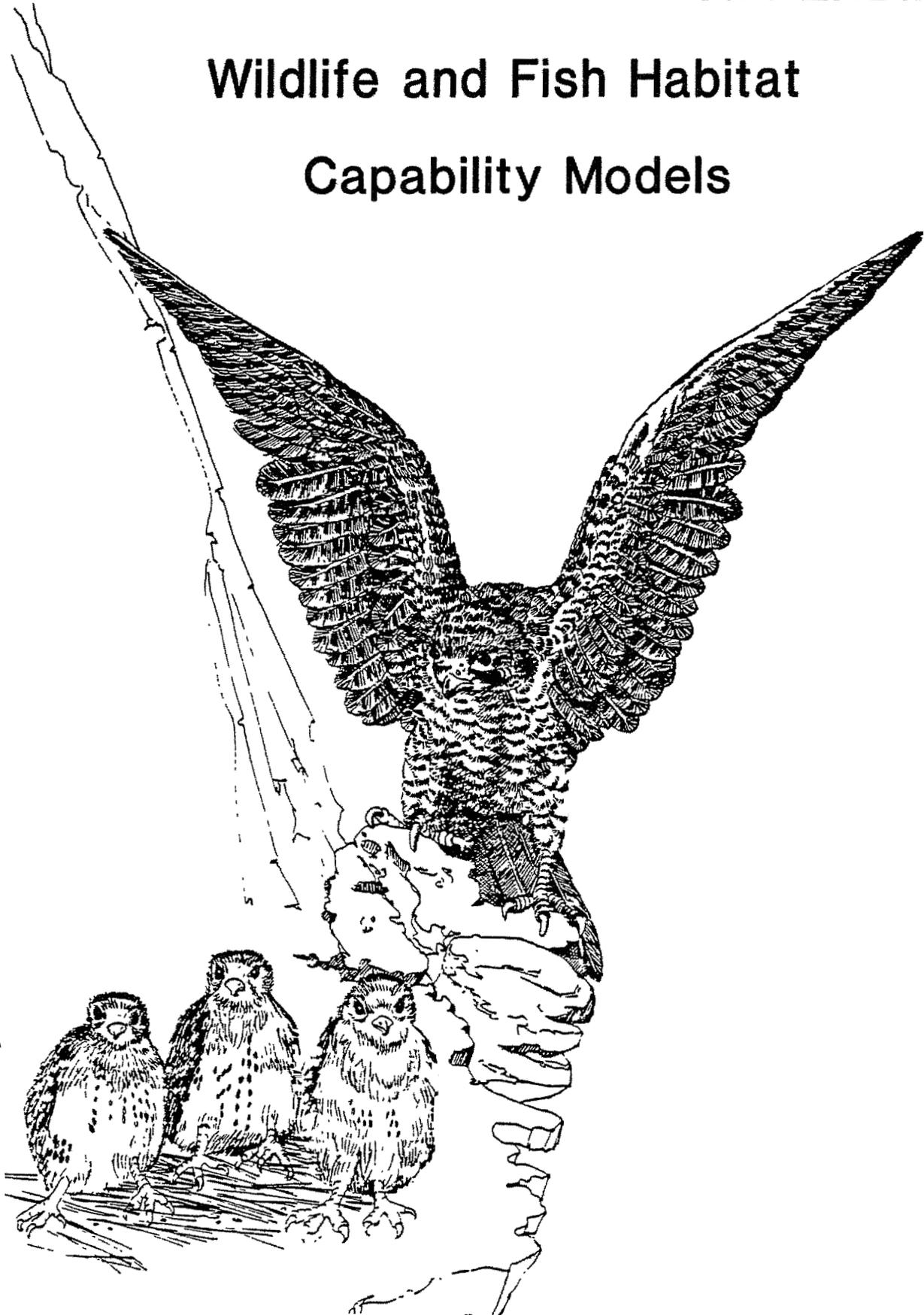


APPENDIX E

Wildlife and Fish Habitat Capability Models



APPENDIX E

WILDLIFE HABITAT CAPABILITY MODELS

Habitat Capability Models (HCMs) were developed for use in Land Management and project level planning to describe habitat conditions needed to sustain Management Indicator Species (MIS) at different wildlife population levels. Habitat capability maintained at the low or marginal level, as described for a particular species, will not provide the required conditions or amount of habitat necessary for continued reproductive success of a pair. In addition, areas of moderate to high habitat capability need to be distributed and maintained throughout the Forest to provide for viable populations of some MIS. Habitat Capability Models (HCMs) will also be used to identify factors limiting the occurrence of MIS within specific areas. These limiting factors may be manipulated to improve habitat capability for MIS in designated areas.

Individual capability models have been refined for use on the Mendocino National Forest. This was deemed necessary since there were three major vegetation typing systems used at various stages of the planning process. These were the Wildlife Habitat Relationships (WHR) program, Forest Timber Strata (used in LMP), and Forest Vegetation Labels. Of the three systems used the Forest Vegetation Labels provided the most detailed display of vegetation types and stand structure. Refinements were restricted to adjusting vegetation types and seral stages displayed in various models to those represented in the Forest Vegetation Label system. A "crosswalk" among the various systems used is displayed in Table 1. The models will be field verified during the implementation of this Plan, and they will also be subject to revision as new information becomes available and validation is conducted through research efforts.

The sources of information used in compiling these models includes the following:

- 1) Schamberger, M., A.H. Farmer, and J.W. Terrell. 1982. Habitat suitability index models: introduction. USDI Fish and Wildlife Service. FWS/OBS-82/10. 2 pp. (There are numerous models in this series.)
- 2) USDA, Forest Service. 1981. Fish and wildlife habitat capability models and special habitat criteria for the Northeast Zone National Forests. Lassen, Mendocino, Modoc and Plumas National Forests. 259 pp.

Additional sources of information included pertinent research and literature, published and unpublished, which is not referenced in the two publications above.

Table E-1

**CROSSWALK AMONG THE VARIOUS VEGETATION TYPING SCHEMES
USED DURING THE FOREST PLANNING PROCESS**

I. VEGETATION TYPING

Forest Vegetation Label	Forest Strata Label	WHR
Black Oak	Hardwoods	Oregon Oak Forest
Mixed Hardwoods	Hardwoods	Oregon Oak Forest
Blue Oak-Grassland Savanna	Hardwood Savanna	Blue Oak-Gray Pine Forest
Conifer/Hardwood*	Conifer/Hardwood*	?
Douglas Fir	Mixed Conifer	Coast Range Montane
Mixed Conifer	Mixed Conifer	Coast Range Montane
Ponderosa Pine	Mixed Conifer	Coast Range Montane
Red Fir	Red Fir	Coast Range Montane
White Fir	Mixed Conifer	Coast Range Montane
Chaparral	Chaparral	Chaparral
Chamise	Chaparral	Chaparral
Miscellaneous Shrubs	Chaparral	Chaparral
Shrub Hardwoods	Chaparral	Chaparral
Streamside Shrubs	Streamside Shrubs	Riparian Deciduous
Grass	Grass	Annual Grassland
Herbaceous Plants	Grass	Perennial Range
Barren	Barren	?
Water	Barren	?
Urban Development	Barren	?
Recent Type Conversion	Barren	?
Recent Fire	Barren	?
Cultivated	Barren	?

* Includes stands of Douglas fir and mixed conifer where the hardwood canopy closure equals or exceeds the conifer canopy closure.

II. SERAL STAGES

Successional Stage	WHR	Forest Vegetative Types	LMP
grass/forb	1	PL	1
shrub/seedling/sapling	2	1	2
poles/small trees, <40% crown closure	3A	2S, 3S, 2P, 3P	3A
poles/small trees, 40+% crown closure	3B, 3C	2N, 2G, 3N, 3G	3B, 3C
medium/large trees, <40% crown closure	4A	4S, 4P	4A
medium/large trees, 40-70% crown closure	4B	4N, 5N, 6N	4B, 4C
medium/large trees, >70% crown closure	4C	4G, 5G, 6G	4C older

SPECIES HABITAT CAPABILITY MODEL: ACORN WOODPECKER (Melanerpes formicivorus)

SPECIES STATUS: California = Fully Protected

SEASON: All

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Vegetation Type and Seral Stage	Black Oak 4S/P; Blue Oak-Grassland Savanna 4S/P/N; Conifer/Hardwood 4S/P	Black Oak 3S/P; Blue Oak-Grassland Savanna 3S/P/N; Conifer/Hardwood 3S/P; Mixed Hard- woods 3S/P, 4S/P; Mixed Conifer 4S	All other types and seral stages
*Minimum Patch Size of Suitable Habitat:	>15 acres	7-15 acres	<7 acres
Snags Within Suitable Habitat*			
...Density			
.....15-24 inches DBH	>2.0 per acre	0.8-2.0 per acre	<0.8 per acre
.....>24 inches DBH	>0.5 per acre	0.2-0.5 per acre	<0.2 per acre
...Height	>40 feet tall	>12-40 feet tall	<12 feet tall
Mast Producing Species within Suitable Habitat	4 or more	2-3	<2
Distance to Water	<0.25 miles	0.25-0.5 miles	>0.5 miles

* Suitable habitat includes at least 1-2 acres of large (size class 4 or greater) oaks and/or pines.

SPECIES HABITAT CAPABILITY MODEL: BALD EAGLE (*Haliaeetus leucocephalus*)

SPECIES STATUS: USFWS = Endangered, California = Endangered

SEASON: Breeding

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Vegetation Type and Seral Stage	Conifer/Hardwood 4S/P, 5S/P; Douglas Fir 4S/P, 5S/P; Mixed Conifer 4S/P, 5S/P; Ponderosa Pine 4S/P, 5S/P	Conifer/Hardwood 4N, 5N; Douglas Fir 4N, 5N; Mixed Conifer 4N, 5N; Ponderosa Pine 4N, 5N	All Others
Nest Tree Species	Dominant sugar and ponderosa pines, >38 inches DBH, large limbs, and open crown	Dominant sugar and ponderosa pines, 28-38 inches DBH, large limbs, and open crown	Other species
*Number and Size of Pilot Trees	2-3 per acre within ¼ mile of nest and 1 tree per acre >24 inches DBH	2-3 per acre within ¼ mile of nest and 1 tree per acre >16 inches DBH	<2 per acre >16 inches DBH
Morphoedaphic Index	>50	10-50	<10
Distance From Nest Site to Foraging Area	<½ mile	½-1 mile	>1 mile
Disturbance	see "Pacific States Bald Eagle Recovery Plan" page 53, sections 1.331-1.334	see "Pacific States Bald Eagle Recovery Plan" page 53, sections 1.331- 1.334	see "Pacific States Bald Eagle Recovery Plan" page 53, sections 1.331-1.334

* Pilot trees are snags, spike top trees, or open canopy live trees.

SPECIES HABITAT CAPABILITY MODEL: BALD EAGLE (Haliaeetus leucocephalus)

SPECIES STATUS: USFWLS = Endangered, California = Endangered

SEASON: Winter

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Vegetation Type and Seral Stage	All Types 4S/P/N/G, 5S/P/N/G	All Types 3S/P/N/G	All Other Types and Seral Stages
Night Roosts	Douglas Fir 4N/G, 5N/G; Mixed Conifer 4N/G, 5N/G	Douglas Fir 4S/P; Mixed Conifer 4S/P; Black Oak 4S/P/N/G; Conifer Hardwood 4S/P/N/G	All others
Distance From Roosting to Foraging Areas	<12 miles	10-12 miles	>12 miles
Perches	Dominant trees or snags, with open crowns and stout limbs, distributed throughout area	Dominant trees or snags, with open crowns and stout limbs, distributed throughout area	Dominant trees or snags, with open crowns and stout limbs, distributed throughout area
Food Supply	Abundant waterfowl or fish; occasional carrion	Abundant waterfowl or fish; occasional carrion	Abundant waterfowl or fish; occasional carrion
Disturbance	see "Pacific States Bald Eagle Recovery Plan" page 53, sections 1.331-1.334	see "Pacific States Bald Eagle Recovery Plan" page 53, sections 1.331- 1.334	see "Pacific States Bald Eagle Recovery Plan" page 53, sections 1.331-1.334

SPECIES HABITAT CAPABILITY MODEL: BLACK-TAILED DEER (*Odocoileus hemionus columbianus*)

SPECIES STATUS: California = Harvest Species

SEASON: All

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Vegetation Type and Seral Stage:			
...Forage	Black Oak 1, 2; *Blue Oak-Grassland Savanna 1, 2; Conifer/Hardwood 1, 2; Mixed Hardwoods 1, 2; Mixed Conifer 1, 2; Chaparral 1, 2; Chamise 1, 2; *Miscellaneous Shrubs 1; *Shrub Hardwoods 1; *Streamside Shrubs; Grass; Herbaceous Plants	Black Oak 3S, 4S; Blue Oak-Grassland Savanna 3S, 4S; Conifer/Hardwood 3S, 4S; Mixed Hardwoods 3S, 4S; Mixed Conifer 3S, 4S; Chaparral 3; Chamise 3; *Miscellaneous Shrubs 2; *Shrub Hardwoods 2	All others
Vegetation Type and Seral Stage:			
...Cover	Black Oak 3P/N, 4P/N; Blue Oak-Grassland Savanna 3 P/N, 4P/N; Conifer/Hardwood 3 P/N, 4P/N; Mixed Hardwoods 3 P/N, 4P/N; Mixed Conifer 3 P/N, 4P/N; Chaparral 3; Chamise 3; *Miscellaneous Shrubs 3; *Shrub Hardwoods 3; *Streamside Shrubs; Grass; Herbaceous Plants	Black Oak 2, 3S, 4S; Blue Oak-Grassland Savanna 2, 3S, 4S; Conifer/Hardwood 2, 3S, 4S; Mixed Hardwoods 2, 3S, 4S; Mixed Conifer 2, 3S, 4S; Chaparral 2; Chamise 2; *Miscellaneous Shrubs 2; *Shrub Hardwoods 2	All others
Cover/Forage Ratio:			
...Cover	40-50%	30-70%	<30% or >70%
...Forage	50-60%	30-70%	<30% or >70%
Escape Cover Patch Size	>20 acres	10-20 acres	<10 acres
Forage Stand Patch Size	0.5-10 acres	10-60 acres	<0.5 or >60 acres

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Hardwood Density (basal area) within Key Summer & Winter Ranges and Migration Routes	Conifer/Hardwood 35 sq ft/ac or retain 75% of existing if <35 sq ft/ac Mixed Conifer 15 sq ft/ac or retain 75% of existing if <15 sq ft/ac	Conifer/Hardwood 35 sq ft/ac or retain 75% of existing if <35 sq ft/ac Mixed Conifer 15 sq ft/ac or retain 75% of existing if <15 sq ft/ac	Conifer/Hardwood 35 sq ft/ac or retain 75% of existing if <35 sq ft/ac Mixed Conifer 15 sq ft/ac or retain 75% of existing if <15 sq ft/ac
Slope	<40%	40-60%	>60%
Distance to Water: ...General ...Fawning	<2 miles <0.25 miles	2-3 miles 0.25-1 mile	>3 miles >1 mile
Open Road Density	<2 miles per square mile	2-4 miles per square mile	>6 miles per square mile
Livestock Utilization of Grassland Habitats	Light	Moderate	Heavy
Other	**	**	**

* The Forest vegetation typing scheme does not distinguish among seral stages for shrub vegetation types or seral stages 1 and 2 for Blue Oak-Grassland Savana type. Field review will be required to make these determinations.

**Black-tailed deer can be wide ranging animals and may exhibit localized, seasonal movements. Succulent, herbaceous vegetation is necessary during the fawning and fawn-rearing period (spring thru summer).

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Hardwood Density (basal area) within Key Summer & Winter Ranges and Migration Routes	Conifer/Hardwood 35 sq ft/ac or retain 75% of existing if <35 sq ft/ac Mixed Conifer 15 sq ft/ac or retain 75% of existing if <15 sq ft/ac	Conifer/Hardwood 35 sq ft/ac or retain 75% of existing if <35 sq ft/ac Mixed Conifer 15 sq ft/ac or retain 75% of existing if <15 sq ft/ac	Conifer/Hardwood 35 sq ft/ac or retain 75% of existing if <35 sq ft/ac Mixed Conifer 15 sq ft/ac or retain 75% of existing if <15 sq ft/ac
Slope	<40%	40-60%	>60%
Distance to Water: ...General ...Fawning	<2 miles <0.25 miles	2-3 miles 0.25-1 mile	>3 miles >1 mile
Open Road Density	<2 miles per square mile	2-4 miles per square mile	>6 miles per square mile
Livestock Utilization of Grassland Habitats	Light	Moderate	Heavy
Other	**	**	**

* The Forest vegetation typing scheme does not distinguish among seral stages for shrub vegetation types or seral stages 1 and 2 for Blue Oak-Grassland Savana type. Field review will be required to make these determinations.

**Black-tailed deer can be wide ranging animals and may exhibit localized, seasonal movements. Succulent, herbaceous vegetation is necessary during the fawning and fawn-rearing period (spring thru summer).

SPECIES HABITAT CAPABILITY MODEL: FISHER (*Martes pennanti*)

SPECIES STATUS: USFS (R5) = Sensitive, California = Fully Protected

SEASON: Year Round

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Home range	6000 acres 8 mile linear limit (Buck 1989)	9400 acres >8 miles: actual limit undefined	10,800 acres
Seral Stages: ...Denning/Resting	5 (old growth), 4 (mature)	5,4	5,4
...Foraging	5,4,3 (mid- succession)	5,4,3	5,4,3
Minimum Stand Size	>120 acres adja- cent to mature timber; >500 acres adjacent to open- canopied areas	80-119 acres adja- cent to mature tim- ber; 200-499 acres adjacent to open- canopied areas	60-79 acres adja- cent to mature timber; 120-199 acres adjacent to open-canopied areas
Denning/Resting Habitat Canopy Closure	>80%, WHR C	61-80%, WHR B	40-60%, WHR B
Home Range Stand Structure	70-80% mature conifer(≥4C); if unavailable, 50-60% ≥4C & 20-30% ≥4B. 25-30% mixcon/hardwoods (≥4B); if unavail- able, 15-20% ≥4B or 3C, 10-15% ≥3C or 3B. 5% hardwood/other (≥4A HW/≥3A-4A other)	60-70% mature coni- fer (≥4C); if unavail- able 40-50% ≥ 4C & 20-30% ≥4B. 20-25% mixcon/hardwoods (≥4B); if unavailable, 10-15% ≥4B or 3C, 10-15% ≥3C or 3B. 5-10% hardwood/other (≥4A HW/≥3A-4A other)	50-60% mature conifer (≥4C); if unavailable 30-40% ≥ 4C & 20-30% ≥4B. 30-40% mixcon/hardwoods (≥4B); if unavail- able, 15-20% ≥4B or 3C, 15-20% ≥3C or 3B. 10-20% hardwood/other (≥4A HW/≥3A-4A other)
Denning and Resting Habitat in Proximity to Riparian or Wet Meadows	< ¼-½ mile	½-1 mile	1-2 miles
Vertical diversity of Denning, Resting, Foraging areas	3-4 layers plus shrubs	2-3 layers plus shrubs	2 layers plus shrubs
Openings without Cover	<1 acre each	1-2 acres each	2-3 acres each

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Minimum Snag Densities:			
...Resting/Denning	≥2/acre ≥44" DBH	1-2/acre ≥30-43" DBH	0.5-1/acre ≥24-29" DBH
...Other Snags (foraging use)	4-5/acre >20" DBH	2-3/acre >20" dbh	1/2-1/acre >15" DBH
Snag Replacement Densities:			
...Resting/Denning	≥6/acre ≥44" DBH	3-6/acre 30-43" DBH	1.5-3/acre 24-29" DBH
...Other snags (foraging use)	12-15/acre >20"DBH	9-18/acre >20"DBH	4.5-9/acre >15"DBH
Downed logs (hunting use)	>4/acre >30"x15'	2-3/acre >20"x15'	1-2/acre >20"x15'
Road Density (miles per square mile)	0 to <0.5	0.5-2	2-3
Travel Corridors:			
...Width	≥600 feet within mature stands; ≥1200 feet adjacent to clearcuts	300-599 feet within mature stands; 600-1199 feet adjacent to clearcuts	100-299 feet within mature stands; 300-599 feet adjacent to clearcuts
...Canopy Closure	>60%	50-60%	40-50%
Habitat Spacing Distance	≤3 miles	3-8 miles	>8-12 miles

SPECIES HABITAT CAPABILITY MODEL: GOSHAWK (*Acipiter gentilis*)

SPECIES STATUS: USFS (R5) = Sensitive, California = Fully Protected

SEASON: All

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Vegetation Type and Seral Stage	Conifer/Hardwood 4N/G, 5N/G; Mixed Conifer 4N/G, 5N/G; Red Fir 4N/G, 5N/G; White Fir 4N/G, 5N/G	Conifer/Hardwood 4P; Mixed Conifer 4P, 3N/G; Red Fir 3N/G; White Fir 3N/G	All others
Minimum Patch Size of Nest Stand	> 125 acres	50-125 acres	< 50 acres
Slope	<25%	25-50%	>50%
Distance to Water	<0.25 miles	0.25 - 1 miles	>1 miles
Distance to an Opening >0.1 acre	<0.25 mile	0.25-1 mile	>1 mile
*Disturbance	Low level within 0.5 mile of the nest site from March 1 - August 30.	Low level within 0.5 mile of the nest site from March 1 - August 30.	Low level within 0.5 mile of the nest site from March 1 - August 30.

*Disturbance is defined as frequent foot traffic, vehicular traffic, road building, logging, etc. This disturbance zone is best delineated on a site specific basis.

SPECIES HABITAT CAPABILITY MODEL: PEREGRINE FALCON (*Falco peregrinus*)

SPECIES STATUS: USFWS = Endangered, California = Endangered

SEASON: All

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Elevation	<4000 feet	4-8000 feet	>8000 feet
Cliff Conditions	Vertical face 75-300 feet high with abundant ledges >10 square feet, or deep caves with commanding views.	Vertical face 75-300 feet high with abundant ledges >10 square feet, or deep caves with commanding views.	Vertical face 75-300 feet high with abundant ledges >10 square feet, or deep caves with commanding views.
Cliff Aspect at Elevations Above 4000 Feet	135-225 degrees(SE-SW)	45-135 degrees(NE-SE), 225-315 degrees (SW-NW)	315-45 degrees (NW-NE)
Proximity to a Major River, Lake, or Marsh	<0.5 miles	0.5-1 mile	>1 mile
Disturbance	Follow guidelines outlined in the Pacific States Recovery Plan for the American Peregrine Falcon.	Follow guidelines outlined in the Pacific States Recovery Plan for the American Peregrine Falcon.	Follow guidelines outlined in the Pacific States Recovery Plan for the American Peregrine Falcon.
Other	*	*	*

*Avian prey must be available in abundance within 6-12 miles of the nest site. Common prey species that should be present in the area, in order of importance, are band-tailed pigeon, rock dove, mourning dove, northern flicker, jays, starling, robin, western meadowlark, acorn woodpecker, red-winged black-bird, and cedar waxwing.

SPECIES HABITAT CAPABILITY MODEL: PILEATED WOODPECKER (*Dryocopus pileatus*)

SPECIES STATUS: California = Fully Protected

SEASON: All

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Vegetation Type and Seral Stage	Douglas Fir 4N/G, 5N/G; Mixed Conifer 4N/G, 5N/G; Ponderosa Pine 4N, 5N; Red Fir 4N/G, 5N/G; White Fir 4N/G, 5N/G; Conifer/Hardwood 4N/G, 5N/G	Douglas Fir 4P; Mixed Conifer 4P; Ponderosa Pine 4P; Red Fir 4P; White Fir 4P	All others
Suitable Habitat Required Per Pair	>300 acres	>300 acres	<300 acres
Nest Stand:			
...Snag Density	1-2 acre patch of 8 or more snags/acre, > 20" DBH with at least 3 > 26" DBH	1-2 acre patch of 3-8 snags/acre, > 20" DBH with at least 3 > 26" DBH	1-2 acre patch of ≤3 snags/acre, > 20" DBH
...Nest tree	> 26" DBH, >80' tall, broken top, no top	20-26" DBH, 40-80' tall, top intact, no bark	<20" DBH, <40' tall, bark present
Snags in Suitable Habitat:			
...Density			
.....15- 24" DBH	>3.0/acre	1.2-3.0/acre	<1.2/acre
.....>24" DBH	>0.5/acre	0.3-0.5/acre	<0.3/acre
...Height	>40'	>40'	<40'
*Feeding Sites Within Suitable Habitat	>10/acre	2.5-10/acre	<2.5/acre

*Feeding sites are dead trees or trees that are alive and have rot; greater than 10 inches in diameter or stumps greater than 3 feet tall and 12 inches in diameter.

SPECIES HABITAT CAPABILITY MODEL: MARTEN (*Martes americana*)

SPECIES STATUS: USFS (R5) = Sensitive, California = Fully Protected

SEASON: Year Round

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Home range	1400 acres	1900 acres	2300 acres
Seral Stage: ...Denning/Resting ...Foraging	5,4 5,4,3	5,4 5,4,3	5,4 4,3
Minimum Stand Size	>120 acres adjacent to mature stands; >500 acres adjacent to open-canopied areas	80-119 acres adjacent to mature stands; 200-499 acres adjacent to open-canopied areas	60-79 acres adjacent to mature stands; 120-199 acres adjacent to open-canopied areas
Denning, Resting Canopy Closure	>70%, WHR C	41-70%, WHR B, C	30-40%, WHR A, B
Stand Structure	50% mature (5% mature $\geq 4C$); if unavailable, 35% $\geq 4C$ & 15% $\geq 4B$. 30% $\geq 4B$; if unavailable, 15% $\geq 4B$ or 3B, 15% $\geq 3C$ or 3B. 20% $\geq 4A$ /other	35% mature ($\geq 4C$); if unavailable, 20% $\geq 4C$ & 15% $\geq 4B$. 45% $\geq 4B$; if unavailable, 25% $\geq 4B$ & 20% $\geq 3C$ or 3B. 20% $\geq 4A$ /other	25% mature ($\geq 4C$); if unavailable, 15% $\geq 4C$ & 10% $\geq 4B$. 55% $\geq 4B$; if unavailable, 30% $\geq 4B$ & 25% $\geq 3C$ or 3B. 20% $\geq 4A$ /other
Basal Area	≥ 350 square feet	176-350 square feet	175 square feet
Opening Size	<1 acre each	1-2 acres each	2-3 acres each
Riparian/Wet Meadows	<1/4 mile from closed canopy stands	1/4-1/2 miles from closed canopy stands	1/2-1 mile from closed canopy stands
Travel Corridors: ...Width ...Canopy Closure	>300 feet within mature stands; >600 feet adjacent to open, un-canopied areas >60%	150-299 feet within mature stands; 300-599 feet adjacent to open, un-canopied areas 50-60%	100-149 feet within mature stands; 200-299 feet adjacent to open, un-canopied areas 40-50%
Habitat Spacing	≥ 2 miles	>2-3 miles	>3-6 miles

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Snag Densities (minimums):			
...Resting/Denning			
.....Number	≥3/acre	2-3/acre	1-2/acre
.....Size	>24" DBH	24" DBH	20-23" DBH
...Foraging			
.....Number	>3/acre	3/acre	2/acre
.....Size	>15" DBH	>15" DBH	>15" DBH
Snag Replacement Densities:			
...Resting/Denning			
.....Number	>9/acre	6-9/acre	3-6/acre
.....Size	>24" DBH	>24" DBH	>24" DBH
...Foraging			
.....Number	>9/acre	9/acre	6/acre
.....Size	>15" DBH	>15" DBH	>15" DBH
Downed Logs:			
...Number	≥20/acre	10-19/acre	5-9/acre
...Size	≥15" x 15'	≥15" x 15'	≥15" x 15'
Road Densities (paved)			
	<1 mile per square mile	1-2 miles per square mile	2-3 miles per square mile

SPECIES HABITAT CAPABILITY MODEL: SPOTTED OWL (*Strix occidentalis*)

SPECIES STATUS: USFWS = Threatened

SEASON: Breeding

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
*Vegetation Type and Seral Stage	Douglas Fir 4G, 5G; Mixed Conifer 4G, 5G	Conifer/Hardwood 4P/G, 5G; Douglas Fir 4N, 5N, 6N/G; Mixed Conifer 4N, 5N, 6N/G	All other types and seral stages
Average DBH of Overstory Trees	>36 inches	21-36 inches	<21 inches
**Tree Canopy Closure	>70%	40-70%	<40%
Tree Canopy Diversity (Number of Layers)	3	2	1
Decadence	High	Moderate	Low
Minimum Size of Nest Stand	>500 acres	300-500 acres	<300 acres
Disturbance (i.e. logging, road building, etc.)	No major or frequent disturbance within nest stand from Feb. 1 to July 15	No major or frequent disturbance within nest stand from Feb. 1 to July 15	No major or frequent disturbance within nest stand from Feb. 1 to July 15

* Hardwood component should consist of trees predominately in size class 4.

** Conifer canopy closure must comprise at least 40% of the total closure.

SPECIES HABITAT CAPABILITY MODEL: TULE ELK (*Cervus elaphus*)

SPECIES STATUS: California = ?

SEASON: All

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Vegetation Type and Seral Stage: ...Forage	Black Oak 1, 2; Blue Oak-Grassland Savanna 1, 2; Chaparral 1; Chamise 1; Stream-side Shrubs; Grass; Herbaceous Plants	Black Oak 3S, 4S; Blue Oak-Grassland Savanna 3S, 4S; Conifer/hardwood 1, 2, 3S; Mixed Hardwoods 1, 2, 3S; Mixed Conifer 1, 2; Chaparral 2; Chamise 2	All other types
Vegetation Type and Seral Stage: ...Cover	Black Oak 3P/N, 4P/N; Blue Oak-Grassland Savanna 3P/N, 4P/N; Conifer/Hardwood 3P/N, 4P/N; Mixed Hardwoods 3P/N, 4P/N; Mixed Conifer 3P/N, 4P/N; Chaparral 3; Chamise 3; Miscellaneous Shrubs 3; Shrub Hardwoods 3; *Streamside Shrubs; Grass; Herbaceous Plants	Black Oak 2, 3S, 4S; Blue Oak-Grassland Savanna 2, 3S, 4S; Conifer/Hardwood 2, 3S, 4S; Mixed Hardwoods 2, 3S, 4S; Mixed Conifer 2, 3S, 4S; Chaparral 2; Chamise 2; Miscellaneous Shrubs 2; Shrub Hardwoods 2	All other types
Cover/Forage Ratio: ...Cover	40-50%	30-70%	<30% or >70%
...Forage	50-60%	30-70%	<30% or >70%
Escape Cover Patch Size	>26.0 acres	5-26 acres	<5 acres
Distance to Water	<0.5 miles	0.5-4 miles	>4 miles
Open Road Density	<1 mile per square mile	1-3 miles per square mile	>3 miles per square mile
Livestock Utilization of Grassland Habitats	Light	Moderate	Heavy
Other	**	**	**

*The Forest vegetation label typing scheme does not distinguish among seral stages for the shrub vegetation types or seral stages 1 and 2 for the Blue Oak-Grassland Savana type. Field review will be required to make these determinations.

**Tule elk can be wide ranging animals and may exhibit localized, seasonal movements. Planning for this species will require providing the necessary vegetative components and habitat elements over a planning area at least 5,000 acres in size under optimum conditions. The key limiting component is the availability of succulent, herbaceous vegetation throughout the year.

SPECIES HABITAT CAPABILITY MODEL: WESTERN GRAY SQUIRREL (*Sciurus griseus*)

SPECIES STATUS: California = Harvest Species

SEASON: All

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Vegetation Type and Seral Stage	Black Oak 4P/N; Blue Oak-Grassland Savanna 4P/N; Conifer/Hardwood 4P/N; Mixed Conifer 4P/N; Mixed Hardwoods 4P/N	Black Oak 3P/N; Blue Oak-Grassland Savanna 3P/N; Conifer/hardwood 3P/N; Mixed Conifer 3P/N; Mixed Hardwoods 3P/N; Ponderosa Pine 4P/N	All other types and seral stages
*Snags in Suitable Habitat:			
...Density			
.....15- 24" DBH	>3.0/acre	1.2-3.0/acre	<1.2/acre
.....>24" DBH	>0.5/acre	0.2-0.5/acre	<0.2/acre
...Height	>40 feet tall	>20-40 feet tall	<20 feet tall
Minimum Patch Size of Suitable Habitat	>10 acres	2.5-10 acres	<2.5 acres
Number of Mast-Producing Species within Suitable Habitat	4+	2-3	<2
Basal Area of Mast-Producing Species >10" DBH within Suitable Habitat	>35 square feet/acre	15-35 square feet/acre	<15 square feet/acre

*Snags should be a mixture of conifers and hardwoods.

SPECIES HABITAT CAPABILITY MODEL: STEELHEAD TROUT (Onchorhynchis mykiss) and CHINOOK SALMON (Onchorhynchus tshawytscha)

SPECIES STATUS: USFWS = Threatened, applies only to the winter run chinook salmon. California = Harvest Species, except the winter run chinook salmon which is listed as Endangered.

LIFE STAGE: Adult (migration)

SEASON: Winter and Spring

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Temperature:			
...Chinook Salmon			
.....Fall	51-60°F	60-67°F	<51°F or >67°F
.....Spring	38-50°F	50-56°F	<38°F or >56°F
...Steelhead			
.....Winter	40-50°F	50-56°F	<40°F or >56°F
Dissolved Oxygen	>80% saturation	80% saturation	<80% saturation
Turbidity	0-10 NTU's	11-19 NTU's	>20 NTU's
Waterfall Height	3 to <6 feet	6 feet	>6 feet
Water Velocities	0-4 feet/second	4-9 feet/second	>9 feet/second
Water Depth	>2 feet	1-2 feet	<1 foot
Pool/Riffle Ratio	40:60	20:80 or 80:20	<20% or >80%
Cover	>80%	60-80%	<60%

SPECIES HABITAT CAPABILITY MODEL: STEELHEAD TROUT and CHINOOK SALMON CONTINUED

LIFE STAGE: Adult Spawning Plus Egg and Larvae Incubation

SEASON: Winter and Spring

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Temperature:			
...Chinook Salmon	45-53°F	42-45°F or 54-57°F	<42°F or >57°F
...Steelhead	41-47°F	39-40°F or 48-49°F	<39°F or >49°F
Substrate	0-10% fines (<3.35 mm)	10-15% fines	15-20% fines
Water Depth:			
...Chinook Salmon			
.....Fall	0.5-2.0 feet	0.4-0.5 or 2.0-3.0 feet	<0.4 or >3.0 feet
.....Spring	0.5-1.0 feet	1.0-2.0 feet	<0.5 or >2.0 feet
...Steelhead			
.....Winter	0.5-2.0 feet	0.3-0.5 or 2.0-3.0 feet	<0.5 or >3.0 feet
.....Summer	0.5-2.0 feet	0.4-0.5 or 2.0-4.0 feet	<0.4 or >4.0 feet
Velocity			
...Chinook Salmon			
.....Fall	1-2 feet/second	0.5-1 or 2-3.5 feet/second	<0.5 or >3.5 feet/second
.....Spring	1-2 feet/second	<1 or 2-3 feet/second	>3 feet/second
...Steelhead			
.....Winter	1-2 feet/second	0.3-1 or 2-3 feet/second	>3 feet/second
.....Summer	1-2 feet/second	0.8-1 or 2-3 feet/second	<0.8 or >3 feet/second
Dissolved Oxygen	>8 ppm	5-8 ppm	<5 ppm

SPECIES HABITAT CAPABILITY MODEL: STEELHEAD TROUT and CHINOOK SALMON CONTINUED

LIFE STAGE: Juvenile

SEASON: All

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Water Velocities	80-100% of the riffles with velocities between 0.5 and 3.5 feet/second	60-80% of the riffles with velocities between 0.5 and 3.5 feet/second	<60% of the riffles with velocities between 0.5 and 3.5 feet/second
Water Depth	80-100% of the stream 0.5 to 3.5 feet deep	60-80% of the stream 0.5 to 3.5 feet deep	<60% of the stream 0.5 to 3.5 feet deep
Substrate	>60% of the streambed composed of coarse gravel, 1.2-2.9", and rubble, 2.9-11.8"	>40-60% of the streambed composed of coarse gravel, 1.2-2.9", and rubble, 2.9-11.8"	<40% of the streambed composed of coarse gravel, 1.2-2.9", and rubble, 2.9-11.8"
Temperature: ...Steelhead ...Chinook Salmon	45-50°F 45-54°F	51-58°F 55-68°F	<45°F or >58°F <45°F or >58°F
Dissolved Oxygen	>7 ppm	6-7 ppm	<6 ppm
Turbidity	0-10 NTU's	11-19 NTU's	>20 NTU's
Cover	80-100% of the stream having suitable cover	60-80% of the stream having suitable cover	<60% of the stream having suitable cover
Streamflow	Flows sufficient to provide near 50:50 pool:riffle ratio, 60-100% of the riffles covered with water, riffle velocities 1.0-1.5 feet/second, pool velocities of 0.3-0.8 feet/second	Flows sufficient to provide 40-60% pools, 40-60% of the riffles covered with water, riffle velocities 0.5-1.0 or 1.5-2.0 feet/second, pool velocities of 0.1-0 or 0.8-1.0 feet/second	Flows providing <40% or >60% pools, <40% of the riffles covered with water, riffle velocities of <0.5 feet/second, pool velocities of <1.0 foot/second

SPECIES HABITAT CAPABILITY MODEL: RAINBOW TROUT (*Onchorhynchis mykiss*)

SPECIES STATUS: California = Harvest Species

SEASON: All

LIFE STAGE: All

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Average Water Width	8-40 feet	4-8 feet	<4 or >40 feet
Average Water Depth	>1.6 feet	0.4-1.6 feet	<0.4 feet
Water Temperature	50-61°F	50-50°F or 61-72°F	<40°F or >72°F
Stream Channel Stability	>80%	50-80%	<50%
Pool Abundance (pool riffle ratio)	40-60%	20-40% or 60-80%	<20 or >80%
Pool Characteristics (pool grade)	A At least 50% of the pools must be greater than 3 feet deep and submerged cover must be >30%	B At least 20% of the pools must be greater than 6 inches deep, and submerged cover must be >20% or stream sections must have continuous deep, slow-moving water	C Less than 20% of the pools are greater than 6 inches deep and submerged cover is >20%
Water Surface Shade	70-95%	35-70% or 95-100%	<35%
Dissolved Oxygen	>7 ppm	6-7 ppm	<6 ppm
Turbidity	0-10 NTU's	11-19 NTU's	>20 NTU's
Spawning Area Substrate	>80% gravel in riffles; <15% silt cover	25-80% gravel in riffles; 15-25% silt cover	<25% gravel in riffles; >25% silt cover
Average Velocity (August 1 - September 15)	1.3-2.7 feet/second	0.8-1.3 or 2.7-3.3 feet/second	<0.8 or >3.3 feet/second
Aquatic Organisms	Abundant-->24 per square foot	Common--10-24 per square foot	Few--<10 per square foot

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Allowable Disturbance to Stream Habitat:			
...Spring Spawners	August 15 - Sep- tember 15	July 15 - August 15 or September 15 - October 30, weather permitting	Any other time of the year
...Spring and Fall Spawners	August 1 - 31	June 15 - July 31 or September 1 - Octo- ber 15	Any other time of the year
...Fall Spawners	June 1 - September 15	May 15 - May 31 or September 15 - October 1	Any other time of the year

SPECIES HABITAT CAPABILITY MODEL: SNAGS

TYPE: Montane Conifer 1/

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Average Density:			
...15-24" DBH	>3.0/acre	1.2-3.0/acre	<1.2/acre
...>24" DBH	>0.5/acre	0.2-0.5/acre	<0.2/acre
...Total	>3.5/acre (max = 10/acre)	1.4-3.5/acre (max = 5/acre)	<1.4/acre (max = 3/acre)
Height	>40 feet	20-40 feet	<20 feet
Dispersion	One group per 5 acres or less, with 15+ snags	One group per 5-15 acres, with 5-15 snags	Even dispersion
Hard:Soft Ratio	>3:1	2:1-3:1	<2:1
Location	Edges of meadows, brushfields, streams, and other water	Throughout wooded stands	Rocky, open slope, barren areas
Species	White fir, Douglas fir, lodgepole pine, black oak, Mt. hemlock	Ponderosa pine, Jeffrey pine, sugar pine, incense cedar, red fir, tan oak, madrone	Whitebark pine

1/ Includes ponderosa pine, mixed conifer, lodgepole pine, red fir subalpine forest, eastside pine, Jeffrey pine, coast range montane, mixed evergreen, and black oak

SPECIES HABITAT CAPABILITY MODEL: SNAGS

TYPE: CONIFER/HARDWOOD WOODLANDS 1/

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Average Density:			
...15-24" DBH	>2.0/acre	0.8-2.0/acre	<0.8/acre
...>24" DBH	>0.5/acre	0.2-0.5/acre	<0.2/acre
...Total	>2.5/acre (max = 10/acre)	1.0-2.5/acre (max = 5/acre)	<1.0/acre (max = 3/acre)
Height	>40 feet	20-40 feet	<20 feet
Dispersion	Combination of clumps (3-6 snags/acre) and even dispersion	Even dispersion	
Hard:Soft Ratio	>3:1	2:1-3:1	<2:1
Location	Edges of meadows, brushfields, streams, and other water	Throughout wooded stands	Barren areas
Species	Gray pine, ponderosa pine, Jeffrey pine, black oak, blue oak, madrone, juniper	White oak, tan oak, live oak	

1/ Includes blue oak savanna, white oak, Oregon oak, gray pine/oak, and pine/juniper WHR types.

SPECIES HABITAT CAPABILITY MODEL: SNAGS

TYPE: Riparian 1/

HABITAT VARIABLE	HIGH (Optimum)	MODERATE (Sub-optimum)	LOW (Marginal)
Average Density:			
...15-24" DBH	>3.6/acre	1.4-3.6/acre	<1.4/acre
...>24" DBH	>0.6/acre	0.2-0.6/acre	<0.2/acre
...Total	>4.2/acre (max = 10/acre)	1.6-4.2/acre (max = 5/acre)	<1.6/acre (max = 3/acre)
Height	>40 feet	20-40 feet	<20 feet
Dispersion	Combination of clumps (5-10 snags/acre) and even dispersion	Even dispersion	
Hard:Soft Ratio	>3:1	2:1-3:1	<2:1
Species	Aspen, cottonwood	Alder, conifers	Willow

1/ The riparian area includes areas within a horizontal distance of 100 feet from the edge of streams, wetlands, and other bodies of water.