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**Table 5-7. Covered Species Habitat Acquisition Patch Size, Configuration, and Habitat Connectivity Considerations**

<i>Proposed Covered Species</i>	<i>Minimum Patch Size/Configuration Considerations<sup>1</sup></i>	<i>Habitat Connectivity Considerations<sup>2</sup></i>
<b>Birds</b>		
Tricolored blackbird <i>Agelaius tricolor</i>	Patches of emergent wetland tule/cattail or riparian scrub (e.g., blackberry brambles) of at least 0.5 acre in size (Beedy 1989).	<ul style="list-style-type: none"> <li>▪ Protect habitat areas within 75 feet of a water source and 0.5 mile of wetland, irrigated pasture, alfalfa, or other land cover types that produce large numbers of insects.</li> </ul>
Yellow-breasted chat <i>Icteria virens</i>	Minimum patch size of 10 acres (territory size ranges from 0.2 to 10 acres [Zeiner et al. 1990, Gaines 1974]).	<ul style="list-style-type: none"> <li>▪ Protect drainages with existing continuous woody riparian cover or that could be restored to provide continuous cover to provide for movement and expanding distribution.</li> </ul>
Bank swallow <i>Riparia riparia</i>	At least 17 feet of open, vertical, and erodable channel bank supporting soils that provide suitable nesting substrate (Garrison 1989).	<ul style="list-style-type: none"> <li>▪ Focus preservation within channel reaches that currently support nesting colonies to provide for the ongoing replacement of existing nesting habitat that is lost as channels meander and erode.</li> </ul>
Western burrowing owl <i>Athene cunicularia hypugea</i>	Burrowing owl home range sizes are highly variable (14 to 481 acres [Bates 2006]). Mean home range in California reported by Gervais et al (2000) was 467 acres. Based on these ranges, minimum patch size is 400 acres.	<ul style="list-style-type: none"> <li>▪ Give priority to occupied habitats and grassland habitats that support healthy ground squirrel populations.</li> <li>▪ Protect burrowing owl habitats adjacent to existing habitat areas.</li> </ul>
Western yellow-billed cuckoo <i>Coccyzus americanus occidentalis</i>	At least 25 acres (Gaines 1974) of mature cottonwood/willow riparian forest in a linear configuration along drainages. Habitat patches should be at least 330 feet wide and at least 990 feet long (Gaines 1974), with preservation priority given to patches greater than 50 acres and with widths over 660 feet (defined as suitable habitat by Laymon and Halterman [1989]).	<ul style="list-style-type: none"> <li>▪ Protected habitat should be located within drainages that generally provide continuous canopy cover along its length to promote movement. Does not require continuous breeding habitat, but at least cover and roosting habitat.</li> </ul>
Greater sandhill crane <i>Grus canadensis tabida</i>	Minimum patch size for preserving winter roosting/foraging habitat should be 160 acres. This corresponds with the size of a large intact agricultural parcel. During winter, cranes are found almost exclusively in agricultural fields (rice, corn, wheat, alfalfa) within open agricultural landscapes. They are sensitive to human disturbances and thus will not typically be found in small agricultural patches. The sizes of nocturnal roost sites are highly variable (1-300 acres [Littlefield and Ivey 2000]. Littlefield and Ivey (2000) recommend roost sites of at least 100 acres.	<ul style="list-style-type: none"> <li>▪ Protect foraging habitats within 2 miles of roosting habitat (Littlefield 1993, Littlefield and Ivey 2000).</li> <li>▪ Protect roosting habitats that are at least 0.25 miles from sources of human disturbance that could be sufficient to cause abandonment of roost sites. This distance is recommended by Littlefield and Ivey (2000) for hunting restrictions.</li> </ul>

<i>Proposed Covered Species</i>	<i>Minimum Patch Size/Configuration Considerations<sup>1</sup></i>	<i>Habitat Connectivity Considerations<sup>2</sup></i>
<p>California black rail <i>Laterallus jamaicensis coturniculus</i></p>	<p>Minimum patch size of emergent wetland habitats that can be used by black rails is 0.5 acres (The California Black Rail Project 2004).</p>	<ul style="list-style-type: none"> <li>▪ Give priority to preserving occupied habitat areas and unoccupied habitat areas that are located within 3.7 miles of occupied habitat areas (This distance corresponds with the distance between occupied sites in Yuba County (Aigner et al. 1995).</li> <li>▪ Protect small patches of existing habitat within larger protected patches of grassland, pastureland, and seasonal wetland.</li> </ul>
<p>American Peregrine Falcon <i>Falco peregrines anatum</i></p>	<p>Minimum nesting habitat requirements are rock outcrops, cliff faces, and rimrock with near vertical slopes that are at least 30 feet in height (Wheeler 2003).</p> <p>Foraging occurs over a wide territory (up to a 15 mile radius from the nest [Hays and Milner 1999]), but typically forages in specific areas that congregate waterfowl or shorebird prey. In this respect the peregrine is an opportunistic foraging and the minimum patch size for specific bird concentration areas has not been determined. For purposes here, use a 40 acre minimum patch size for specific foraging sites.</p>	<ul style="list-style-type: none"> <li>▪ No connectivity criteria are proposed because 1) peregrine falcons can forage over a distance from nesting habitat located along the eastern edge of the Planning Area that is greater than the extent of the Planning Area and 2) nesting habitat is defined by fixed geologic features.</li> </ul>
<p>Swainson’s hawk <i>Buteo swainsoni</i></p>	<p>Minimum patch size for preserving foraging habitat should be 830 acres. This represents the smallest home range size of recorded home ranges in the Sacramento Valley (Estep 1989).</p> <p>Minimum patch size for riparian nesting habitat is the same as recommended for western yellow-billed cuckoo (25 acres).</p> <p>Minimum patch size for other nesting habitats is the same as recommended for white-tailed kite (150 acres).</p>	<ul style="list-style-type: none"> <li>▪ Give priority to foraging habitat areas that are within 1 mile of nesting habitat. This roughly corresponds to the minimum home range size (830 acres). However, Swainson’s hawks regularly travel to more distant foraging habitats depending on seasonal changes in prey availability and accessibility (Estep 1989).</li> <li>▪ Conservation lands should be contiguous with other suitable agricultural lands at a minimum of 2,760 acres, the mean home range size of Swainson’s hawks in the Sacramento Valley (Estep 1989).</li> <li>▪ Focus on preserving lands that include potential nesting habitat (e.g., woodland patches, riparian, tree rows, isolated trees) or have potential for enhancement of both nesting and foraging values.</li> </ul>
<p>White-tailed kite <i>Elanus leucurus</i></p>	<p>Minimum patch size of 150 acres, which roughly corresponds to average territory size (Dunk 1995).</p>	<ul style="list-style-type: none"> <li>▪ Prioritize preservation of foraging habitat that is located within 0.5 mile of nesting habitat.</li> </ul>

<i>Proposed Covered Species</i>	<i>Minimum Patch Size/Configuration Considerations<sup>1</sup></i>	<i>Habitat Connectivity Considerations<sup>2</sup></i>
<p>Bald eagle <i>Haliaeetus leucocephalus</i></p>	<p>Minimum patch size for nesting habitat should be at least 30 acres. This corresponds with the USFWS' National Bald Eagle Management Guidelines maximum buffer requirement for bald eagle nest site protection (660 feet from nests) (USFWS 2007). Nesting habitat patch size is highly variable suggesting that use of nesting habitat is not necessarily a function of patch size, but instead related to nest tree structure, proximity to foraging habitat, proximity to other nesting bald eagles, and disturbance. Thus, the maximum buffer distance was used as a minimum patch size.</p> <p>Minimum patch size for preserving terrestrial foraging habitats should be at least 500 acres. This is based on reported territory sizes, and particularly Stalmaster (1987) who suggested 1-2 square km (approximately 500 acres [2 square km]). Territory size is used here to establish a minimum patch size for foraging habitat because territories are defended in part to ensure sufficient food resources to raise young.</p> <p>Preservation of aquatic foraging habitats should focus on preserving the entire length of streams that support anadromous fish.</p>	<ul style="list-style-type: none"> <li>▪ Protect nesting habitat along the Feather River, Sacramento River, Big Chico Creek, Butte Creek, and adjacent to Lake Oroville that are at least 660 feet (USFWS 2007) from sources of human disturbance that could be sufficient to adversely affect nesting success.</li> <li>▪ Restore/create nesting habitat on lands that are adjacent to aquatic foraging habitats, such as Lake Oroville, the forebay and the afterbay.</li> <li>▪ Conservation of foraging habitat should focus on preserving agricultural lands and wetlands that also provide foraging habitat for wintering waterfowl.</li> </ul>
<b>Reptiles and Amphibians</b>		
<p>Giant garter snake <i>Thamnophis gigas</i></p>	<p>Wylie et al. (2002) reported home ranges ranging from 17 to 234 acres in Colusa County. E. Hansen in: ICF Jones &amp; Stokes (2008) reports annual movements of between 0.42 to 0.78 miles along canals in the Natomas Basin. For this species, home range size is less relevant than connectivity of suitable aquatic habitat, which is essential. Minimum patch size should be 320 acres (using a movement distance of 0.5 miles (0.5 miles squared = 320 acres) and should include suitable linear aquatic habitat with connectivity throughout the larger region and adjacent suitable habitat, particularly rice fields.</p>	<ul style="list-style-type: none"> <li>▪ Connectivity of aquatic habitats (e.g., streams or canals) is essential to sustaining populations.</li> <li>▪ Suitable upland aestivation habitat is required immediately adjacent to aquatic habitat (banks, levees, edges, or open uncultivated lands).</li> <li>▪ Adjacency with rice lands is preferred.</li> </ul>
<p>1.1.1.1.1 Blainville's horned lizard <i>Anota coronatum</i> (formerly <i>Phrynosoma coronatum frontale</i>)</p>	<p>Wone and Beauchamp (2003) calculated a maximum home range of 15 acres. In order to provide minimum movement and dispersal potential, minimum patch site should be 40 acres, which also corresponds with a small parcel size in open grassland or chaparral communities.</p>	<p>Conservation lands should be contiguous with larger protected grassland, chaparral, or savannah communities on the eastern edge of the Plan Area.</p>

<i>Proposed Covered Species</i>	<i>Minimum Patch Size/Configuration Considerations<sup>1</sup></i>	<i>Habitat Connectivity Considerations<sup>2</sup></i>
Western pond turtle <i>Actinemys marmorata</i>	Average home range size for adult male is 2.5 acres (Bury 1972). Average nesting distance from water is approximately 100-feet and average distance to upland refugia is 164 feet (Rathbun et al. 2002). Minimum patch size should be 2.5 acres of suitable aquatic habitat (stream or pond/lake) with a minimum 200-foot upland buffer around the perimeter.	Conservation lands along stream courses should have sustainable permanent water flows and are free of significant upstream disturbances including toxins, streamside development, and other sources of potential upstream habitat degradation. Pond or lake conservation lands should be contiguous with open grassland or other natural land habitats to facilitate dispersal.
<b>1.1.1.2</b> Foothill yellow-legged frog <i>Rana boylei</i>	Minimum patch sizes for this species have not been established. Fellers (2005) states that the home range of foothill yellow legged frogs is largely unknown and that movements along streams are fairly modest in terms of distance traveled. Home ranges have been calculated for mountain yellow-legged frog but are highly variable (Vrendenburg et al. 2005). The species is highly aquatic and generally not associated with adjacent upland habitats other than along the immediate edges of streams.	<ul style="list-style-type: none"> <li>▪ Protect aquatic stream habitat and adjacent riparian and upland habitats extending at least 50 feet from the stream.</li> <li>▪ Conservation lands should be along streams that are otherwise protected along their length. Movements and dispersal occur within the stream corridor.</li> </ul>
<b>1.1.1.3</b> Western spadefoot <i>Spea hammondi</i>	Stebbins (1972) suggests individual home ranges of about 1 acre. However, Semlitsch and Brodie (2003) suggest that spadefoot uses an area that can extend an average 1,207 feet from aquatic habitat. Using this distance, the minimum circular patch size should be 105 acres.	<ul style="list-style-type: none"> <li>▪ Conservation lands must include suitable aquatic breeding habitat (streams with pools, vernal pools, ponds) and adjacent open natural lands, mainly vernal pool grasslands, but also other grasslands, chaparral, riparian, and savannah communities.</li> <li>▪ Conservation lands should be contiguous with other protected grasslands, chaparral, riparian, or savannah habitat in order to retain larger landscapes suitable to sustain populations and allow for dispersal.</li> </ul>
<b>Fish</b>		
Central Valley steelhead <i>Oncorhynchus mykiss</i>	<p>Minimum habitat patch sizes for steelhead habitat have not been established. Functional floodplain rearing habitat, however, can be provided by relatively small patches of floodplain. Based on this assessment, floodplain areas of at ___ acres should provide sufficient area to support rearing steelhead.</p> <p>Preserved patches of channel margin habitat supporting overhead and instream cover should be at least █ linear feet.</p> <p>Spawning habitat should encompass at least █ linear feet of stream channels supporting spawning gravels.</p>	<ul style="list-style-type: none"> <li>▪ Focus preservation on floodplain habitats that maintain or can be altered to maintain hydrologic connectivity to main river channels.</li> <li>▪ Topography of inundated floodplains should avoid stranding of steelhead.</li> <li>▪ Must be connected to mainstem Sacramento River with adequate flows for fish passage.</li> <li>▪ Preserved reaches should not include diversions that entrain steelhead.</li> </ul>

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Sacramento River winter run Chinook salmon <i>Oncorhynchus tshawytscha</i>	Minimum habitat patch sizes for Chinook salmon habitat have not been established. Functional floodplain rearing habitat, however, can be provided by relatively small patches of floodplain. Based on this assessment, floodplain areas of at ___ acres should provide sufficient area to support rearing steelhead.  Preserved patches of channel margin habitat supporting overhead and instream cover should be at least █ linear feet.	<ul style="list-style-type: none"> <li>▪ Focus preservation on floodplain habitats that maintain or can be altered to maintain hydrologic connectivity to main river channels.</li> <li>▪ Topography of inundated floodplains should avoid stranding of Chinook salmon.</li> <li>▪ Must be connected to mainstem Sacramento River with adequate flows for fish passage.</li> <li>▪ Preserved reaches should not include diversions that entrain Chinook salmon.</li> </ul>
Central Valley spring run Chinook salmon <i>Oncorhynchus tshawytscha</i>	Minimum habitat patch sizes for Chinook salmon habitat have not been established. Functional floodplain rearing habitat, however, can be provided by relatively small patches of floodplain. Based on this assessment, floodplain areas of at ___ acres should provide sufficient area to support rearing steelhead.  Preserved patches of channel margin habitat supporting overhead and instream cover should be at least █ linear feet.  Spawning habitat should encompass at least █ linear feet of stream channels supporting spawning gravels.	<ul style="list-style-type: none"> <li>▪ Focus preservation on floodplain habitats that maintain or can be altered to maintain hydrologic connectivity to main river channels.</li> <li>▪ Topography of inundated floodplains should avoid stranding of Chinook salmon.</li> <li>▪ Must be connected to mainstem Sacramento River with adequate flows for fish passage.</li> <li>▪ Preserved reaches should not include diversions that entrain Chinook salmon.</li> </ul>
Central Valley fall/late-fall run Chinook salmon <i>Oncorhynchus tshawytscha</i>	Minimum habitat patch sizes for Chinook salmon habitat have not been established. Functional floodplain rearing habitat, however, can be provided by relatively small patches of floodplain. Based on this assessment, floodplain areas of at least █ acres should be to provide sufficient area to support rearing steelhead.  Preserved patches of channel margin habitat supporting overhead and instream cover should be at least █ linear feet.  Spawning habitat should encompass at least █ linear feet of stream channels supporting spawning gravels.	<ul style="list-style-type: none"> <li>▪ Focus preservation on floodplain habitats that maintain or can be altered to maintain hydrologic connectivity to main river channels.</li> <li>▪ Topography of inundated floodplains should avoid stranding of Chinook salmon.</li> <li>▪ Must be connected to mainstem Sacramento River with adequate flows for fish passage.</li> <li>▪ Preserved reaches should not include diversions that entrain Chinook salmon.</li> </ul>

<i>Proposed Covered Species</i>	<i>Minimum Patch Size/Configuration Considerations<sup>1</sup></i>	<i>Habitat Connectivity Considerations<sup>2</sup></i>
Sacramento splittail <i>Pogonichthys macrolepidotus</i>	<p>Minimum habitat patch sizes for splittail habitat have not been established. Functional floodplain spawning and rearing habitat, however, can be provided by relatively small patches of floodplain. Based on this assessment, floodplain areas of at ___ acres should provide a substantial level of splittail production.</p> <p>Preserved patches of channel margin habitat supporting overhead and instream cover should be at least █ linear feet.</p>	<ul style="list-style-type: none"> <li>▪ Focus preservation on floodplain habitats that maintain or can be altered to maintain hydrologic connectivity to main river channels.</li> <li>▪ Topography of inundated floodplains should avoid stranding of splittail.</li> <li>▪ Must be connected to mainstem Sacramento River with adequate flows for fish passage.</li> <li>▪ Preserved reaches should not include diversions that entrain splittail.</li> </ul>
Green sturgeon <i>Acipenser medirostris</i>	<p>Minimum habitat patch sizes for green sturgeon habitat have not been established. Preserved patches of channel margin habitat supporting overhead and instream cover should be at least █ linear feet.</p>	<ul style="list-style-type: none"> <li>▪ Must be connected to mainstem Sacramento River with adequate flows for fish passage.</li> <li>▪ Preserved reaches should not include diversions that entrain green sturgeon.</li> </ul>
River lamprey <i>Lampetra ayresi</i>	<p>Minimum habitat patch sizes for river lamprey habitat have not been established. Preserved patches of channel margin habitat supporting overhead and instream cover should be at least █ linear feet.</p> <p>Spawning habitat should encompass at least █ linear feet of stream channels supporting spawning gravels.</p>	<ul style="list-style-type: none"> <li>▪ Must be connected to mainstem Sacramento River with adequate flows for fish passage.</li> <li>▪ Preserved reaches should not include diversions that entrain river lamprey.</li> <li>▪ Preserved spawning habitat should be should be located near channel margins with sandy substrates that support ammocoete habitat.</li> </ul>
<b>Invertebrates</b>		
Valley elderberry longhorn beetle <i>Desmocerus californicus dimorphus</i>	<p>Minimum habitat patch size for a beetle is a single shrub. USFWS guidelines for replacing habitat for a single removed elderberry shrub require 1,800 square feet of area for restoration (USFWS 1999).</p>	<ul style="list-style-type: none"> <li>▪ Focus preservation on areas that provide a gradient of habitat conditions that support elderberry extending from woody riparian to adjacent oak savanna.</li> </ul>
Vernal pool tadpole shrimp <i>Lepidurus packardi</i>	<p>A vernal pool supporting habitat and its watershed.</p>	<ul style="list-style-type: none"> <li>▪ Protect the integrity of subwatersheds that support vernal pools.</li> </ul>
Conservancy fairy shrimp <i>Branchinecta conservatio</i>	<p>A vernal pool supporting habitat (typically greater than 500 sq ft) and its watershed.</p>	<ul style="list-style-type: none"> <li>▪ Protect the integrity of subwatersheds that support vernal pools.</li> </ul>
Vernal pool fairy shrimp <i>Branchinecta lynchi</i>	<p>A vernal pool supporting habitat and its watershed.</p>	<ul style="list-style-type: none"> <li>▪ Protect the integrity of subwatersheds that support vernal pools.</li> </ul>

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<sup>1</sup>Minimum patch size/shape that should be preserved to provide meaningful habitat value for the species.

<sup>2</sup>Connectivity requirements such as proximity to other patches of species habitat, proximity to other patches of specific land cover types, movement corridors.

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