conservation efforts, alternative water sources such as recycled water and desalination, all contribute to the amount of water available for future use. The 1983 California Urban Water Management Act

requires all major water suppliers to prepare an Urban Water Management Plan every 5 years to ensure the long-term management and efficient use of water supplies. The SFPUC's 2005 Urban Water Management Plan includes reliability planning; past, current, and projected water use; supply and demand comparisons; water demand management; shortage contingency plans; and water recycling. The SFPUC expects to meet projected water demand (in normal water years) through 2030 (SFPUC 2005). Because these types of plans are developed to manage existing and future supply and demand of water, there would be no existing study area cumulative effect. The analysis in Section 5.1.8, Public Services found that any future development would be subject to available water allocations. The Proposed Action or alternatives, along with other reasonably foreseeable actions would not result in an adverse cumulative effect on water supply.

5.5.2.9 Land Use

The study area for land use is San Mateo and Santa Clara counties. Land use is regulated by city and county general plans and zoning ordinances so that there is a balance between residential, commercial and industrial uses and these uses are appropriately located. There is no existing regional cumulative land use effect in the study area because the land use has been locally controlled and approved.

Implementation of the Proposed Action or alternatives along with other reasonably foreseeable urban development would not result in significant changes in land use, and no cumulative impacts to land use are therefore anticipated. As such, the Proposed Action or the alternatives would not result in cumulatively adverse changes in land use in the absence of a regional cumulative effect.

5.5.2.10 Biological Environment

The study area for the cumulative effects analysis for the tiger salamander, pond turtle, garter snake, and other biological resources, including special-status species, (Cooper's hawk, long-eared owl, yellow warbler, California thrasher, golden eagle, San Francisco dusky-footed woodrat, long-eared myotis, Yuma myotis, and Townsend's big-eared bat, and western leatherwood),[22] includes San Mateo and Santa Clara counties. The assessment of cumulative effects on steelhead presented in this EIS encompasses the Coastal San Francisco Bay Diversity Stratum. Diversity strata for salmonids are generally defined by Bjorkstedt et al. (2005) as groups of populations that inhabit regions of relative environmental similarity and therefore presumed to experience similar selective regimes. Diversity strata represent an important level of structure (although not necessarily biological structure) between the population and DPS, and offer a useful framework for accounting for diversity and spatial structure in the evaluation of population viability under current conditions and future scenarios (Bjorkstedt et al. 2005). The Coastal San Francisco Bay Diversity Stratum of the CCC Steelhead DPS includes populations that spawn in eastern Marin County (Novato Creek, Miller Creek, Corte Madera Creek, and Arroyo Corte Madera del Presidio), in portions of Santa Clara County (Guadalupe River, Stevens

[22] The other special-status species that are included in this analysis are the Cooper's hawk, long-eared owl, yellow warbler, golden eagle, San Francisco dusky-footed woodrat, long-eared myotis, Yuma myotis, and Townsend's big-eared bat, and western leatherwood. These species variously occur in riparian, scrub, and grassland habitat. They are known to occur at Stanford and elsewhere in San Mateo and Santa Clara counties. The San Francisco dusky-footed woodrat and the western leatherwood occur in more restricted ranges than the other species. The woodrat occurs from the southern end of the Golden Gate Bridge to Santa Cruz. Western leatherwood occurs only in the San Francisco Bay area in six counties. The remaining special-status species also occur in other areas of California.

Creek and a portion of San Francisquito Creek), and in portions of San Mateo County (San Francisquito Creek and San Mateo Creek) (Figure 5-1, Coastal San Francisco Bay Diversity Stratum of CCC Steelhead). Activities on these creeks could affect the Coastal San Francisco Bay Diversity Stratum of CCC steelhead populations.

The study area for red-legged frog includes Recovery Unit #4 identified in the USFWS Recovery Plan for the California Red-legged Frog (USFWS, 2002). The recovery unit covers most of San Mateo, Santa Clara, Alameda, and Contra Costa counties. It is defined by watersheds and contains an area with similar conservation needs and population statuses. Stanford is within this Recovery Unit (Figure 5-2, CRLF Recovery Units).

Population growth in San Mateo and Santa Clara counties has contributed to the decline in numbers or extent of several plant and wildlife species, primarily due to disturbance or loss of vegetation types that provide the plant and animal habitat (Section 4, Affected Environment for more information on the status of these species). Moreover, small losses of habitat for non-listed plants may be overlooked at the single-project level, but contribute to the cumulative decline of these species throughout their range. While non-listed these species generally occur in a broader range and have higher population numbers than special status species, over time their habitat in San Mateo and Santa Clara counties have been adversely affected by development. Reasonably foreseeable actions that would affect the biological environment include future operations and maintenance of Searsville Dam and Reservoir, future water withdrawals at the Searsville Diversion, the sedimentation of Searsville Reservoir, future incidental take authorizations, future urban development, future regional flood reduction activities, and conservation activities that could improve habitat conditions and populations.

The Proposed Action is designed to conserve and protect Covered Species from the impacts associated with Covered Activities. The Conservation Program would establish conservation easements along San Francisquito/Los Trancos and Matadero/Deer creeks and the preserved habitat would be monitored and managed in perpetuity. Although there would be temporary impacts when some projects are constructed, riparian restoration, instream habitat enhancement actions, and conservation easements would result in a net benefit to Covered Species. Therefore, no cumulative adverse impacts on Covered Species will occur from the Proposed Action.

For non-listed species and the biological environment overall, the HCP's Conservation Program would have beneficial effects on the biological environment by protecting riparian areas, creeks, and other open space areas in conservation easements. Implementation of minimization measures would avoid and reduce the impacts of ongoing operations and maintenance activities. Degraded and eroding stream bank conditions would be restored through bioengineering for bank stabilization. Enhancement actions such as additional tiger salamander breeding ponds and instream restoration structures would improve existing environmental conditions for native plants and wildlife. Other HCP actions such as controlling non-native species, removing fish passage barriers when feasible, biological surveys and monitoring, and the adaptive management program would benefit the biological environment and result in a reduction of impacts associated with Stanford's ongoing activities. Although the conservation program in the HCP for CTS Only alternative is reduced in scope, it is also designed to provide a net benefit to tiger salamander and the biological environment associated with this species. Therefore, no adverse cumulative impacts to the biological environment are anticipated from the Proposed Action or alternatives.

5.5.2.11 Socioeconomics

The study area for socioeconomics is San Mateo and Santa Clara counties. The existing cumulative effect of employment, housing and income-producing activities have created a study area that is generally economically stable. Implementation of the Proposed Action or alternatives, in conjunction with other reasonably foreseeable actions, would not have a cumulative effect on socioeconomics, although new urban development may provide some additional employment opportunities. Therefore, no cumulative socioeconomic effects are anticipated.

5.5.3 Global Climate Change

Climate change is defined as any significant change in climate metrics, including temperature, precipitation, and wind patterns, over a period of time. The effects of climate change most people refer to today stems from "global warming," a relatively recent phenomenon of rising average temperatures across the globe. The temperature increase is thought to be due in large part to the human-induced increase in greenhouse gas emissions released into the atmosphere as a result of combustion. Common greenhouse gases (GHG) such as carbon dioxide, methane, and nitrous oxide trap radiant heat from the earth causing the average temperature to rise.

Climate change research in reports from the United Nations Intergovernmental Panel on Climate Change (IPCC) (www.ipcc.ch), U.S. Climate Change Science Program's Science Synthesis and Assessment Products, and the U.S. Global Change Research Program, conclude that earth's climate is already changing. This change is expected to accelerate. Human GHG emissions, primarily carbon dioxide emissions (CO_2), are the main source of accelerated climate change. This rise in temperature changes the climate worldwide and is expected to continue to cause or increase the severity of droughts, flooding, wildfires, and food and water shortages (USDA Forest Service guidance).

Currently, there are no laws on the national level that specifically require the evaluation of climate change in NEPA documents nor have any thresholds been set. However, NEPA generally directs Federal agencies to consider the environmental effects of their actions, and as such the effects of global climate change are addressed here.

In an effort to provide Federal agencies with guidance regarding the consideration of global climatic change in documents prepared pursuant to NEPA, the Council on Environmental Quality issued draft guidance. (October 8, 1997); see also, Climate Change Considerations in Project Level NEPA analysis (U.S. Forest Service (USFS), January 13, 2009). The draft guidance identifies two aspects of global climate change which should be considered in NEPA documents:

1. The potential for Federal actions to influence global climatic change (e.g., increased emissions or sinks of greenhouse gases); and
2. The potential for global climatic change to affect Federal actions (e.g., feasibility of coastal projects in light of projected sea level rise).

5.5.3.1 Effects of Climate Change in the Bay Area

General predictions can be made about the regional effects of global climate change, and some qualitative assumptions about the effects of the alternatives, and on the alternatives, can be made based on available scientific information. Predictions regarding air temperature, sea level rise, rainfall patterns, energy use, and fire hazard are presented below.

In March 2006, the California Environmental Protection Agency published the *Climate Action Team Report to the Governor and the Legislature*, which evaluated three scenarios for reducing the amounts of greenhouse gases released into the atmosphere over the next century. Depending on whether and how much these emissions can be reduced, the report projects that by 2100 average temperatures in California will rise between 3 and 10.5 degrees Fahrenheit.

One of the most publicized consequences of global climate change is a predicted acceleration of sea level rise. This acceleration would increase the historic rate of sea level rise, which has been measured in San Francisco Bay for over 140 years. Between 1900 and 2000, the level of the Bay increased by 7 inches. Depending on which end of the range of projected temperature increases occurred, the California Climate Action Team found that water levels in San Francisco Bay could rise an additional 5 inches to 3 feet, or nearly 1 meter by the end of this century. More recent analyses indicate that sea level rise from warming oceans may exceed 4 feet over the next 100 years, or even higher depending upon the rate at which glaciers and other ice sheets on land melt (BCDC 2008).

Warmer weather temperatures would change where and how rain falls in areas. If more precipitation is falling as rain in the Sierra Nevada, where a slowly melting snowpack is the norm, the water will run off faster and less water can be stored. Increased temperatures would likely mean that droughts would be longer and the average annual rainfall could decrease over time. When rain does fall it can create flash flood conditions causing flooding and increased erosion and scouring of waterways.

Warmer temperatures could result in increased energy use due to longer hours of air conditioning. Reduced total rainfall or changes in rainfall patterns could result in increased fuel loads and drier fuels, which in turn could increase the risk and severity of wildfires.

5.5.3.2 Potential for the Alternatives to Influence Global Climatic Change

The EIS assesses the effects of the Proposed Action, the No Action alternative, and HCP for CTS Only alternative. Both the Proposed Action and the HCP for CTS Only alternative include conservation programs that would require the occasional use of construction vehicles. The contribution of GHG emissions from these actions is expected to be minimal.

The ongoing operation and maintenance of Stanford and future development are activities that would occur under the Proposed Action and both of the alternatives. These activities may result in an incremental contribution of construction-related vehicle equipment emissions and increases in traffic related to future development. An assessment of GHG emissions associated with the Covered Activities cannot be undertaken because project-level details are unknown at this time, and any attempt to quantify GHG emissions from future development would be speculative. Future development subject to the ITPs would undergo project specific CEQA or NEPA evaluation at the local level, and would include a more detailed evaluation of GHG emissions that may more precisely quantify the extent of GHG emissions, and if appropriate, impose specific mitigation.

5.5.3.3 Potential for Global Climatic Change to Affect the Proposed Action and the Alternatives

Global climate change is expected to adversely affect habitat conditions for the Covered Species for all of the alternatives. For example, North American climate models predict warmer temperatures, particularly in the summer, and less precipitation in the form of snow for the southwestern United States (IPCC 2007). VanRheenen et al. (2004) found reduced late spring snow pack resulted in decreased winter, spring, and summer stream flows in the Sacramento-San

Joaquin River Basin. Warmer temperatures and reduced stream flows could adversely affect steelhead throughout its range. For example, lower stream flows affect steelhead at all life stages. Reduced winter flows, which attract adults into their natal stream for reproduction, may result in lowered spawning recruitment rates. Lower spring and summer flows would reduce the number of smolts able to leave a watershed, particularly in arid systems that dry back in most water years.

The San Francisquito watershed would likely experience the increased temperatures, particularly in summer, and generally reduced stream flows predicted for California over the next century (IPCC 2007). Reduced winter stream flows would likely have the greatest impact on San Francisquito Creek as the limiting factor for steelhead productivity is overwintering habitat (Jones and Stokes 2006). Reduced winter flow means less recruitment of the boulders and large woody debris that create complex overwintering habitat. In addition, lower flows means less scouring action and lower rates of fine sediment removal from creek pools resulting in less overwintering habitat.

Shorter rainfall seasons and more frequent or prolonged droughts may also affect other Covered Species. Tiger salamander, for example, depends on seasonal ponds that retain enough water in the Spring to facilitate metamorphosis into land-dwelling juveniles. Metamorphosis generally occurs in May or June. A prolonged drought, which is a potential consequence of global climatic change, could therefore seriously impair the continued existence or recovery of the tiger salamander (and other listed species) by impairing this important life-stage.

The effect of global climate change on the Proposed Action and alternatives is currently unknown. However, as described above, global climatic change may worsen habitat conditions for the Covered Species. But, the implementation of the HCP could respond to, and thereby reduce, some of the anticipated effects of global climatic change on the Covered Species and their habitats.

Stanford supports the last known tiger salamander population on the San Francisco peninsula, and as described above, worsening or prolonged drought conditions could adversely the tiger salamander. The HCP, however, addresses certain drought conditions, and commits to remedial measures that would lessen the effect of drought conditions. For example, under the HCP, Stanford may supply artificial water sources to sustain tiger salamander ponds that would otherwise no longer support tiger salamander reproduction. The HCP also includes management actions, such as stream bank revegetation, that would lessen the effects of erosion caused by increased storm severity. Steelhead enhancement actions include the addition of woody debris to San Francisquito Creek, which would improve overwintering conditions. Furthermore, the HCP's monitoring program would improve the Services' understanding of the overall impacts climate change may be having on the Covered Species and their habitat. In this way, the effects of global climate change on the Proposed Action would be reduced. The HCP for CTS Only alternative could likewise reduce the effects of climate change on tiger salamander but would not have any effect on the other Covered Species. The No Action alternative would not reduce the effect of global climate change on the Covered Species because it does not include a comprehensive conservation program.

5.5.4 Comparison of Alternatives

The Proposed Action or alternatives would not contribute to cumulative adverse effects in the study area associated with geology and seismicity, cultural and historical resources, water quality, flooding, biological resources, air quality, noise, hazardous materials/waste, public

services, land use, and socioeconomics. Future development associated with the Proposed Action or alternatives would contribute to cumulatively adverse traffic effects.

Future development covered by the Proposed Action or alternatives would contribute to the loss of a relatively small amount of habitat within the study area. The Proposed Action and HCP for CTS Only alternative could have an additive beneficial effect in combination with proposed conservation plans in preparation in Santa Clara County, however ITPs issued in conjunction with these HCPs would also result in a greater amount of authorized take, so until permit decisions are made, and these HCPs are completed, the cumulative conservation effect is not known.

The Proposed Action and the HCP for CTS Only alternative include conservation programs, but the contribution of GHG emissions from these actions is not cumulatively significant. Because project-level details are unknown at this time, any attempt to quantify GHG emissions from future development under the Proposed Action or alternatives would be speculative. The Proposed Action's Conservation Program includes actions that could reduce the effects of global climate change on the Covered Species. Similarly, the HCP for CTS Only alternative includes actions that could reduce the effects of climate change on tiger salamander.

In comparison, the Proposed Action and alternatives are the same except with regard to cumulative effects on biological resources related to future development and to greenhouse gas emissions. The Proposed Action is superior to the alternatives because it provides a cumulatively beneficial effect on biological resources and provides for adaptive management throughout Covered Species habitat on Stanford's lands to respond to the effects of global climate change on the Covered Species.

5.6 SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

In accordance with NEPA, Section 102 (42 USC 4332), an EIS must include a discussion of the relationship between the short-term uses of the environment and the maintenance and enhancement of long-term productivity. The Proposed Action is fundamentally designed to enhance long-term productivity, and ensures that the long-term preservation and enhancement provided through the Conservation Program (including conservation easements, management plans, habitat enhancement and take minimization measures) would be in place in advance of future habitat conversion.

Long-term productivity is considered in terms of both the natural environment and the human environment. In the case of this HCP, the natural environment would be protected and restored in order to foster increases in the populations of the Covered Species, and this in turn would help overall ecological productivity in the creek zones and the CTS Reserve. The HCP also would provide assurances that operation and maintenance of Stanford could continue and provide a measure of predictability for future development needed by Stanford in order to operate.

5.7 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

In accordance with NEPA, Section 102 (42 USC 4332), an EIS must explain which environmental effects of the proposed project are irreversible or would result in an irretrievable commitment of resources, such as consumption of fossil fuels.

The Proposed Action would result in a minor irretrievable commitment of fossil fuel to implement the Monitoring and Management Plans and for future habitat enhancement. The

Proposed Action would not result in a substantial change in ongoing operations and maintenance or its use of irretrievable resources.

The conversion of land from vacant to urban use would be considered an irreversible commitment due to the remote possibility that the land could revert to open space in the future. Conversion of land to urban use is a Covered Activity, but no specific development is authorized by the Proposed Action.

Table 5-8. Comparison of Alternatives

	Proposed Action	**No Action Alternative**	**HCP for CTS Only Alternative**
Geologic Hazards and Soils	No significant adverse effects, either individually or cumulatively. Bank stabilization would reduce erosion and benefit water quality and easements would protect prime farmland. Greatest benefit for Geologic Hazards and Soils compared to No Action and HCP for CTS Only alternatives.	No significant adverse effects, either individually or cumulatively. Because there would be no comprehensive conservation program, including minimization measures that reduce erosion in Zones 1 and 2 and easement-related conservation activities, the amount of erosion control is likely less than under the Proposed Action. The location of future easements is unknown, so the effect on farmland is unknown.	No significant adverse effects, either individually or cumulatively. Because there would be no comprehensive conservation program for the riparian areas, including minimization measures or easement related conservation activities that reduce erosion in Zone 1 and 2 riparian areas, the amount of future erosion control is unknown, but is likely to be less than under the Proposed Action. The location of future riparian easements is unknown, so the effect on farmland is unknown.
Cultural Resources	No significant adverse effects, either individually or cumulatively.	No significant adverse effects, either individually or cumulatively.	No significant adverse effects, either individually or cumulatively.
Hydrology and Water Quality	No significant adverse effects and would provide beneficial effects. Overall, the Conservation Program under the Proposed Action would improve surface water quality by limiting activities in the riparian easements and requiring minimization measures that protect water quality to benefit the Covered Species.	No significant adverse effects. Provides less water quality protection than the Proposed Action.	No significant adverse effects. Provides less protection of water quality than the Proposed Action.
Air Quality	No significant adverse effects individually. Significant adverse cumulative effects due to particulate emissions.	No significant adverse effects individually. Significant adverse cumulative effects due to particulate emissions.	No significant adverse effects individually. Significant adverse cumulative effects due to particulate emissions.

Table 5-8. Comparison of Alternatives

	Proposed Action	No Action Alternative	HCP for CTS Only Alternative
Noise	No significant adverse effects, either individually or cumulatively.	No significant adverse effects, either individually or cumulatively.	No significant adverse effects, either individually or cumulatively.
Traffic	Unavoidable significant adverse effects, both individually and cumulatively. Projected traffic impacts associated with the GUP development were significant and unavoidable. Future development covered by the ITPs could result in additional traffic to levels of service that are already unacceptable. However, a definitive determination of effects on traffic is not possible because of uncertainty about future land uses and traffic patterns or traffic improvements.	Unavoidable significant adverse effects, both individually and cumulatively. The effects for this alternative would be the same as for the Proposed Action.	Unavoidable significant adverse effects, both individually and cumulatively. The effects for this alternative would be the same as for the Proposed Action.
Hazardous Materials/Waste	No significant adverse effects, either individually or cumulatively.	No significant adverse effects, either individually or cumulatively.	No significant adverse effects, either individually or cumulatively.
Public Services	No significant adverse effects, either individually or cumulatively.	No significant adverse effects, either individually or cumulatively.	No significant adverse effects, either individually or cumulatively.
Land Use	No significant adverse effects, either individually or cumulatively.	No significant adverse effects, either individually or cumulatively. Likely less area subject to the restriction of a conservation easement than under the Proposed Action.	No significant adverse effects, either individually or cumulatively. Likely less area subject to the restriction of a conservation easement than under the Proposed Action.
Biological Resources	Beneficial effect due to a comprehensive Conservation Program that would preserve, enhance, and restore habitat.	No significant adverse effects. This alternative would provide fewer benefits to the Covered Species and other species than the Proposed Action. Conservation activities would be piecemeal and implemented later in time to avoid or mitigate for specific impacts.	No significant adverse effects. This alternative would have the same benefit to tiger salamander as the Proposed Action, but less benefit to the red-legged frog, garter snake, steelhead, and pond turtle due to the lack of a comprehensive conservation program.

Table 5-8. Comparison of Alternatives			
	Proposed Action	**No Action Alternative**	**HCP for CTS Only Alternative**
Socioeconomics	No significant adverse effects, either individually or cumulatively.	No significant adverse effects, either individually or cumulatively.	No significant adverse effects, either individually or cumulatively.

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Figure 5-1. Coastal San Francisco Bay Diversity Stratum of CCC Steelhead DPS

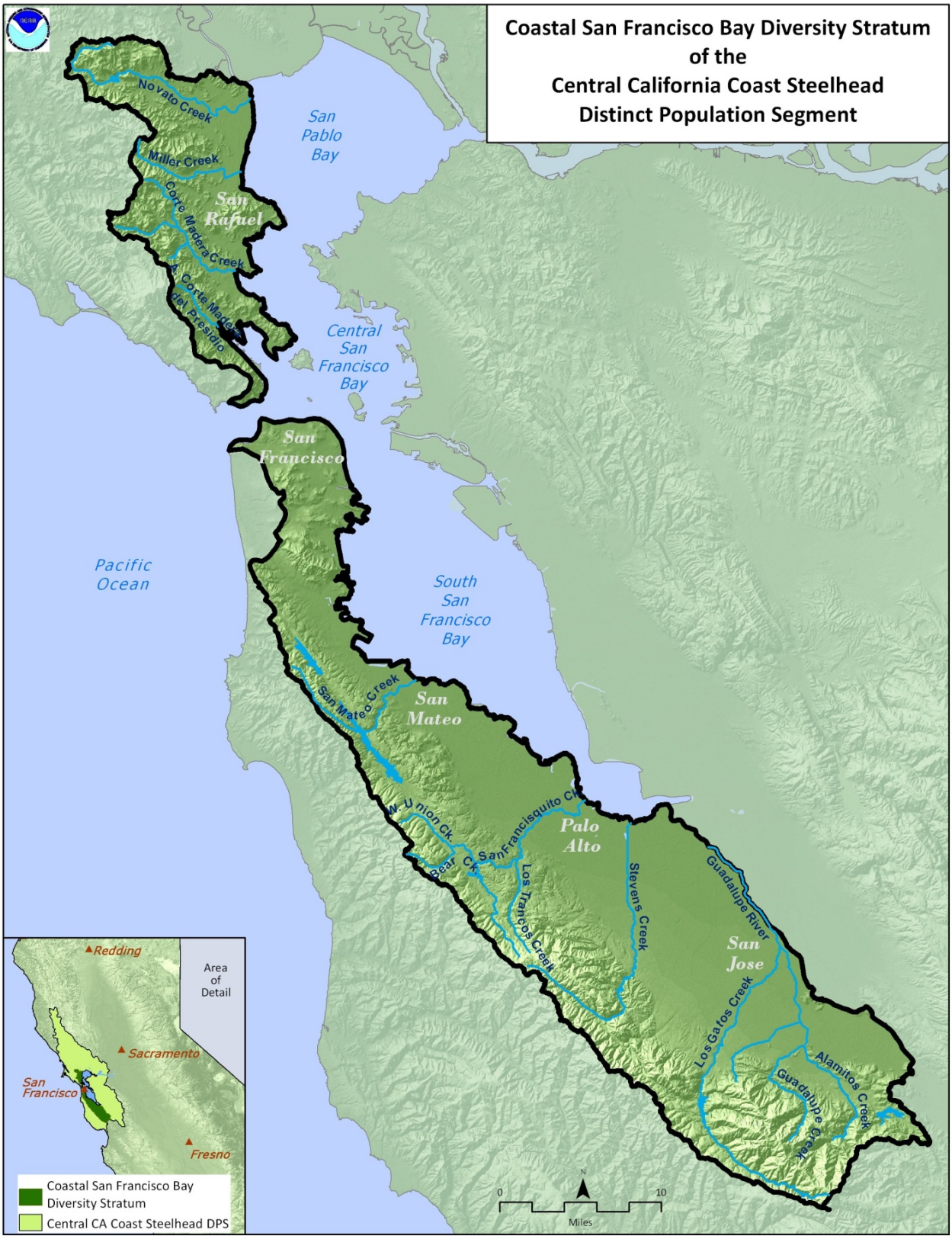
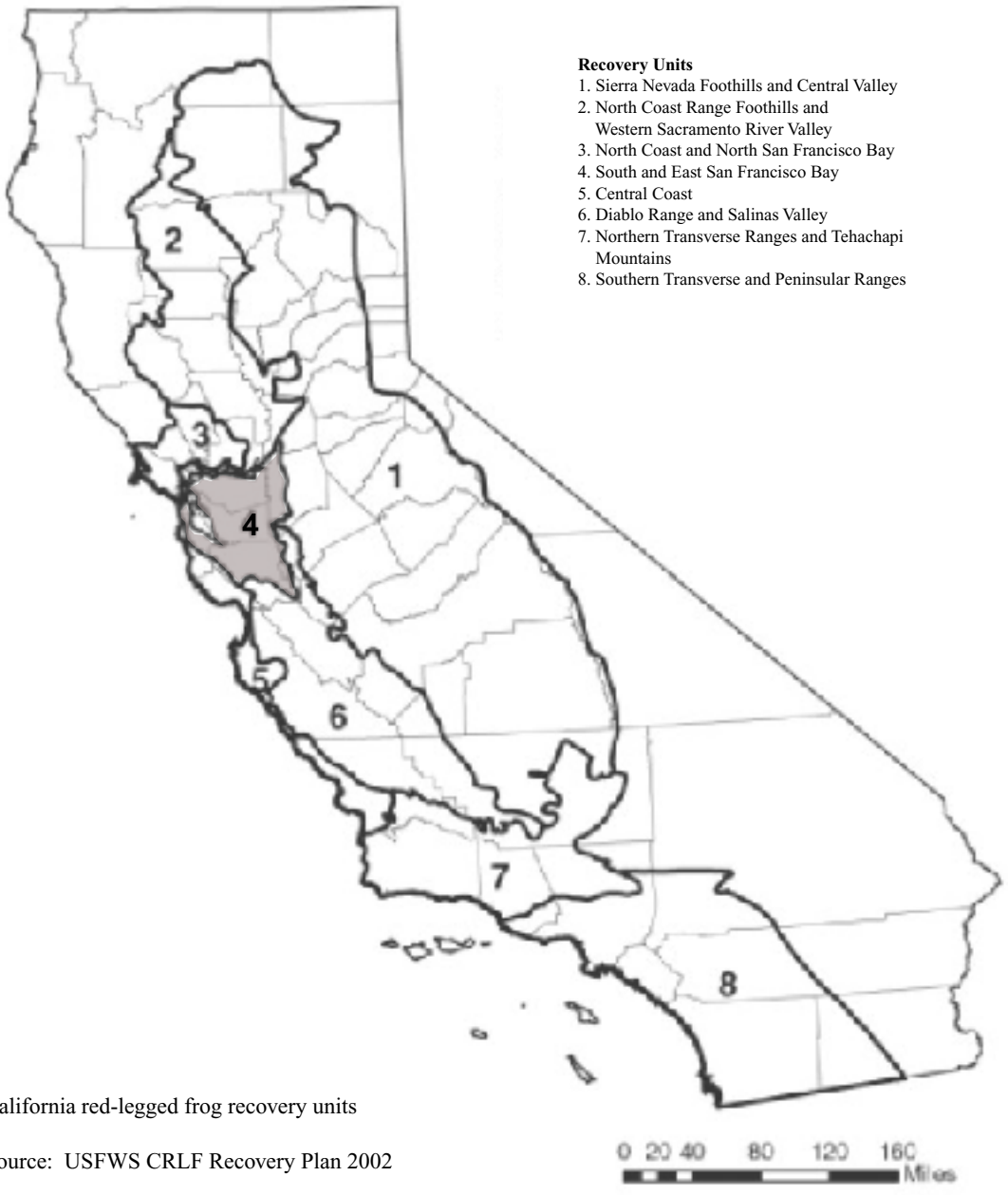


Figure 5-2. CRLF Recovery Units



California red-legged frog recovery units

Source: USFWS CRLF Recovery Plan 2002

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