

Ecological Inventory Manual

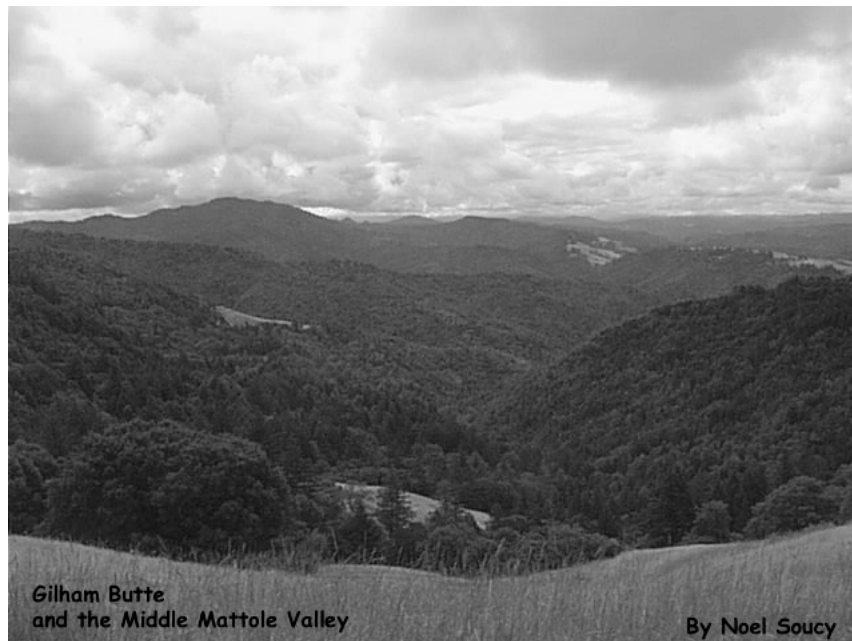
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An Introduction to the Wildlands and Focal Species of the California North Coastal Basin

Written, Compiled, and Edited by
Noel Soucy, Benjamin Marckmann, Keith Slauson, Daniel Boiano, and Shayne Green

LEGACY – The Landscape Connection
Arcata, California

Dedicated in support of
The Redwoods to Sea Stewardship Project



Ecological Inventory Manual – 2001

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This is a not-for-profit, non-published, uncopyrighted manual created and compiled for community use in the conservation of wildlands. This manual offers valuable ecological inventory techniques for community members who wish to understand and steward their homesteads for wildness.

2001 Field Season Version

- ? If you need any help with field surveys in 2001, or find a focal species, please contact the authors or AFI. A professional biologist may be available to do a follow-up survey for spotted owls, marbled murrelets, bald and golden eagle nests, goshawks, and other “special status” species.
- ? Call us at 707-629-3562 for information regarding scheduling workshops in your area.
- ? Please send in your data sheets to POB 4831, Arcata, CA 95518, so we can compile all the citizen-collected data and use it to inform conservation planning decisions.
- ? Fax us your track plate tracks to AFI c/o FCTP: 707-923-4486 so we can help you identify them!

This manual was created with the inspiration that you, the community members, can plan for the wildlife and ecological integrity in your backyard, and the watershed in which you live.

CONTACTS:

Noel Soucy or Benjamin Marckmann
POB 4931 Arcata, California 95518
(707) 629-3562
Screeech_owl@yahoo.com, Weebolls@yahoo.com

LEGACY-The Landscape Connection
POB 59, Arcata, California 95518
(707) 826-9408
www.legacy-tlc.org, jacob@legacy-tlc.org

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I. About the Redwoods to Sea Stewardship Project

"In perhaps the first demonstration that The Wildlands Project concept (of core wilderness areas connected by a web of corridors) is more than pie in the sky here in California, in early October the San Francisco based Save-the-Redwoods League purchased critical pieces of a wildlife corridor between Humboldt Redwoods State Park, the largest old-growth redwood forest, and the King Range National Conservation Area, the longest roadless coastal area in the lower 48. They are calling the acquisition "the corridor from the Redwoods to the Sea." The three key parcels in the purchase, totaling 3,800 acres, were bought from Eel River Sawmills for \$5.25 million, only a fraction of the \$380 million taxpayers paid for the nearby Headwaters Forest, which is approximately the same size. Yet the conservation value of the stepping stones in this corridor may be orders of magnitude greater." (California Wild, Winter 2000)

The Redwoods to Sea Stewardship Project creates connectivity among nearly 140,000 acres of public and private lands on California's North Coast for long-term habitat enhancement and stewardship management. The Redwoods to Sea acquisition project recently purchased several parcels of old- and second-growth forest (as mentioned above) to protect critical connectivity between two of California's most spectacular protected reserves. While acquisition efforts continue, Ancient Forest International (AFI) is organizing the project's second stage: organizing landowners in activities that complement the goal of connectivity and expand the project's conservation opportunities, the Redwoods to Sea Stewardship Project.

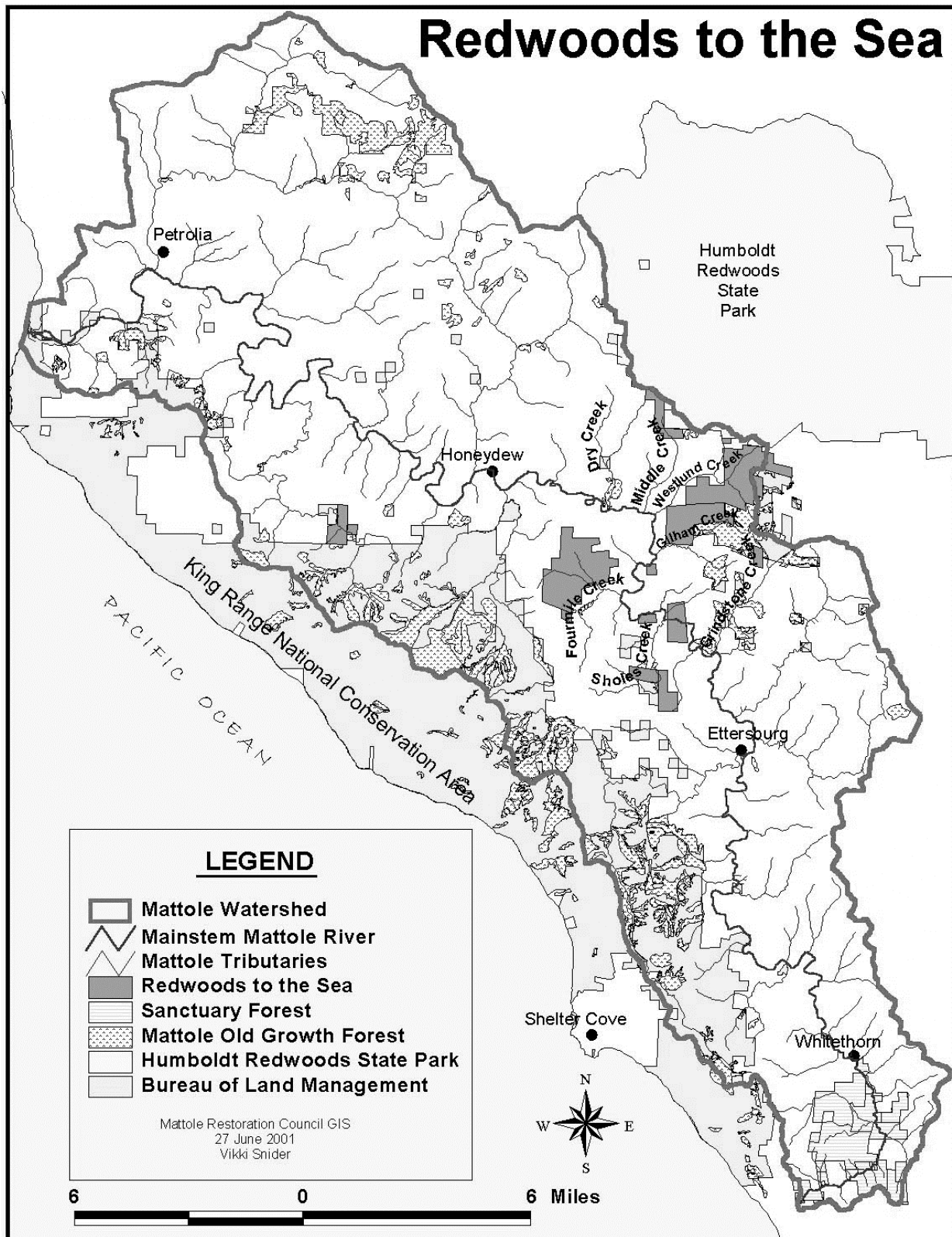
The overall project goals of the Redwoods to Sea Stewardship Project are:

- ? To empower the people living on and near the land to steward the area long into the future.
- ? To protect and recruit wildlife habitat in the largely intact Gilham Butte wildlands area, linking together Humboldt Redwoods State Park, the King Range National Conservation Area, and private parcels.
- ? To enhance the ecological functions and processes at the landscape level.

Many of Humboldt County's cutting edge non-profit organizations have come together for this effort, including AFI, Friends of Gilham Butte, Institute for Sustainable Forestry, LEGACY-The Landscape Connection, Mattole Restoration Council, Mattole Salmon Group, Middle Mattole Conservancy, Sanctuary Forest, and the Tress Foundation.

The project neighbors primarily inhabit Panther Gap, Wilder Ridge and Salmon Creek communities. This diverse group ranges from ranchers to back-to-the-landers, with retirees, loggers, telecommuters, and almost everyone else in between. They share a common desire to steward their properties. Many neighbors recognize the destructiveness of the previous unsustainable logging and its bias towards short-term profits; they are searching for economical ways to restore their land to better health. With help from involved organizations, these land owners are beginning to make decisions on how to implement a better model for conservation across the Redwoods to Sea landscape. This manual is written for those land stewards.

This Ecological Inventory Manual was funded through grants awarded to the Redwoods to Sea Stewardship Project. It was developed as a tool to make wildlands conservation planning possible to every landowner, regardless of their background. The Ecological Inventory Manual brings the work of wildlife biologists home to our backyards. Involving community members in ecological inventory is a relatively new and untried concept. The Ecological Inventory Manual hopes to prove that land owner involvement in creating wildlife corridors is not just a "pie in the sky" idea, but rather a viable step towards landscape recovery and community stability.



II. Introduction to Ecological Integrity Assessment

*Ecological Integrity** is defined as “the capability of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of natural habitats of the region.” (Karr and Dudley 1981). In plain terms, it means that the natural environment is functioning in a way that it can deal with a lot of stress!

Fundamentals of Citizen Surveys

“Through ecological surveys one can learn about one’s neighbors (that is, all the other species) and learn more about the biological community in which one lives. Much can be gained by validating the presence of species that indicate intact and functioning ecosystems, but so much more can be learned by conducting the surveys and learning about the other 99% of the species that will be encountered along the way.

“Some protocols provided in this manual produce results that are independently verifiable by a biologist. These include any protocols that result in a photograph, track, or specimen. In these cases, the only uncertainty that remains is the exact geographic location of the detection. This aspect depends on two things: 1) the ability of the surveyor to orient themselves accurately using map, compass, and/or *GPS*, and 2) the temptation to misrepresent the location of the detection to achieve some other goal. However, detection of many other species cannot be verified and many public agencies and academic scientists would not consider them as useful data in their own right. It will help to have as many *focal species* photographed in the hand prior to release. This mainly applies to the amphibians and reptiles. Photographs are not always definitive. Although the “data” from community surveys will not usually be used by most professional biologists in their original form, these data may be valuable in suggesting locations where follow-up surveys conducted by experienced biologists are warranted.” (Zielinski, pers. comm.)

Training is available in some survey techniques to help make community-collected data more scientifically valuable. The assistance of a professional biologist is also available to conduct follow-up surveys for some focal species, such as spotted owls, bald and golden eagles, northern goshawk, marbled murrelet, willow flycatcher, and snowy plover. Nests of any of these birds are especially important to have verified by a professional biologist. Make sure to take a picture of any nests you find, especially if the parents are around. Please feel free to contact us for information regarding trainings and follow-up surveys in your area.

This manual focuses specifically on focal *terrestrial* and *aquatic* vertebrate species that are indicators of ecological integrity. It is important to realize that focal species can be found at any level of the food chain from the smallest mushroom or insect, to the largest mammals? the elk and the mountain lion. Focal species can be found, but are not limited to, the following groups: unicellular organisms, mold and fungus, lichens, mollusks, insects, plants, vegetation communities, fish, reptiles, amphibians, birds, and mammals.

Importance of Ecological Inventory through Field Surveys

Through community-based field surveys we accomplish numerous important objectives:

Education and Awareness

- 1) Familiarize community members with the “tools of the trade” for ecological inventory including wildlife tracking, habitat assessment, and mapping.
- 2) Create better awareness of wildlife and wildlands of our region.

* Please note: All terms in *italics* in this manual are defined in the Glossary.

- 3) Teach the community to collect scientifically-valuable data for use in conservation and land use planning decisions.

Conservation

- 1) Provide evidence of areas of conservation priority.
- 2) Identify landscapes with high ecological integrity or restoration potential.
- 3) Assess the wildlife habitat potential of wildlands.
- 4) Determine the status of plants and animals that are indicators of ecological integrity.
- 5) Determine the presence of *special status species*.
- 6) Assess impacts and threats to native *biodiversity*.
- 7) Monitor *cumulative impacts* of community *stressors*.
- 8) Monitor ecological changes across the landscape, as well as locally, through time.

Landscape planning

- 1) Inspire community stewardship of landscapes? including component plant and animal communities? through field inventory.
- 2) Provide techniques to collect data for informed land-use planning on a local and regional scale.
- 3) Provide initial survey techniques as a part of a long-term ecological monitoring and planning effort.
- 4) Assess and resolve potential conflicts and *mitigations* before they occur.

Cooperation

- 1) Create a framework in which community members can share and teach.
- 2) Provide a standardized basis for information collection and exchange among local and regional groups.

Plant Communities of the California North Coastal Basin (CNCB)

The California North Coastal Basin (CNCB) is defined by its rivers, from Redwood Creek which drains into Redwood National Park in the north, to the Russian River in the south, including each entire watershed from its headwaters to the ocean. Within this rugged section of coastal California, which extends roughly 300 miles from north to south, and 100 miles inland, one can find the largest contiguous ancient redwood forests and the longest stretches of unroaded coastline in the western states.

Community includes all of the plants and animals in a specific area and their interactions with each other and the environment. We, as humans, are a part of this community, and the balance of its processes. In this manual we will refer to communities by their *dominant* plant or wildlife habitat type.

Plant communities provide a variety of diverse wildlands in the California North Coastal Basin. These wildlands provide habitat and refugia for many organisms. Wildlands of high ecological integrity usually have less negative disturbance by humans or other *stressors*. Protecting wild places of high integrity from *stressors* can not await perfect knowledge. Documenting wild places less affected by *stressors*, as well as those wildlands with occurrences of *special elements* such as old-growth forests, and rare plant and animal species, is important for informing conservation activities, see *Chapter VI. Measuring Special Elements*. The plant communities of the California North Coastal Basin are further described in Chapter III.

Focal Wildlife Species of the California North Coastal Basin

In a region where wildlands are in decline, determining the presence of species that are indicators of ecological integrity? or *focal species*? is important in identifying land that still functions as *refugia* for native biodiversity sensitive to human disturbance. In order to avoid habitat loss and extinction, we must develop our understanding of focal wildlife species so that

their populations can be maintained and restored. Different *indicator species* reflect overall as well as specific ecological health. The information we gather and interpret together through field inventory needs to guide policy and planning decisions in order to truly be effective. The focal species are further described in Chapter IV.

Mapping Special Elements of the CNCB

Special elements include old-growth or *late-seral* forest; locations of rare and threatened species; roadless and wilderness areas; wetlands and seeps; *landscape linkages*; and special places with high aesthetic, cultural, spiritual, or recreational importance; and other entities considered having high conservation value.

A few important reasons to incorporate these areas into a protected area network include: providing *refugia* for rare and threatened species, maintaining ecosystem viability and processes, water quality, flood control, and protecting intrinsic and cultural values of the wildlands. Measuring special elements is further described in Chapter VI.

III. Plant Communities of the CNCB

Within the CNCB, this manual describes twelve plant and four aquatic plant communities. These community types were adapted from *The Terrestrial Vegetation of California* (Barbour and Major 1988). Each of the community types of the CNCB provides important habitat for many associated plant and animal species. The presence of some species within its associated habitat is indicative of ecological integrity (See Appendix 4. Chart 1.). Special habitat attributes, which provide food or shelter for wildlife, are also indicative of ecological integrity. Human disturbances, or extrinsic stressors, decrease the ecological integrity of these plant communities.

Vegetation

Classifying *plant assemblages*, or vegetation types, or simply vegetation, is as variable of a task as the person viewing them is unique. Vegetation forms a continuum across the landscape. Often, the differences among vegetation types are not strongly defined. Patterns in vegetation are thought of by some as being driven by environmental variation. This variation may be viewed as a spectrum of change, or *gradient*, and vegetation changes subtly along these gradients. Where the line is drawn and the definition made is dependent on the purpose of a vegetation *classification scheme*. Vegetation units are developed for functional resource management criteria (i.e. timber or range), conservation measures, ecological and botanical classifications, mapping, etc., and are often associated with landscape units, ecological units, or animal habitats. As the need for the management and conservation of vegetation continues, so does the practical need to understand how vegetation develops and how it is defined. (Sawyer and Keeler-Wolf 1995)

Components of a Plant Community

Within this document, the term *plant community* is used to denote broad, landscape-scale vegetation types and assemblages. Each plant community type is defined by several characteristics. *Community structure* refers to the physical arrangement and form of the plants that comprise the community. *Species composition* refers to the plant series and species that occur within a plant community. Vegetation ecologists have found that certain species may be informative in defining ecological groupings of vegetation types. A *series* is a unit of vegetation named after the plant species (or *genus*) that is dominant in the layer with the greatest amount of *cover* (Sawyer and Keeler-Wolf 1995). The *dominant* layer consists of trees in forests and woodlands, *shrubs* in chaparral and scrub communities, and *herbaceous* plants in grasslands and other non-woody

communities. Each *series* is comprised of one or more species *associations*; fine-scale units of vegetation based on groups of plant species that commonly occur together. Associations are often identified by characteristic species in the understory that co-occur with dominant series layers. (Sawyer and Keeler-Wolf 1995)

Focal species and focal attributes are listed for each of the plant communities present in the CNCB. These are representative species and *ecosystem* attributes that are indicators of ecological integrity. These are elements you should pay attention to and record when you are surveying.

Sources of Information

The plant communities section of this manual synthesizes information about the vegetation of California in terms of the state's North Coastal Basin. Considering the objective of compiling and presenting scientific information on the plant communities of the CNCB in a broad-scale educational format, this manual draws heavily from several sources. Information contained within this section is excerpted and/or adapted from *The Terrestrial Vegetation of California* (Barbour and Major 1977), *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer Jr. 1988), *California Vegetation* (Holland 1985), and *A Manual of California Vegetation* (Sawyer and Keeler-Wolf 1995). Each section within a plant community type is referenced by a three-letter code that indicates the general reference from which the information is excerpted or adapted. In the interests of space, clarity and continuity specific references are contained within the copies of these general references. Reference codes are as follows:

1. (TVC) = *The Terrestrial Vegetation of California* (Barbour and Major 1977)
2. (WHC) = *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer Jr. 1988)
3. (CVH) = *California Vegetation* (Holland 1985)
4. (MCV) = *A Manual of California Vegetation* (Sawyer and Keeler-Wolf 1995)

The following terrestrial and aquatic plant communities are described in the following sections:

A. Terrestrial Habitats

- 1) Redwood and Associated Coastal Conifer Forest
- 2) Mixed-Evergreen Forest
- 3) Oak Woodland
- 4) Closed-Cone Pine and Cypress
- 5) Montane and Sub-Alpine Forest
- 6) Chaparral
- 7) Riparian Woodland
- 8) North Coastal Scrub
- 9) Coastal Prairie
- 10) Coastal Salt Marsh
- 11) Beach and Dune

B. Aquatic Habitats

- 12) Riverine
- 13) Estuarine
- 14) Lakes and Ponds
- 15) Springs, Freshwater marshes, Streams
- 16) Vernal Pools

III A. Terrestrial Habitats

1. Redwood and Coastal Coniferous Forests

Focal Species

1. Marbled murrelet, *Brachyramphus marmoratus*
2. Northern spotted owl, *Strix occidentalis caurina*
3. Pacific fisher, *Martes pennanti pacificus*
4. Humboldt marten, *Martes americana humboldtensis*
5. Tailed frog, *Ascaphus truei*
6. Southern torrent salamander, *Rhyacotriton variegatus*
7. Clouded salamander, *Aneides ferreus*

Focal Attributes

1. Old -rowth trees
2. Snags
3. Downed logs
4. Multi-layered understory
5. Cone-bearing trees

Additional Focal Species:

1. Black salamander, *Aneides flavipunctatus*
2. White-footed vole, *Arborimus albipes*
3. Pileated woodpecker, *Dryocopus pileatus*
4. Red Tree vole, *Arborimus pomo*
5. Shrew mole, *Neurotrichus gibbsii*
6. Northern flying squirrel, *Glaucomys sabrinus*
7. Varied thrush, *Ixoreus naevius*

8. Pacific giant salamander, *Dicamptodon tenebrosus*
9. Del Norte salamander, *Plethodon elongatus*
10. Mountain lion, *Felis concolor*
11. All bat species, Order Chiroptera
12. Cooper's hawk, *Accipiter cooperi* (nesting sites)
13. Sharp-shinned hawk, *Accipiter striatus* (nesting sites)



By Noel Soucy

Community Structure

Stable redwood forest is composed of a multi-layered canopy, dominated by large trees of similar height from various associated species. These impressive forests can reach nearly 120m (400 feet) in height. Redwoods sprout vigorously and eventually form the dominant canopy in *stands* closer to the coast. Douglas-fir becomes the dominant *late-seral* structural component farther from the coast. *Understory* vegetation is usually dense,

(except on *alluvial floodplains*), and a high diversity of species are represented. Mature stands are very shady, nearing complete *canopy closure*, and usually exhibit a dense growth of ferns, mosses, *liverworts*, and *lichens*. (WHC)

Species Composition

Redwood (*Sequoia sempervirens*) is one of the most awe-inspiring species native to the coast of California, and distinguishes the north coastal forests of this region from other forests of the world. Redwood habitat encompasses a mix of conifer species that grow within the coastal influence zone (less than 31 miles from the coast). In traversing these forests from moist to dry locations (as along the coast from Crescent City to Ukiah), one progresses from mixed Sitka spruce-grand fir-hemlock in moist, northern areas, to redwood mixed with other conifers, to redwood mixed with hardwoods, to Douglas-fir with hardwoods, and finally to grassland with oak woodland mosaics in the driest, southerly locations. (TVC) Common conifer associates of redwood habitat include Douglas-fir, western hemlock, grand fir, Coulter pine, Monterey pine, Port Orford cedar, Sitka spruce, sugar pine, and western red cedar. Common hardwood associates include big leaf maple, California bay, canyon and coast live oak, golden chinquapin, madrone and tanoak. Grassland habitats are present as glades and prairies throughout the range of redwood forests. Hardwood presence (except red alder) increases with distance traveled inland. The distribution of these forest types is complex, roughly determined by environmental changes from north to south and from the coast inland. The narrow ecological tolerances of coast redwood is reflected in this distribution. (TVC)

Successional Stages

Redwood trees possess several qualities that make them remarkably adaptable to disturbance. Redwoods have the ability to stump sprout or regenerate saplings from burned, logged, or fallen tree bases. They also tolerate burial of their lower trunks by sediment and debris deposited by flooding. (CVH) After disturbance such as fire, flood, or logging, redwood forest regenerates rapidly. Following the establishment of herb and shrub layers, conifer sprouts and saplings quickly gain dominance by increasing height and canopy closure. Depending on the redwood associates present, a multi-layered canopy is formed and dominated by conifers. In drier areas, hardwoods can be *co-dominant* until they are eventually shaded out and displaced by conifers. Large areas of redwood forest are now in secondary succession or the stage of the plant community development after an initial disturbance, in this case, usually logging or other clearing of the original forest. (WHC)

Threats to the Redwood Forest

Redwood forest is estimated to have covered two-million acres 160 years ago (Stone et al. 1972; Leydet 1969). Today less than five percent of this virgin forest is left, and only half of that is in protected parkland. The redwood belt is usually only about 16km (10 miles) wide and less than 31 miles from the coast. Protected stands that occupy only the lower slopes of watersheds can be endangered by the activities of private developers above them, so the degree of protection for some stands is relative to adjacent land management. In addition, it is possible that redwood stands will not maintain their current *population sizes* without natural or managed fire and flood cycles. It may be necessary to develop a 500-1,000 year management plan for these parks if they are to remain *functionally intact* well into the twenty-first century.

Wildlife Considerations

Redwood forests provide food, cover or special habitat elements for 193 wildlife species (Marcot 1979). This total is comprised of 12 reptiles, 18 amphibians, 109 birds, and 54 mammals. Sensitive species such as the red-legged frog, ensatina, osprey, ringtail, Pacific fisher and marbled murrelet show a relatively high preference for various redwood habitat phases and stages. (WHC)

2. Mixed-Evergreen Forest

Focal Species

1. Northern spotted owl, *Strix occidentalis caurina*
2. Pacific fisher, *Martes pennanti*
3. Tailed frog, *Ascaphus trueii*
4. Southern torrent salamander, *Rhyacotriton varieagatus*
5. Clouded salamander, *Aneides ferreus*

Focal Attributes

1. Old-growth forest

Additional Focal Species:

- | | |
|---|---|
| 1. Humboldt marten, <i>Martes americana humboldtensis</i> | 10. Marbled murrelet, <i>Brachyramphus marmoratus</i> (not certain of occurrence in this community) |
| 2. Black salamander, <i>Aneides flavipunctatus</i> | 11. All bat species, Order Chiroptera |
| 3. Ringtail, <i>Bassariscus astutus</i> | 12. Northern Goshawk, <i>Accipiter gentilis</i> (nesting sites) |
| 4. Northern flying squirrel, <i>Glaucomys sabrinus</i> | 13. Cooper's hawk, <i>Accipiter cooperii</i> (nesting sites) |
| 5. Mountain lion, <i>Felis concolor</i> | 14. Sharp-shinned hawk, <i>Accipiter striatus</i> (nesting sites) |
| 6. Red tree vole, <i>Arborimus pomo</i> | 15. Red-bellied newt, <i>Taricha rivulans</i> |
| 7. Shrew mole, <i>Neurotrichus gibbsii</i> | |
| 8. Rubber boa, <i>Charina bottae</i> | |
| 9. Pt. Arena Mt. Beaver, <i>Aplodontia rufa phaea</i> (not certain of occurrence in this community) | |

Community Structure



By Noel Soucy

The term “mixed-evergreen forest” describes a characteristic set of coastal California *montane*, higher elevation, plant communities. The closed-canopy stands and the broad, thick, leathery-leaved nature of the dominant vegetation typify these forests, which may also contain a minor to significant conifer presence. (TVC) Conifers form the upper canopy and hardwoods form the lower canopy within these forests. Relatively little understory occurs under the

dense, layered canopy created by the dominant trees. Sites that have been disturbed (e.g. fire or logging) develop more extensive ground cover. Accumulations of leaf and branch *litter* on the forest floor vary with forest slope and topography. (WHC)

The mixed-evergreen forest is bounded by a series of vegetation types. In areas of greater moisture, it borders coniferous forests of the Pacific Northwest (hemlock and Sitka spruce forests), redwood forests, and higher-elevation coniferous forests. In drier areas, it borders chaparral, oak woodland, and grassland communities. In Northern California, the mixed-evergreen forest forms a complicated mosaic with northern oak woodland and coastal prairie. Central coast

mountain *phases* continue to form this character mosaic with oak woodland, grassland, and coastal sage scrub, as well as with chaparral. (TVC)

Species Composition

Many species assemblages are included within mixed-evergreen forests. Big leaf maple (*Acer macrophyllum*), canyon live oak (*Quercus chrysolepis*), and California bay laurel (*Umbellularia californica*) more or less range throughout this forest type. Characteristic dominant species, at least in some phases, are Pacific madrone (*Arbutus menziesii*), tanoak (*Lithocarpus densiflora*), coast live oak (*Quercus agrifolia*), canyon live oak, and Douglas-fir (*Pseudotsuga menziesii*). (TVC)

Successional Stages

Mixed-evergreen habitat reaches a stable *climax* composed of a dominant conifer- and hardwood-tiered canopy, effectively creating a closed canopy. This stage is often seen as small, pure stands of conifers interspersed among hardwood stands. Eventually shade-tolerant conifers overtake the lower-canopy hardwoods. Following disturbance such as fire or logging, broad-leaved species rapidly overtake shrub growth and dominate. Most dominant hardwood species sprout vigorously from cut or burned trunks (a characteristic generally not seen in conifers, except for the coast redwood). As the stand grows, conifers mature and gain height quickly over established hardwoods, developing the characteristic tiered-canopy structure. (WHC)

Wildlife Considerations

Canopy cover and understory vegetation are highly variable which makes mixed-evergreen forest habitat suitable for numerous wildlife species. Mature forests are valuable to cavity nesting birds. In wet areas, many amphibians are found in the *detrital* layer. (WHC)

Mixed-Evergreen Forest Types within the CNCB

Douglas-fir/Hardwood Forest

The mixed-evergreen forest of the coast range can be referred to as Douglas-fir/hardwood forest. The hardwood element encompasses a low-elevation coast live oak/madrone forest and a redwood/tanoak/madrone/oak (*Quercus sp.*) forest. Various combinations of Douglas-fir, tanoak, and madrone dominate on deeper, well-watered soils.

This region has a long history of intensive grazing and more recently extensive logging. Keep in mind the larger characteristic pattern of forest-woodland-prairie, so typical of the north coastal region. Stands with grassland species in the openings form a transition with oak woodland. Very old forests are hard to find in this very fire-prone landscape; on frequently burned slopes, the hardwood forest is reduced to low thickets. Nonsprouting conifers lose ground to the hardwoods after major fires. In the absence of major fires, hardwoods lose ground to the shade tolerant conifers. (TVC)

Mixed Hardwood Forest

This forest type occupies the southern portion of the mixed-evergreen forest region, where Douglas-fir has a minor presence, or is absent. In the North Coast Ranges, pure hardwood stands are often fragmented transitions between Douglas-fir/hardwood forest and northern oak woodland or coastal prairie. The understory tends to have many forest shrubs and perennial herbs and few grassland annuals, so typical of oak woodland. (TVC)

Coast Live Oak/Madrone Forest

The lowest-elevation form of the mixed hardwood forests are dominated by coast live oak. However, away from the immediate coast, madrone and other hardwoods may be common. (TVC)

Tanoak/Madrone/Oak Forest

Found in lower elevations within the coast range, this type is considered a redwood border forest. (TVC)

3. Oak Woodland

Focal species

1. Red-bellied newt, *Taricha rivularis*
2. American badger, *Taxidea taxus*
3. Arboreal salamander, (*Aneides lugubrus*)
4. California tiger salamander, (*Ambystoma tigrinum californica*) (not certain of presence within the NCB)
5. Golden Eagle (*Aquila chrysaetos*)
6. Mountain Lion (*Felis concolor*)
7. All bat species, Order Chiroptera

Community Structure

Oak woodland structure is quite variable. Deciduous and evergreen hardwoods, usually oaks, comprise the *overstory*, sometimes accompanied by scattered conifers. Depending on the moisture of the site, the overstory ranges from dense, closed canopies to widely spaced trees forming woodland or *savannah* at drier stands. Understory structure varies greatly, encompassing nearly complete closure by shade-tolerant shrubs and herbs at damper sites, to sparse shrub cover, to total grassland at drier sites. (WHC)



Species Composition

Species from adjacent grassland, chaparral, and forest communities associate with the oak woodland trees over a wide range of location and climate. Many regionally unique, *endemic species* grow in the oak woodland, but often extend well beyond into other plant communities.

Open stands of deciduous white oaks (e.g. Oregon white oak, *Quercus garryana*) characterize vast tracts of oak woodland, but evergreen black oaks are often present and sometimes dominant. Also, one or more species of pine may be scattered among the oaks. On the ground, the oak woodland has significant grass cover under and between the trees. The combination of the interspersed grassland may be similar whether the oaks are of savannah(isolated trees) or woodland (>30% ground cover). The combination of partial deciduous oak canopy and grassy ground cover distinguishes the typical form of this habitat. (TVC)

Successional Stages

Most coastal oak woodlands are comprised of medium to large trees with seedlings and saplings noticeably absent. Regeneration of these forests has not been adequately studied, although it is apparent that many of the stands of component oaks are not reproducing properly.

Introduction of domestic grazing animals and accompanying land management practices are suspect in the change of understory vegetation and the subsequent displacement of young oaks. When mature oaks die they are often followed by open woodlands, savannah, or grassland devoid of younger oaks. (WHC)

Several theories account for the drastic decline of oak regeneration in the past century. On rangeland, acorns and seedlings are eaten and/or trampled by cattle and sheep. An overabundance of deer causes the destruction of young oak seedlings in other portions of oak woodland. Aggressive, introduced species now dominate the herbaceous ground cover and are a significant factor in reducing the survival rate of oak trees. Annual grasses that have replaced native *perennial* bunch grasses compete for moisture and nutrients. They also tremendously increase seed production, along with populations of seed predators, many of which also prey on oak seedlings (e.g. pocket gophers, ground squirrels, field mice, etc.). Changing the grazing pattern of livestock to more closely follow those of historic native grazing animals may be a better land-use practice and may be less detrimental to oak regeneration. (CVH)

Wildlife Considerations

Oak woodlands provide food and cover for many wildlife species. Oak habitat has long been considered important to some birds and mammals as a food resource (i.e. acorns and browse). Barrett (1980) reports that at least sixty species of mammals may use the oak woodlands in some way. Verner (1980) reports 110 species of birds observed during a breeding season in California habitats where oaks form a significant part of the canopy or *subcanopy*. Quail, turkeys, squirrels, and deer may be so dependent on acorns in fall and early winter that a poor acorn year can result in significant declines in their populations (WHC). Many wildlife managers are concerned over the continuing loss of oak woodland habitat. Oak woodland habitat hosts six of our focal species. (WHC)

Oak Woodland Types within the CNCB

Foothill Woodland

On deep soils, valley oak (*Quercus lobata*) often forms nearly pure stands of large trees with no woody understory (valley oak phase). Such valley oak savannahs appear similar in structure on valley bottoms and rolling slopes over a wide range of elevations. A few coast live oaks (*Q. agrifolia*) may be scattered with this phase in Coast Range valleys. On shallower upland soils a more mixed-species community develops. Blue oak (*Q. douglasii*) and Grey pine (*Pinus sabiniana*) are the most characteristic trees in the hillside woodlands (blue oak phase), and valley oak may be present on deep soils. Live oaks are far more important in the uplands. Non-sprouting chaparral shrubs are scattered about. In all regions there is increased evergreen tree and shrub density at higher elevations. (TVC)

Valley Oak Phase

Park-like valley oak stands are best developed on watercourse *floodplain terraces* of large valleys, but they may extend onto older terraces and low rolling hills. (TVC)

Blue Oak Phase

Blue oak grow over many thousands of acres in southeast Mendocino County. It is considered the most drought tolerant of California oak trees. (TVC)

Bald Hills

Bald hills not only have Oregon oak (*Q. garryana*) rather than blue oak, but they also have a different structure. Although there is a superficial resemblance, the savannas have a more balanced mixture of blue oak trees and grass, whereas on the bald hills either Oregon oak or grass are dominant (Clark 1937). In part, this grass/tree mosaic reflects a *soil mosaic*. The best

development of the bald hills type occurs on ridgetops in Mendocino and Humboldt Counties up to 1600m (5,250 feet) in elevation. (TVC)

4. Closed-cone Pine and Cypress

Focal Species/Attributes

1. Stand recruitment

Community Structure

The closed-cone pine and cypress are unique plant communities scattered the length of the CNCB's coast and mountains. Most stands are influenced by maritime climate. A number of endemic species are associated with these communities. These relic forests are usually found on sites that are more rocky and infertile than surrounding soils. Many stands are found on *serpentine* soils, especially knobcone pine, and Sargent and Macnab cypress. (TVC)

Even-aged stands are characteristic of closed-cone pine and cypress forests. This structure is largely determined by the fire ecology of these forests (*see successional stages section below*). Understory vegetation is usually sparse, consisting mainly of shrubs, except in pine stands where *chaparral* shrubs can form a dense cover. (WHC)

The species composition of closed-cone forest understory is strongly affected by the proximity to other plant community types. Closed-cone forest *intergrades* with coastal coniferous, mixed evergreen, and coast live oak forests, as well as coastal scrub and coastal prairie. (CVH)

Species Composition

The characteristic species are the closely related knobcone pine (*Pinus attenuata*), bishop pine (*P. muricata*), and possibly shore pine (*P. contorta* ssp. *contorta*) and pygmy pine (*P. contorta* ssp. *bolanderi*). (Knapp 1965) The cypresses include three species that are all endemic to California. They are Macnab cypress (*Cupressus macnabiana*), Mendocino cypress (*C. pygmaea*), and Sargent cypress (*C. sargentii*). The primary species are intimately related to fire, with the cones usually accumulating on the tree until opened by fire. This habitat is typically dominated by a single species, forming pure stands. Few stands contain both closed-cone pines and cypresses. (TVC)

Successional Stages

Closed-cone-pine and cypress forests are true fire-dependent habitats. Fire is the only effective reproductive agent in opening cones and creating conditions for re-establishment of these stands. The heat of fire causes the closed cones to release their seeds. The seeds fall on freshly burned, bare mineral soils that are exposed to full sunlight. These conditions are ideal for seed germination and promote the establishment of dense, even-aged stands. Cypress groves are not always completely burned, resulting in a mosaic of different even-aged stands of uniform height and density. Many groves are presently stagnated or declining without fire, which needs to return to facilitate regeneration. (WHC & TVC)

Wildlife Considerations

Numerous game species, including tree squirrels and band-tailed pigeons, as well as non-game species make use of this type for feed and cover. Red-tailed hawk and great horned owl will nest in closed-cone forest habitat. (WHC)

Closed-Cone Forest Types within the CNCB

Mendocino Cypress

This cypress is mainly confined to a narrow discontinuous strip up to several kilometers (1 km = 0.62 miles) wide along the Mendocino coast. The strip lies approximately 2.4-3.2 km (1.5-3 miles) inland. Throughout its range Mendocino Cypress is a dominant member of the closed-cone pine forest. However, it is associated with dominant species of the north coastal coniferous forest, Douglas-fir forest, and redwood forest. Common understory shrubs include manzanita (*Arctostaphylos* sp.), California huckleberry (*Vaccinium ovatum*), salal (*Gaultheria shallon*), Labrador tea (*Ledum glandulosum* ssp. *Columbianum*), and California rhododendron (*Rhododendron macrophyllum*). (TVC)

Sargent Cypress

Confined to the inner and outer Coast Ranges, Sargent cypress ranges from Red Mountain in northern Mendocino County to southern Sonoma County within the CNCB. It is commonly found along creeks and lower canyon slopes, most frequently associated with chaparral and foothill woodland communities. Throughout most of its range, Sargent cypress is associated with grey pine (*Pinus sabiniana*), Buck Brush (*Ceanothus sanguineus*), or California lilac (*Ceanothus cuneatus*), Nuttall's scrub oak (*Quercus dumosa*), and Leather oak (*Q. durata*), usually inhabit serpentine or *ultra-basic* soils. (TVC)

Macnab Cypress

Scattered groves occur in the inner Northern Coast Ranges within Sonoma and Mendocino counties in the CNCB. *Cupressus macnabiana* is associated with chaparral and foothill woodland species. This species co-occurs with Sargent cypress, but is more likely to occupy ridgetops. (TVC)

Knobcone Pine

Knobcone pine grows commonly in the North Coast Range up to 1500m (4,920 feet). Little is known about the associated vegetation of *Pinus attenuata* groves or forests. This conifer is apparently restricted to serpentine or other infertile soils. It may also be interspersed with chaparral and sometimes with mixed-evergreen forest. Fire is the usual, necessary cone opener, simultaneously creating favorable seed sprouting conditions in the soil. Reproduction is also absent in older stands where the majority of trees are *senescent* or dying, conditions sometimes created by fire prevention. (TVC)

Knobcone pine occurs in even-aged stands that originate after fire (Newcomb 1962) and often forms mosaics of different aged stands (Vogel 1973). Trees that escape fire begin dying when they are about fifty years old; only a rare tree lives to 100 years. Knobcone pine sites are subject to frequent fires, perhaps once every 33-50 years, because of their relationships to other fire-prone communities, dry sites, and early widespread aging and dieback leading to accumulated fuel conditions. (TVC)

Bishop Pine

Pinus muricata is distributed discontinuously along the coast from Humboldt to Sonoma Counties in the CNCB. (Duffield 1951; Griffin and Crutchfield 1972) The largest and greatest numbers of stands occur in Mendocino and Sonoma Counties. The species exists in a maritime climate, occupying headlands and low hills from near sea level to 400m (1,300 feet) elevation, usually within 12 km (7.5 miles) of the ocean. Additional moisture is provided by fog and fog drip, which may be particularly critical in the dry summer. (Libby et al. 1968) Bishop pine stands occur in Douglas-fir forest, mixed-evergreen forest, redwood forest, coastal grassland, and pygmy forest. These forests are rich in *ercads* (plants from the Ericaceae family) such as manzanita, (*Arctostaphylos* sp.), evergreen huckleberry, (*Vaccinium ovatum*), red huckleberry (*V. parvifolium*), salal (*Gaultheria*

shallon), madrone, (*Arbutus menziesii*), Pacific rhododendron, (*Rhododendron macrophyllum*), and Labrador tea, (*Ledum glandulosum*) (Westman 1975). (TVC)

Stands of Bishop pine are characteristically even aged, originating after fires (Linhart et al. 1967; Cole 1974). Cones are usually opened by fire, but on rare occasion old cones may open on a hot day. A fire-free period of 80+ years would allow trees to succumb to disease and die without reproducing. (TVC)

Beach Pine

Pinus contorta ssp. *contorta* is found along the Pacific coast from Mendocino to southern Alaska, but is uncommon within the CNCB. Beach pine is confined to coastal dune and seaside bluff habitats in the CNCB. (TVC)

Pygmy Pine

Pinus contorta ssp. *bolanderi* is endemic to the white plains or barrens of coastal Mendocino Co. Pygmy pine usually forms a dwarf forest with thickets of pygmy cypress and several endemic shrub species, including manzanita (*Arctostaphylos nummularia*). Thickets of stunted trees are often apparently even aged, relating to the closed-cone habit and fire origin. (TVC)

5. Montane-Subalpine Forests

Focal Species

1. Pacific fisher, *Martes pennanti*
2. Northern goshawk, *Accipiter gentilis*
3. Northern flying squirrel, *Glaucomys sabrinus*
4. Mountain lion, *Felis concolor*
5. Northern spotted owl, *Strix occidentalis caurina*
6. Cooper's hawk, *Accipiter cooperii* (breeding sites)
7. Sharp-shinned hawk, *Accipiter striatus* (breeding sites)
8. All bat species, Order Chiroptera

Focal Attributes

1. Patch size (it is believed that these types only occur in isolated portions of the highest mountain tops on the eastern extent of the CNCB.
2. Old-growth forest

Community Structure

Dominant conifers create a tall, mixed-evergreen canopy displaying varying degrees of closure, depending on slope, aspect, soils, etc. Patches of broad-leaved evergreen and deciduous low trees and shrubs form the understory. On less rugged, damper sites the conifer overstory, shrub and herbaceous layers are all well developed. Drier, extreme sites are generally more open. (WHC)

Klamath montane forests form a series of more or less discrete, island-like patches within a matrix of low-elevation forest and woodlands in the CNCB. These forests grow mostly above low-elevation coniferous forests rather than chaparral, woodlands, or grasslands. The lower limit of this forest type is about 600m (2,000 feet) within the CNCB, determined by the presence of white fir. (TVC)

Species Composition

The montane-subalpine forests of the Klamath region are some of the most diverse in the world in terms of conifer species. Dominant species, such as Douglas-fir, Ponderosa pine, (*Pinus ponderosa*), and grey pine (*Pinus lambertiana*) are typical of low as well as montane elevations. The occurrence of white fir (*Abies concolor*) on damper habitats has been recognized as a montane forest indicator. As elevation increases, white fir and California red fir (*A. magnifica* var. *shastensis*) mark characteristic zones of this forest type. Isolated stands of relic conifers contribute to species diversity. Outcrops of serpentine soil exhibit unique species assemblages, often quite different than surrounding vegetation. (TVC)

Successional Stages

Stable *climax* forests within this habitat can survive for several centuries due to the fire-resistant nature of the old-growth conifers. Following disturbance, such as historically frequent fires, dense montane chaparral or grassland regenerates from buried seed. This initial establishment phase is followed by dense young conifer forest and then old-growth conifer forest, accompanied by associated shrubs and understory trees. (WHC)

Wildlife Considerations

Extensive *glaciation* combined with complex geology has led to highly diverse vegetation, soils, and wildlife habitats within montane-subalpine forests. A wide array of nesting and feeding opportunities and thermal cover for wildlife has resulted. Rare, threatened, or endangered wildlife in this habitat includes spotted owl, peregrine falcon, and wolverine. (WHC)

6. Chaparral

Focal Attributes

Burn potential and burn need (*see closed-cone pine and cypress*). Any specific modifications to chaparral areas (e.g. thinning) to decrease burn potential should be included in an assessment.

Community Structure

California chaparral is composed primarily of evergreen woody shrubs, which can form extensive shrublands that occupy hill and lower mountain slopes within the CNCB. Shrub height and crown closure vary greatly, depending on environmental conditions such as age since last burn, precipitation regime, aspect, and soil type. On favorable sites, shrub cover is nearly complete, forming dense thickets. In the CNCB, chaparral is more widely scattered than in the other portions

of its range in California. Chaparral soils are highly porous and are notoriously low in essential plant nutrients. Some chaparral grows on serpentine soils, particularly in Northern California. (TVC)

Species Composition

The pattern and structure of chaparral is much the same throughout its range, yet there is a great amount of species diversity. Chaparral habitat is home to nearly 250 species of woody plants. Extensive variation and *hybridization* are rampant among certain *genera* of California chaparral (Cooper 1922). Many species of California chaparral are endemic, with some species considered rare or endangered by the California Native Plant Society (Powell 1974). (TVC)

Successional Stages

The Mediterranean climate is the dominant environmental factor influencing the ecology of CNCB chaparral. In the late summer and early autumn, hot, dry winds add to the severity of the drought stress to which chaparral is exposed. In this dry state, conditions for fire in the chaparral are extraordinarily great. Fire is a powerful force that shapes the chaparral habitat. Chaparral is well adapted to drought and fire, passing endlessly through cycles of burning and regrowth. Most of the fires in California natural areas are in chaparral, occurring with a frequency of once every 10-40 years. (Muller et al. 1968). Fire maintains or assures perpetuation of many chaparral species (Vogal 1970; Vogal and Schorr 1972). (TVC)

Following disturbance by fire in chaparral, recovery begins with the growth of annual and perennial herbs originating from long-lived seeds in the soil. Shrubs that will be dominant in mature stands are present as seedlings and *root crown sprouts*. As shrub height and cover increase with age, towards habitat maturity, herbaceous species are displaced and eventually disappear. (WHC)

Wildlife Considerations

Montane chaparral provides habitat for a variety of birds, rodents, *herbivores*, rabbits, and other small mammals. Herbivores use chaparral species in fall and winter when grasses are not in abundance. Shrubs form windbreak and shade for many mammals. Chaparral contributes seeds, fruits, insects, protection from predators and climate, as well as singing, roosting and nesting sites for many bird species. (WHC)

Chaparral Types within the CNCB

Chamise Chaparral

This is the dominant type of chaparral throughout California, with chamise (*Adenostoma fasciculatum*) being the dominant member. It is associated with hot, dry sites (south- and west-facing slopes and ridges), forming extensive stands in Mendocino county. Chamise chaparral is a dense, interwoven vegetation 1-3m (3-10 feet) high at maturity, without understory (Horton 1960; Hanes 1971) and with scanty ground cover. (TVC)

Ceanothus Chaparral

Dominated by *Ceanothus* (California lilac) species, with an understory usually absent. This type is sometimes a stable climax community in the CNCB. Ceanothus chaparral develops on damper sites. (TVC)

Manzanita Chaparral

Dominated by *Arctostaphylos* (Manzanita) species. It occurs from sea level to higher elevations, with understory layers usually absent. This chaparral type often forms dense, impenetrable thickets. (TVC)

Montane Chaparral

This occurs in association with montane coniferous forests. It is often found on sites where fire, logging, landslide, or other disturbance removes the original forest cover. Montane chaparral can occur as an understory element where the montane forest canopy is open. (TVC)

Serpentine Chaparral

This chaparral type is dwarfed and more widely spaced than other chaparral. It *intergrades* and sometimes grows as an understory element in mixed evergreen and Sargent cypress forests, and foothill (oak) woodlands. (TVC)

Scrub Oak Chaparral

Scrub oak (*Quercus berberidifolia*) dominates this type. These stands sometimes include the shrub forms of coast live oak (*Q. agrifolia*) and Oregon oak (*Q. garryana*). This chaparral type is sometimes called “dwarf” or “pygmy” woodland. (TVC)

7. Riparian Woodland

Focal Species

1. Presence and relative density of *obligate* riparian birds during the breeding season. Obligate riparian birds include: **Yellow-breasted chat** (*Icteria virens*), **Yellow warbler** (*Dendroica petechia*), **Willow flycatcher** (*Empidonax traillii*)
2. Bald eagle, *Haliaeetus leucocephalus*
3. Ardeid roosts/colonies
4. All bat species, Order Chiroptera
5. Mustelids
6. Beavers, *Castor canadensis*, or *Aplodontia rufa*

Focal Attributes

1. Forest structure and age classes (e.g. mature cottonwood/alder with well developed understory) All alluvial/floodplain forest patches (those at the lower and estuary regions of major river systems) should be completely described and mapped.

Community Structure

Riparian forests occur along the lower stretches of the major rivers within the CNCB, generally below 3,000 feet in elevation. Cottonwoods, alders, and willows usually dominate this community type. Vegetation type, height, and crown cover are dependent on the topography and soils of the banks, and size class of the watercourses on which riparian habitat occurs. The transition between riparian forests and adjacent habitat is often quite abrupt. Riparian communities are extremely diverse and difficult to characterize. The majority of these forests have been converted to pasture, agricultural fields, or structures (e.g. houses, industrial sites).



Riparian Dynamics

Riparian communities are primarily dependent upon a permanent water supply. The extent of riparian vegetation away from the watercourse depends on the size and nature of the banks and flood plains, amount of water carried by the stream or lake, and depths and extent of subterranean *aquifers*. Primary physical processes that characterize riparian areas are flooding, *sediment deposition*, and channel cutting. Periodic flooding changes vegetation patterns, sometimes drastically, altering riparian plant species composition and structure. Areas that receive floodwaters on a regular basis are often in a condition of perpetual natural succession. Sediment is deposited as its

component organic matter and parent rock materials settle out of the water onto watercourse beds and banks. Most sediment is transported and deposited during flooding, providing a steady, rich source of nutrients to riparian areas. Riparian vegetation stabilizes watercourse banks and in the process confines the flowing water to a channel. The process of channel cutting creates deeper, narrower watercourses that provide cooler water and higher quality habitat than shallow, wide streams. The extent of flooding, sediment deposition, and channel cutting are dependent on such factors as topography, soils, precipitation, and size of the watercourse. The shape of many riparian zones, particularly the linear nature of streams, maximizes the development of *edge*, which is so highly productive for wildlife. (CV)

(The following is excerpted from *Riparian Resources: A Symposium on the Disturbances, Management, Economics, and Conflicts Associated with Riparian Ecosystems*.)

Water

Riparian ecosystems are of great ecological interest because they are often functionally and structurally distinct from the upland ecosystems that they dissect. Their ecological uniqueness is largely due to the presence of water. Availability of water is one of the most important conditions limiting plant growth in terrestrial environments. Because water is readily available in riparian ecosystems, plant growth may be much greater in these areas than in upland areas.

Wildlife

Average bird densities in riparian ecosystems are approximately twice as high as they are in upland areas. Furthermore, more wildlife use riparian areas than all other habitats combined. Wildlife congregate in riparian areas because these ecosystems provide abundant water, food, and shelter and provide forested corridors through which individual animals can migrate and disperse.

Fisheries

Stream ecosystems that are surrounded by healthy riparian ecosystems also tend to have more productive and diverse fisheries than streams lacking riparian vegetation. The reasons for this productivity and diversity are that riparian floodplains provide important nursery habitat for many fish species, function as a source of large woody debris (dead trees) that fish use for shelter, stabilize stream channels, and reduce summer and increase winter water temperatures. Riparian vegetation also appears to stabilize the invertebrate food base for fish by inputting *organic matter* into the stream.

Livestock Grazing in Riparian Areas

Grazing of domestic stock in riparian areas has resulted in the removal of palatable plants, eating and trampling of seedlings of riparian tree species, invasion of non-palatable weed species, and the degradation of stream bank and water quality. (Holland 1988)

(The following "Grazing Management Practices" is excerpted from an American Fisheries Society publication on *Management Practices for the Management and Protection of Western Riparian Stream Ecosystems* (1982).)

Grazing cattle and other livestock is one of several threats to the integrity of riparian areas. The following specific practices should be considered for use within grazing systems to manage riparian-aquatic systems.

- 1) Place salt blocks at least 1/4 mile away from riparian areas. Salt and supplemental feeding sites should be located away from *ephemeral* drainages in order to minimize disturbance that could cause sedimentation of adjacent streams. These sites can be moved about to encourage better grazing distribution.
- 2) Develop off-site watering facilities or structures to prevent concentrations of animals along streambanks.

- 3) Developed watersites should be placed on slopes of less than eight percent.
- 4) If a riparian area is used for a watering site, select the least sensitive site. Usually rocky sites are the least sensitive. Water gaps should be kept small.
- 5) Keep bedding areas and corrals out of riparian areas.
- 6) Do not route stock driveways along riparian areas.
- 7) Do not establish feed lots within riparian areas.
- 8) Grazing should not be allowed in riparian areas.

7. North Coastal Scrub

Focal Species

Point Arena mountain beaver, *Aplodontia rufa phaea*. Known locations should be mapped. All adjacent areas with suitable habitat should be surveyed. Surveys should focus on looking for burrows and sign.

Community Structure

This community extends in a narrow coastal strip through the CNCB. It is dominated mainly by evergreen shrubs less than 2 m (6.5 feet) tall, and interrupted by patches of coastal prairie. Vegetation structure ranges from ground-hugging subshrubs surrounded by grassland to dense, tall



shrub overstory/perennial herb and subshrub understory. Ground cover is usually nearly complete although bare patches occur throughout, especially where this habitat intergrades with adjacent plant communities. The understory of north coastal scrub is very diverse and high in cover. (WHC)

Species Composition

Important shrubs include coyote brush (*Baccharis pilularis* var. *consanguinea*), seaside woolly sunflower (*Eriophyllum staechadifolium*), salal (*Gaultheria shallon*), lupine (*Lupinus spp*), and California blackberry (*Rubus ursinus*). There are two distinct *phases* of north coastal scrub, one dominated by coyote brush, the other by lupine. The former phase dominates most of the northern range of north coastal scrub in the CNCB, with the latter phase dominant into the southern portion of the range in Sonoma County. (TVC)

Successional Stages

Light, wind-dispersed seed and tolerance of dry conditions allow coastal scrub to invade disturbed adjacent areas and habitats easily. Roadcuts and landslides near the coast are easily colonized by scrub vegetation. Continuous grazing pressure presents an overwhelming *disturbance regime* and can convert scrub into grassland. This habitat type is relatively stable and self-perpetuating in the absence of disturbance. In some areas it is considered a successional stage between coastal prairie and forest in areas dominated by coyote brush. (WHC)

9. Coastal Prairie

Focal Species/Attributes

1. Native/exotic plant species ratios (see oak woodlands).
2. Burn potential (see closed cone-pine and cypress) and level of prairie encroachment by Douglas-fir. The level of encroachment should be assessed by walking a fixed length transect along prairie edges and counting invading Douglas-firs.
3. Grazing (see oak woodlands)
4. American badger (in large prairie systems), *Taxidea taxus*
5. Roosevelt elk, *Cervus elaphus rooseveltii*
6. Additional species: Golden eagle, *Aquila chrysaetos*

Community Structure

Fescue-oat grassland? or coastal prairie? occurs intermittently along the coast of the CNCB. Perennial grasses comprise the dominant vegetation of this habitat. Introduction of exotic, annual



species and grazing pressure have created a mosaic of annual and perennial grass and herb species. Exotic species compete for nutrients, water, and space within the densely covered prairie. Elimination of frequent fires also substantially contributes to the altered range and species composition of this habitat. Historically, high biological productivity has led to the cultivation of the coastal prairie for agricultural purposes. The prairie is seldom more than 100 km (62 miles) from the coast and typically occurs on ridges and south-facing slopes. Coastal prairie

intergrades with coastal scrub where they meet. Coastal prairie will return to other areas under certain grazing practices. (WHC & TVC)

Species Composition

The dominant perennial grasses include blue bunch grass (*Festuca idahoensis*), Red fescue (*F. rubra*), and California oatgrass (*Danthonia californica*). Hundreds of grass and herb species can be found in the grasslands. Dominant species of the coastal prairie vary from north to south and with distance inland from the ocean. (TVC)

Wildlife Considerations

Coastal prairie provides quality habitat for reptile, rodent, raptor and other birds, as well as mammal species such as bat and Roosevelt elk. The badger, a focal species, is found in coastal prairie habitat. (WHC)

10. Coastal Salt Marsh

Focal Attributes

1. Native/exotic plant ratios. Estimate this ratio, identify the current plant species at the site.
2. Patch size

Community Structure

Coastal salt marshes are restricted to the upper *intertidal* zone of protected shallow bays, *estuaries*, and coastal lagoons. Salt or brackish marshes containing low-growing perennial grasses and *succulent* herbaceous plants characterize this habitat. These communities develop where fresh water meets salt water. Coastal salt marsh occurs above intertidal sand and mud flats and below habitats not subject to tidal action. Component plant occurrence is determined by tidal action and is a response to elevational changes in the frequency and duration of flooding. Due to tidal process and accompanying environmental changes, species of vegetation overlap as elevation changes. A change of only a few inches often marks a change in species present. Ground cover by vegetation is total except where creeks, ponds, or disturbance occurs. Coastal salt marsh grades into estuarine habitat along elevational and moisture gradients and into freshwater marsh and riparian habitat along a salinity gradient. (WHC & TVC)

Successional Stages

Coastal salt marsh is established as low marsh on intertidal flats and advances towards the sea as plant *detritus* and sediments accumulate, causing a change to high marsh. High marsh can also extend towards the land as sea level rises. Most coastal salt marsh is of relatively recent origin, less than 100-years old. Within the CNCB, salt marsh habitat is found only in the Humboldt Bay, Eel River, Russian River, and Bodega Bay estuaries. (WHC)

Wildlife Considerations

Coast salt marsh provides food, cover, nesting, and roosting habitat for a diverse group of birds, reptiles, amphibians, and mammals. Bird species found in these wetlands include heron, egret, ducks, hawks, coots, shorebirds, swallows, and marsh wren. Coastal salt marshes are very important as feeding and nesting sites for resident and migratory birds. A number of species from adjacent habitats visit the wetlands to feed. (WHC)

11. Beach and Dune

Focal Species/Attributes

1. Exotic species invasion extent, (native/exotic ratios)
2. Level of human disturbance (OHV and hiking measured separately)
3. Level of disturbance of dunes and dune vegetation
4. Western snowy plover, *Charadrius alexandrinus nivosus*
5. Additional species: Pt. Arena mountain beaver, *Aplodontia rufa phaea*



Only 23% of California's 1326 km (822 mile) long coastline is occupied by beach and dune. Beach and dune type locations within the North Coastal Basin include Dillon Beach, Bodega Beach, Pt. Arena, Ft. Bragg, and Humboldt Bay. Of these the least altered, as of 1988, was Humboldt Bay. Major differences between beach and dune in salt spray, soil salinity, and air and soil temperatures have been demonstrated. (TVC)

Beach Vegetation

Beach vegetation is low in species richness and plant cover. Generally, about five species compose the vegetation at any one beach, and only one or two contribute significantly to the amount of ground cover? usually European beach grass (*Ammophila arenaria*). In brief, *A. arenaria*, native beach grass (*Leymus mollis*), beach bur (*Ambrosia chamissonis*), and sea rocket (*Cakile maritima*), in that order, characterize beaches north of Pt. Reyes. Any one of the four may be dominant, but all four are usually present. Sand verbena (*Abronia latifolia*) and beach morning glory (*Calystegia soldanella*) are common *subdominant* associates. (TVC)

Dune Vegetation

Dune vegetation may be characterized by four habitat attributes: moving dune, stabilized ridge, vernal pool hollow, and dune forest. Active dunes occur where sand movement exceeds colonization by plants. When established dune plants stop wind, sand, and dune movement, a stabilized ridge is formed. A stabilized dune section can develop productive soil, consequently shrub and tree species can colonize and form a dune forest. South of Arcata, climax dune forest is dominated by Bishop pine (*Pinus muricata*), and just north of the town of Bodega Bay the climax shifts to a dune scrub. Climax dune forest from Arcata north is dominated by Shore pine (*Pinus contorta*) and Sitka spruce (*Picea sitchensis*). (TVC)

Introduced Species

European beach grass, or marram grass (*Ammophila arenaria*), has been widely planted along the Pacific coast in the last 100 years. This species has changed the topography of the dunes. Before its introduction, foredunes were low, rose gradually, and were dominated by native beach grass (*Elymus mollis*), and led to a series of dunes alternating with *swales* which all were oriented roughly perpendicular to the coast, that is, aligned with the prevailing onshore winds. Such a virgin dune system may still persist south of Trinidad Head. However, most systems have been replaced by a steep, *Ammophila*-dominated foredune, which gives way to a series of dunes, and swales oriented parallel to the coast. (TVC)

Erosion management historically has been done by planting *Ammophila arenaria* or *A. breviligulata*. It is believed that the need for erosion management has been heightened in this century by human-caused trampling of dune vegetation. Other impacts include: grazing by livestock, attempts at cultivation, and recreation (hiking, walking, equestrian, and especially vehicular). Other

introduced *exotics* include: sea rocket (*Cakile* spp.), iceplant (*Carpobrotus* spp., and/or *Mesembryanthemum* spp.), Yellow bush lupine (*Lupinus arboreus*), as well as a number of annual grasses and herbs restricted to small wet depressions on the beach and dune habitat. (TVC)

III B. AQUATIC HABITATS

The aquatic habitats of the North Coastal Basin have been divided into five categories. All of these communities are considered wetlands:

- 1) riverine and perennial streams
- 2) estuarine
- 3) lakes and ponds
- 4) springs, freshwater marshes, and intermittent streams
- 5) vernal pools

12. Riverine

Focal Species/Attributes

For all fish species, all current data on the distribution and population estimates within each river system will be used. We will rely on the current efforts by agencies to fill in any data gaps.

1. Coho salmon, *Oncorhynchus kisutch*
2. Summer steelhead, *Oncorhynchus mykiss irideus*
3. Pink salmon, *Oncorhynchus gorbuscha*
4. Chum salmon, *Oncorhynchus keta*
5. Northwestern pond turtle, *Clemmys marmorata marmorata*
6. Foothill yellow-legged frog, *Rana boylei*
7. Northern red-legged frog, *Rana aurora draytonii*
8. River lamprey, *Lampetra ayresii*
9. Coastal cutthroat trout, *Oncorhynchus clarki clarki*
10. California freshwater shrimp, *Syncaris pacifica*
11. Green sturgeon, *Acipenser medirostris*
12. Russian river tule perch, *Hysterothorax traskii*
13. California roach subspecies: Gualala roach, *Lavinia symmetricus parvipinnis*; Navarro roach *L. s. navarroensis*.
14. Hardhead, *Mylopharodon conocephalus*
15. Winter steelhead, *Oncorhynchus mykiss irideus*
16. Red-bellied newt, *Taricha rivularis*. (See oak woodlands)
17. Tailed frog, *Ascaphus trueii*. (See redwood forests)

Community Structure

The riverine habitat of the CNCB is defined as the freshwater portion of all streams and extends from the estuarine/freshwater interface upstream to the confluence of all perennial tributaries. These streams collectively drain the portion of the coast range from Redwood Creek in the north to the Russian River in the south. The upper reaches of most riverine habitats in the CNCB have moderate to extreme environmental gradients (i.e. topography), while the lower reaches have gentle gradients as the rivers cruise through the coastal plain en route to the ocean. Although many of these streams are small, several are large enough to be named as rivers and include the Little, Mad, Elk, Eel, Van Duzen, Salt, Bear, Mattole, Ten Mile, Noyo, Big, Albion, Navarro, Garcia, Gualala, and Russian Rivers, respectively.

The annual *hydrologic pattern* can be described as being relatively dry in the beginning of the water year from July through September, with many of the smaller streams having no *superficial flow*. Strong precipitation events usually begin to arrive in October, and as the soils become saturated the potential for flooding increases. *Peak discharges* typically occur between



November and March, and the number of flood events produced depends on the frequency, timing, and magnitude of precipitation events within a season. Precipitation amounts begin to taper off in April, and by June most of the water entering the *basin* is extracted from fog.

Most of these drainages are characterized by topography of steep *relief* and are underlain by Franciscan soils that are susceptible to high rates of weathering. This unstable

characteristic of local geology is exacerbated by the widespread land use practices of logging and livestock grazing that denude the landscape of natural cover and expose extensive areas of land to the elements. Consequently, the majority of north coastal streams are impacted by excessive amounts of sediment and debris that are deposited into streambeds during precipitation events of large magnitude.

Species Composition

The riverine community of aquatic species is quite complex owing to the substantial area and diverse physical attributes encompassed by this habitat. The vertebrate component is largely an assembly of fish species, that are obviously confined to the aquatic zone, coexisting with a smaller component of amphibians that have the ability to survive outside of water. The riverine habitat also contains a large assemblage of exotic fish species that have successfully established populations within the large area covered by this freshwater zone.

Wildlife Considerations

The vegetated banks of open water zones of large rivers provide resting and escape cover for many species of waterfowl. Terns, osprey, and bald eagle hunt in open water. Near-shore waters provide food for waterfowl, herons, shorebirds, and belted kingfisher. *Insectivorous* birds including swallows, swifts, and flycatcher catch their prey over water. Amphibians and mammals are also found in riverine habitat. (WHC)

13. Estuarine

Focal Species/Attributes

1. Coho salmon, *Oncorhynchus kisutch*
2. Summer steelhead, *Oncorhynchus mykiss irideus*
3. Pink salmon, *Oncorhynchus gorbuscha*
4. Chum salmon, *Oncorhynchus keta*
5. Tidewater goby, *Eucycloglobius newberryi*
6. River lamprey, *Lampetra ayresi*
7. Coastal cutthroat trout, *Oncorhynchus clarki clarki*
8. Green sturgeon, *Acipenser medirostris*
9. Russian river tule perch, *Hysterocarpus traskii pomo*
10. California roach subspecies: Gualala roach, *Lavinia symmetricus parvipinnis*; Navarro roach *L. s. navarroensis*.
11. Hardhead, *Mylopharodon conocephalus*
12. Winter steelhead, *Oncorhynchus mykissirideus*

Community Structure

The estuarine habitat of the CNCB is defined as the brackish water portion of all streams that flow into the ocean, and extends from the seawater/brackish water interface upstream to the brackish water/freshwater interface. Although most streams in the CNCB have an estuary or lagoon, some do not flow into the ocean, and thus do not contain an estuarine habitat.

The estuarine habitat is characterized by very gentle environmental gradients as the water elevation is similar to sea level, thus allowing freshwater and seawater to blend. The salinity gradient present in the estuarine zone supports a high diversity of aquatic species and is one of the primary factors responsible for the substantial biological productivity associated with this habitat.

Species Composition

The occurrence of an aquatic species within the estuarine zone is contingent on its ability to tolerate salinity. Many native fish of the CNCB have evolved to tolerate both saline and fresh water, and the fish communities that utilize both the estuarine and riverine habitats are therefore quite similar. Amphibians are less common in the estuarine habitat than the riverine habitat due to their general low tolerance of salinity. However, they are able to utilize the edges of this environment where freshwater is in greater abundance. Although some exotic species are present in the estuarine habitat, most exotic species introduced to the CNCB are fish that also do not possess the ability to tolerate salinity, therefore they are mostly found in freshwater environments.

Wildlife Considerations

Reproduction, feeding, resting, and cover are provided by estuarine habitats for many species of mammals and birds. Large numbers of waterfowl find refuge in estuaries, especially during winter storms. (WHC)

14. Lakes & Ponds

Focal Species/Attributes

1. Northwestern pond turtle, *Clemmys marmorata marmorata*. Presence and breeding sites. Time constrained searches may not be sufficient, if so turtle live-traps with standardized trapping effort should be utilized.
2. Grazing (See oak woodlands)
3. Diversity and density of selected native breeding amphibians: Red-legged frog, *Rana aurora*; Brown Salamander (*Ambystoma gracile gracile*), California newt (*Taricha tarosa*), Western toad (*Bufo boreas*), Foothill yellow-legged frog, *Rana boylei*. Shoreline transects should be conducted during the breeding season to detect adults, larvae, and egg masses.
4. Presence of bullfrogs, (*Rana catesbiana*) and exotic fish (e.g. large-mouth bass). Bullfrogs will be detected with the same methods for sampling for fish species
5. Naturalness. Is the lake/pond natural or human-made?

Community Structure

The lakes and ponds aquatic habitat of the CNCB is defined as inland bodies of freshwater containing no apparent flow. This definition encompasses all inland waterbodies visible on 7.5 minute U.S.G.S topographic maps, but generally excludes stillwater lengths of large riverine bodies that simulate a *lacustrine* environment. All waterbodies greater than or equal to one acre in surface area are classified as lakes, while ponds are considered less than one acre in surface area. Although these two subhabitats differ by surface area, they can often be similar in depth, temperature, elevation, water chemistry, and productivity, and thus generally have the potential to contain similar communities of aquatic species.

Species Composition

The lakes and ponds aquatic habitat is primarily characterized by a large assemblage of amphibians. Native fishes generally are not able to naturally colonize this habitat but are present mainly through transplants, and are thus considered exotic species along with a diverse array of non-native fish species that have also been introduced.

15. Springs, Freshwater Marshes and Streams

Focal Species/Attributes

1. Northwestern pond turtle, (see lakes and ponds)
2. Foothill yellow-legged frog (see #4 for lakes and ponds for this and the next two species)
3. Northern red-legged frog, *Rana aurora*
4. Western toad *Bufo boreas*
5. Southern torrent salamander, *Rhyacotriton variegatus* (see redwood forests)

Community Structure

The springs, freshwater marshes, and stream aquatic habitat of the CNCB is defined as a collection of inland waterbodies collectively comprising seeps, springs, wet meadows, swamps, freshwater marshes, and intermittent streams. All of these subhabitats are composed of freshwater, have the potential to lose their surface water during part of the annual water cycle, and are generally unable to be utilized by most fish, especially the larger native *salmonids* that are so prevalent within the CNCB.



Species Composition

This habitat is primarily characterized by a large assemblage of amphibians. Although some smaller fish have the ability to colonize the stream habitat, these collective subhabitats are generally absent of fish due to their shallow depths and capacity to have high water temperatures.

16. Vernal Pools

A vernal pool, or "hogwallow", is a small, hardpan-floored depression in a grassland mosaic that fills with water during the winter. As it dries up in the spring, various annual plant species flower, often in conspicuous concentric rings of showy colors. Vernal pool vegetation is unique, and therefore is included as one of the eight communities containing unique native plant species. Vernal pools are only located in the vicinity of Humboldt Bay within the CNCB. (TVC)

“Crosswalk” for Classification Schemes

ECOLOGICAL INVENTORY MANUAL

A GUIDE TO WILDLIFE HABITATS OF
CALIFORNIA

TERRESTRIAL HABITATS

Redwood/Coastal Coniferous	REDWOOD (RDW)
Mixed Evergreen	MONTANE HARDWOOD CONIFER (MHC) MONTANE HARDWOOD (MHW)
Oak Woodland	COASTAL OAK WOODLAND (COW) VALLEY OAK WOODLAND (VOW) BLUE OAK WOODLAND (BOW)
Riparian Woodland	MONTANE RIPARIAN (MRI) VALLEY FOOTHILL RIPARIAN (VRI)
Closed Cone Pine and Cypress	CLOSED-CONE-PINE-CYPRESS (CPC)
Montane/Subalpine Forest	KLAMATH MIXED CONIFER (KMC) WHITE FIR (WFR) RED FIR (RFR) SUBALPINE CONIFER (SCN)
Chaparral (1)	MONTANE CHAPARRAL (MCP) MIXED CHAPARRAL (MCH) CHAMISE-REDSHANK CHAPARRAL (CRC)
North Coastal Scrub	COASTAL SCRUB (CSC)
Coastal Prairie (2)	PERENNIAL GRASSLAND (PGS)
Coastal Salt Marsh	SALINE EMERGENT WETLAND (SEW)
Beach and Dune	MARINE (MAR)

AQUATIC HABITATS

Riverine	RIVERINE (RIV)
Estuarine	ESTUARINE (EST)
Lakes and Ponds	LACUSTRINE (LAC)
Springs, Freshwater Marshes, Streams	FRESHWATER EMERGENT WETLAND (FEW) WET MEADOW (WTM) See Riparian Woodland
Vernal Pools	

(1) Occurs as an understory element in mixed evergreen, oak woodland, closed-cone pine and cypress, and montane/subalpine plant communities.

(2) Occurs as an understory element in oak woodland and chaparral plant communities.

IV. Focal Wildlife Species of the CNCB

Focal species have been selected for each CNCB habitat type using two sets of criteria:

- 1) Categorizing species that fit the description of focal species types found in current literature.
- 2) Identifying whether species long-term population viability is negatively affected by disturbance to their habitat. This method determines species that are "Indicators of Ecological Integrity."

Indicators of Ecological Integrity (See Appendix 4, Chart 2)

- 1) Species fits criteria for focal species types.
- 2) Species population is negatively effected by disturbance to habitat (stressors).

Subset of Focal Species for Community Surveys (Species included in this manual):

- 1) Tracking species is possible by using a non-invasive technique that community members can use to detect species occurrences in their watershed and backyards.
- 2) Subset inspires awareness in ecosystem function and conservation of biodiversity.
- 3) Should include most "special status" species.

Special Status Species (See Appendix 4, Chart 3)

- 1) Federal or California State Endangered or Threatened Species
- 2) Species of Special Concern
- 3) Survey and Manage Species
- 4) Harvest Species
- 5) US Forest Service Sensitive Species

FOCAL SPECIES TYPES

Area-limited species A species that requires (at least) the largest *patch* sizes to maintain viable populations. These species typically have large home ranges and/or low population densities (Noss et al 1997).

Dispersal-limited species A species that is limited in its ability to move from patch to patch or that faces a high mortality risk in trying to do so. These species require patches in close proximity to one another, movement *corridors*, or crossings across barriers, such as roads (Noss et al 1997). A species that exhibits an inability to disperse, travel, or migrate across landscapes of unsuitable habitat or other barriers (like fences or roads).

Flagship species Charismatic animals who build popular support for a protected area (Foreman et al 2000).

Focal species A species which is used to define different spatial and compositional attributes that must be present in a landscape and their appropriate management regimes (Lambeck 1997).

Habitat Quality Indicator species A species that requires natural habitat of high ecological

integrity, and provides an early warning sign of ecosystem failure, because it is sensitive to ecological disturbance (Foreman et al 2000).

Indicator species A species that is tightly linked to specific biological elements, processes, or qualities; is sensitive to ecological changes; and is useful in monitoring habitat quality (Miller et al 1998/99). A species that is of narrow ecological amplitude with respect to one or more environmental factors and which is, when present, therefore indicative of a particular environmental condition or set of conditions (Allaby 1994).

Keystone species A species that enriches ecosystem function in a unique and significant manner through their activities, and the effect is disproportionate to their numerical abundance. Their removal initiates changes in ecosystem structure and often a loss of biodiversity (Miller et al 1998/99). (e.g. The coho salmon is an important food resource for many species, and also contributes to nutrient cycling from the ocean back to inland areas where it migrates at the end of its life to reproduce.)

Narrow endemics Endemism is the situation in which a species or other taxonomic group is restricted to a particular geographic region, owing to factors such as isolation or response to soil or other climactic conditions. Narrow endemics are taxa with narrowly restricted ranges (Allaby 1994). (e.g. Regional Endemic: The Humboldt marten is a sub-species of marten which occurs only in suitable habitat in a vicinity roughly similar to the land included in Humboldt County. Local Endemic: The Pt. Arena Mountain beaver is a sub-species of beaver that is only found inhabiting a small area in the Pt. Arena vicinity.)

Prey species Key prey species for focal predators in the above categories (Foreman et al 2000).

Process-limited species A species that is sensitive to the level, rate, spatial characteristics, or timing of some ecological process (such as flooding, fire, wind transport of sediments, grazing, competition with exotics, or predation) (Noss et al 1997). A species that is dependent upon the occurrence of

specific ecological processes in order to be present in areas within its range.

Resource-limited species A species requiring specific resources that are critical to at least one stage of their life cycle. These resources are typically in short supply (Noss et al 1997). Also a species whose population is limited by the availability of resources.

Umbrella species Species that generally cover large and ecologically diverse areas in their daily or seasonal movements; protection of enough of suitable habitat to assure a viable population of these organisms could provide habitat and resources to many other species more restricted in range (Foreman et al 2000).

Wilderness Quality Indicator species A species that is vulnerable to human disturbance and thus requires remote, wilderness habitat (Foreman et al 2000).

SPECIAL STATUS SPECIES

Endangered Species A *taxon* (family, genus, species, sub-species, etc.) in which the number of individuals has been reduced to a critical level or habitats drastically reduced that if the causes of such reductions continue there is an imminent risk of its extinction. These species are protected under the Endangered Species Act, and may be protected under the California Forest Practice Rules, and other legislation.

Harvest Species A species that is legal to hunt, kill, or possess. One may have to obtain a permit to hunt or kill a harvest species.

Species of Special Concern The goal of designating species as "Species of Special Concern" is to halt or reverse their decline by calling attention to their plight and addressing the issues of concern early enough to secure their long term viability.

Survey and Manage Species Federal protection status for species included in the Record of Decision.

Threatened Species Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

US Forest Service Sensitive A Forest Service "Sensitive Species" program identifies and manages species whose populations are declining

Information Sources

Most species life histories and habitat information was compiled from *California's Wildlife* Volumes I, II, and III (Zeiner et al 1990), *The Birder's Handbook* (Ehrlich et al 1988), *Forest Carnivore Conservation and Management in the Interior Columbia Basin* (Witmer et al 1998), and others.

Species Tiers: Priority and Difficulty of Community Surveys by Focal Species

	Survey Priority	Independently Verifiable	Tier
Amphibians and Reptiles	*	y	2-3
Badger		y	2
Flying squirrel			4
Golden eagle/bald eagle	***		2
Heron and egret roosts	*	Y	1
Marbled murrelet	***		3
Mountain lion	*	y	2
Northern goshawk	*		3
Northern potted owl	***		3
Other song birds			1-3
Pacific fisher	***	y	2
Pine marten	***	y	2
Red tree vole	*	y	2
Roosevelt elk	*	y	1
Snowy plover	***		3
Varied thrush			1
Western meadowlark			1
Willow flycatcher	*		3

Priority of Survey

*** Survey data are **highest priority** for conservation efforts.

* Sightings, nests, or tracks are important to take photos and/or record location and date.

Independently verifiable?

Evidence of species presence may consist of photographs, tracks, or specimens. (Y = Evidence from survey is independently verifiable.)

Tiers: Difficulty of Survey Technique

1 Easy Survey: Survey is simple enough for a high-school student, or a younger student with adult supervision. An adult could conduct survey for presence or absence of a species with little to no training. A field guide may be necessary.

2 Moderate Survey: Training is usually necessary to determine presence or absence of a species. A field guide may be necessary.

3 Difficult Survey: Training is necessary to determine presence/absence and produce scientifically credible results.

4 Survey Not Recommended for Amateurs: Presence is determined by live capture, or species is dangerous to humans. If tracks or specimens are found of these species, they should be preserved with a record of the date and location where they were found.

IV A. Amphibians and Reptiles

The moist temperate forests and other vegetation communities of north coastal California are inhabited by many species of amphibians, some of which are endemic to the area. Moderate temperatures, wet winters, and clean water found in this region provide important environmental conditions for amphibian survival.

Amphibians are characterized by their moist skin and their early aquatic development as “tadpoles,” “polywogs,” or “larvae.” Like reptiles, amphibians are cold blooded. The skin of any frog, toad, newt, or salamander is extremely permeable to water, and when wet, can be used to “breathe” oxygen from the air. Because of the permeability of their skin and the need for water during their *larval* life stage, amphibians are susceptible to pollution, as well as water shortages, and altered moisture regimes. Amphibians may need cover from being *desiccated* during times of movement, and may not be able to disperse through extremely dry or hot places. Another possible factor to the decline of amphibians may be related to increased ultra-violet (UV) radiation from the sun. UV radiation has been proven in scientific experiments to negatively affect some species of amphibians during their egg and larval development. Because of their sensitivity to toxins in water, amphibians can be good indicators of water quality.

Handling Amphibians

Care should be taken when handling amphibians. Human hands can expose amphibians to many mild toxins including sweat salts, soaps, resins, etc. Hands should be washed and well rinsed with water before handling amphibians. If prolonged handling is necessary, bring along a clear plastic bag or some other container to keep the amphibian safe and secure while under observation. Take care to keep the animal cool (work in the shade), and moist, and release the animal into the same spot as it was found.

Identifying Amphibians in the Field

A field guide to amphibians and reptiles of the western United States will be helpful in identification of amphibians and reptiles you will find during your surveys. You may also want to bring a camera, ideally with a macro lens, to photograph anything interesting you find. A good photo can provide independently verifiable evidence of species identification.

The federal government has a mitigation measure called “survey and manage” for certain old-growth forest dependent species of the Pacific Northwest. These measures apply to all federal land management actions relative to certain species of plants and animals, particularly some amphibians, bryophytes, lichens, mollusks, vascular plants, fungi, and arthropods. In regard to amphibians, the government offers a two-day training for those wishing to be certified in surveying for amphibians. The training includes one day of lecture and species identification, and one day of field instruction.

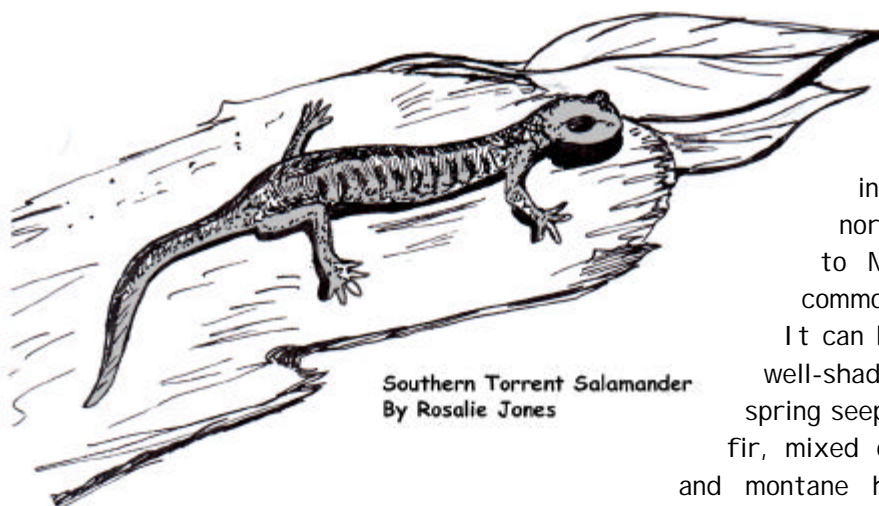
Surveyor skills of those who pass this federal “survey and manage” amphibian training include:

- 1) Ability to identify all salamander species encountered.
- 2) Ability to identify focal species likely habitat.
- 3) Knowledge of species’ microhabitat associations.
- 4) Knowledge of species’ microclimate associations.
- 5) Knowledge of species’ surface activity patterns.
- 6) Knowledge of survey protocol and its implementation.
- 7) Knowledge of documentation procedures, dataforms, and discretionary decisions.

For those wishing to become proficient in surveying for amphibians? especially on public lands? a working knowledge of the above skills is key.

Southern Torrent Salamander

(also known as Olympic Salamander)



Life History and Habitat

The southern torrent (*Rhyacotriton variegatus*) salamander inhabits coastal forests of northwestern California south to Mendocino County, and is common in its preferred habitat. It can be found primarily in cold, well-shaded permanent streams and spring seepages in redwood, Douglas-fir, mixed conifer, montane riparian, and montane hardwood-conifer forests.

The torrent salamander feeds on small insects and spiders that it finds near where it resides amongst the pebbles and rocks within streams and seeps. Nest sites have been discovered within small cracks in sandstone in the mouths of springs, where water flowed slowly through the cracks and over the eggs. Permanent cold streams and seepages are needed throughout the year. On land, torrent salamanders normally only occur within the splash zone or on moss-covered rock rubble with trickling water. Transformed adults are difficult to find between May and September, indicating a possible summer *aestivation* period.

Presence of torrent salamanders in a stream or seep is a good indicator of the integrity of the headwaters of riverine communities. Because of historically poor protection for springs and Class III watercourses during timber harvest, prime southern torrent salamander habitat has been decreasing. The southern torrent salamander is a federal Species of Concern and a California Species of Special Concern.

Conservation

In order to protect viable populations of the southern torrent salamander, springs, seeps, and Class III watercourses need to be protected. In order to maintain a cool, shaded environment in areas of prime torrent salamander habitat, canopy closure needs to be maintained in these areas. Areas draining into springs, seeps, and streams need to be managed so as not to create silt that washes down. As well, they should be managed in a way that does not alter moisture and temperature regimes significantly.

Inventory Technique

To inventory for southern torrent salamanders, start at the spring or headwaters of a forested creek. Look down through the moss into any obscure pools you can find. Keep track of: 1) how much time you spend looking for southern torrent salamanders, 2) the number that you find, and 3) the distance that you traveled from the headwaters to where you found the salamander. A time-constrained search of springs and class III streams in forested environments is ideal. Approximately four hours should be spent surveying in 400 yards of creek. A survey site should be visited three times with a time interval of at least ten days between surveys. You also may want to

consider only surveying for presence or absence of this species. To survey for presence/absence, follow these directions, but discontinue your survey if you find a southern torrent salamander.

Be careful not to confuse torrent salamanders with other amphibians you may find in the creek, such as Pacific giant salamanders, and tailed-frog tadpoles. Presence of other amphibians and fish may be an indicator of predators that will outcompete and displace southern torrent salamanders. Record all species you find and can identify during this survey.

Precautionary Advice

Like all amphibians, if you must handle a salamander, be careful to wash your hands first and rinse off any soap. Bring along a small fish net and clear plastic bag or container for catching and observing any salamanders you find. Be careful when walking in and near headwaters streams, as it is easy to get tangled or hurt in the log jams. Footing can be tricky or treacherous in these areas. Also, springs may be sensitive to heavy exploration, so tread lightly. Remember any mud you expose may end up in the creek.

Del Norte Salamander

Life History and Habitat

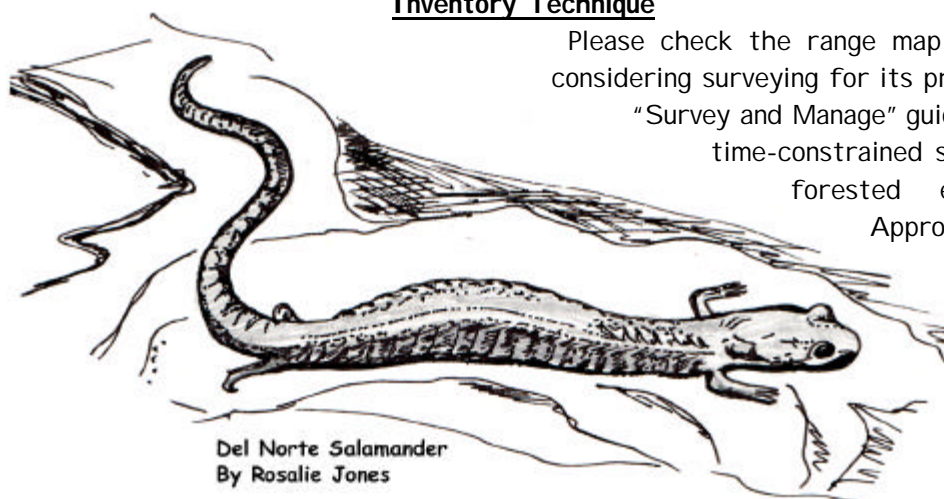
The Del Norte salamander (*Plethodon elongatus*) is an endemic species of northwest California, found in Del Norte, Siskiyou, western Trinity, and Humboldt Counties. This salamander is a common resident in valley-foothill riparian, montane hardwood-conifer, Douglas-fir, and redwood habitats. The Del Norte salamander feeds on a variety of invertebrates including springtails, beetles, annelid worms, spiders, flies, and millipedes. The Del Norte salamander can be found primarily within rock slides and *talus*, beneath rotting logs, and under slabs of bark in damp, but not saturated, situations. Rock rubble with considerable fine soil seems to be preferred. The Del Norte salamander breeds on moist soil, does not require standing water, and is probably nocturnal.

The Del Norte salamander is a regionally endemic species, and a Forest Service "Survey and Manage" species, as well as being loosely described as an associate of old-growth forest conditions. Del Norte salamanders are considered vulnerable to disturbance and appear to be tightly associated with specific habitat conditions that have been affected by past forest management activities. Community groups have filed suit to petition the Del Norte Salamander as a listed species.

Inventory Technique

Please check the range map for this species before considering surveying for its presence. According to the "Survey and Manage" guidelines for this species, a time-constrained search of surface rock in forested environments is ideal.

Approximately four hours should be spent surveying in ten acres of habitat. A survey site should be visited three times with a time interval of at least ten days between surveys. You also may want to



consider only surveying for presence or absence of this species. To survey for presence/absence, follow these directions, but discontinue your survey if/when you find a Del Norte salamander.

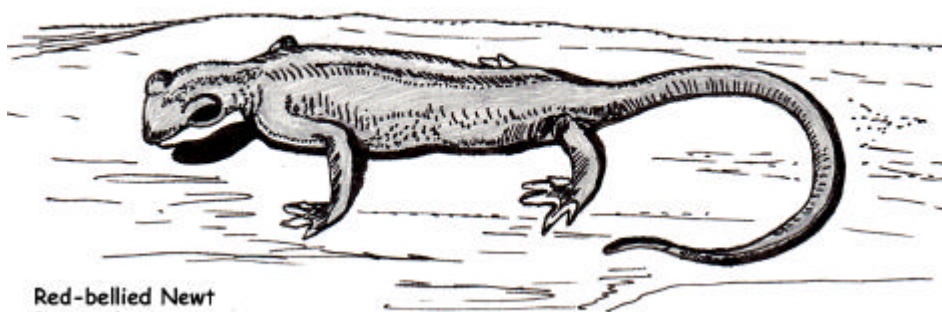
For areas within the range of the Del Norte salamander, select a site within the forested environment where talus slopes or rock can be found. Keep track of how much time is spent looking for salamanders, how much area is covered, and how many salamanders are found. Search for salamanders by carefully turning over rocks, fine woody debris, and anything else of interest on the forest floor. Other species of salamanders you will likely discover will include California slender salamander (*Batrachoseps attenuatus*), Oregon ensatina (*Ensatina eschscholtzi*), clouded salamander (*Aneides ferreus*), and Pacific giant salamander (*Dicamptodon tenebrosus*). Record all salamander species you discover. A time-constrained search of the forest floor is a good technique for surveying for amphibians, reptiles, mollusks, and insect species. Surveys should be conducted during the fall to spring rainy periods when temperatures are neither too cold nor too warm. These seasons are associated with increased surface activity of Del Norte salamanders, and many of their slimy relatives. Keep track of the rain and temperature in your survey notes.

Precautionary Advice

See this section for southern torrent salamander.

During time-constrained searches of the forest floor, take care to put things back closely to how you found them. This will help minimize the detrimental effects of this technique. Also, you may want to bring along some gloves, as they will protect your hands from getting cut, or bitten/stung by some disturbed creepy crawly living in the forest duff. Watch out for rattlesnakes, scorpions, large centipedes, bee hives, etc.

Red-bellied Newt



Red-bellied Newt
By Rosalie Jones

Life History and Habitat

The red-bellied newt (*Taricha rivularis*) is a CNCB endemic species and ranges within Sonoma, Mendocino, Humboldt, and Lake Counties. This newt is abundant in good

habitat throughout its range. The red-bellied newt migrates to streams during fall and winter rains. It inhabits primarily redwood forest, but is also found within mixed-conifer, valley-foothill woodland, montane-hardwood, and hardwood-conifer habitats. The red-bellied newt feeds on arthropods, worms, and snails in water and on the forest floor within ground litter. During the dry season, the red-bellied newt aestivates underground within root channels. This newt requires rapid-flowing, permanent streams with rocky substrate for breeding, egg laying, and larval development. Streams should be in close proximity with redwood forest.

Red-bellied newts may migrate a mile or more to and from the breeding stream. Migratory movements are stimulated primarily by rain, but in heavy amounts rain can inhibit movement towards the stream. Roadways along streams can also jeopardize and inhibit a red-bellied newt crawling towards the stream to breed. *Home range* over land extends only over a small area adjacent to the

breeding site. Density was estimated at 22 salamanders per meter (6.7 per feet) of stream at Pepperwood Creek in Sonoma County. Males arrive at the breeding site before females, both in February. In March to April, females lay eggs on the undersides of submerged rocks. The red-bellied newt has few enemies due to poisonous skin secretions.

Inventory Technique

During the rainy season, it is really easy to find red-bellied newts near streams in which they breed. You may find them wandering around on the forest floor during wet days. They can also be found easily in the creeks in which they breed. These newts are abundant where the habitat is good, and many can be found in a short stretch of stream. There are several other newts you may find in the North Coastal Basin. These include the rough-skinned newt and the California newt. Be sure to check with a field guide to be able to identify the newts you find.

Survey for red-bellied newts during February and March. You can survey for the presence or absence of this newt by spending an hour searching for newts in an area 100 yards along a creek, including 10 yards on each side of the creek. Make sure to search the vegetation on both creek banks, and to conduct an aquatic search of the creek as well. Record the number of newts found during the survey.

Precautionary Advice

In areas where red-bellied newts are found, they are rather abundant. Watch out for stepping on the little fellows as you look for them. Like all newts, the red-bellied newt is poisonous, but only if you eat one. If badgered, the newt may warn you that he is poisonous by lifting his head and tail in what scientists call the "Unken" reflex. This reflex shows off the red belly of the newt, a warning to hungry predators. Don't let your dog eat any newts.

Conservation

By building roads further away from creeks, and driving less or restricting driving on roads near creeks during peak newt migrating season, one may decrease the mortality of newts flattened every year as road kill.

Tailed Frog



Life History and Habitat

Ascaphus truei, the tailed frog, often is considered uncommon, but it can be found fairly easily in suitable habitat. Tailed frogs occur in montane hardwood-conifer, redwood, Douglas-fir, and ponderosa pine habitats. They can be found between sea level up to 1970 m (6500 feet). The tailed frog is listed federally as a Species of Concern, and as a California Species of Special Concern.

Adults forage primarily along stream banks but also occasionally feed underwater. A wide variety of food items are taken, including both aquatic and terrestrial larval and adult insects, other arthropods (especially spiders), and snails. Tadpoles feed primarily on *diatoms*, which are scraped off the surface of submerged rocks in stream bottoms. Tadpoles also consume small quantities of green algae and *desmids* (microplant-animals). Large quantities of conifer pollen are consumed seasonally.

During the day, adults seek cover under submerged rocks and logs in or near the stream. During the winter, individuals are less active, especially inland, and appear to retreat beneath large logs and boulders. Tadpoles require cool streams (15° C/59°F or less) with smooth-surfaced stones with a minimum diameter of 55 mm (2.25 inches). Tadpoles probably spend most of their time attached to submerged rocks by a large oral sucker. They prefer rocks in turbulent water to those in smooth, swiftly flowing water.

Most California populations of tailed frogs occur in areas that receive more than 100 cm (40 inches) of rainfall annually, and distribution may be limited by the required presence of permanent streams. Permanent water is critical, as the tadpoles require 2-3 years to transform. This species is restricted to perennial montane streams in steep-walled valleys with dense vegetation.

A variety of amphibians, including Southern torrent salamander, Pacific giant salamander, western toad, Pacific tree frog, and red-legged and yellow-legged frogs all commonly co-exist with the tailed frog. Pacific giant salamander larvae and adult yellow-legged frogs are known to eat tailed frog tadpoles, and trout have been observed to eat both adult and tadpole tailed frogs.

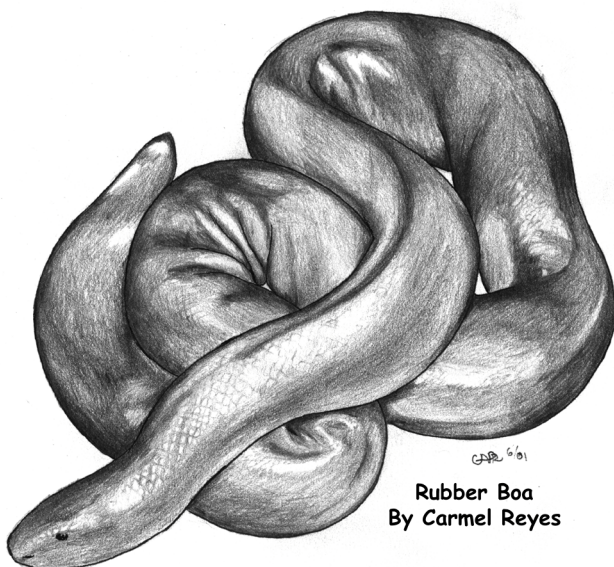
Inventory Technique

To find a tailed frog or one of its tadpoles, go out to a forested creek that is non-fish bearing (Class III). Follow the creek, looking at the submerged rocks. The tadpoles have a distinctive oral sucker, which they use to attach to rocks. You may also see adult frogs. They can be identified by the triangular pattern between their eyes pointing to their nose. Males have a distinctive "tail" which is actually an internal copulatory device.

Unlike other frogs and toads, tailed frogs are not known to be vocal. Other frogs can be found and identified by locating the frog call to the individual male singing. Like other amphibians, avoid picking up tailed frogs, as salts and other chemicals on your hands in addition to your higher body temperature are not good for them.

Conservation

Protection of non-fish bearing streams from the detrimental effects of logging, such as sedimentation and increased stream temperature, will help to maintain viable populations of tailed frog. Extensive logging activities may adversely affect existing tailed frog populations. Several observers have noted that tailed frogs disappear from logged areas, probably the result of increased water temperature and siltation.



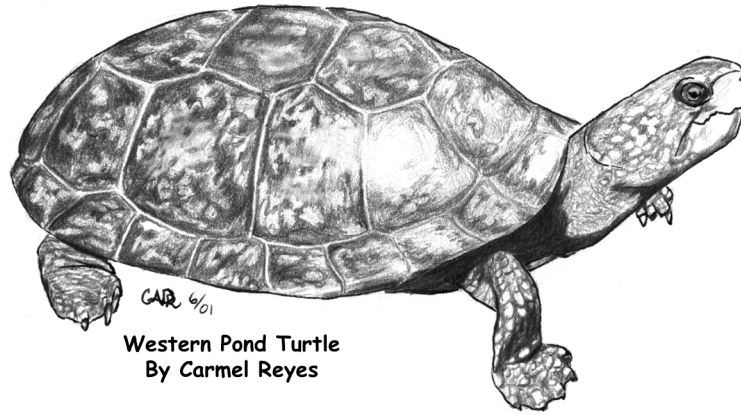
Lizards, Snakes, and Turtles

You may discover some interesting reptilian species as you survey for amphibians. You should record the presence of lizards, snakes, and turtles that you find. Species that are rare or indicative of ecological integrity include; rubber boa, and western pond turtle. These two California Species of Special Concern are both indicators of integrity within their respective habitat types.

Inventory Techniques

Because they are cold blooded or *exothermic*, reptiles need to soak up heat from

their environment to stay warm and active. Snakes and lizards can often be found sunning themselves on or near woodpiles and other woody debris. Woodland-dwelling reptiles, such as the rubber boa, use downed woody debris and other forest litter to hide under and inside during cold spells. Rubber boas are found in a variety of montane forest habitats, as well as redwood, other mixed conifer forests, and riparian areas.



Western pond turtles can be found along creeks and rivers during the summer; look for turtles sunning themselves on rocks and logs emerging from the water. Pond turtles occupy the same stretch of river or lake for their whole life.

IV B. Song Birds

All kinds of song birds, those birds from the order *Passeriformes*, make their homes in the communities of the North Coastal Basin. Some of these birds are year-round residents. Others migrate from as far away as South America, passing through here on their way further north, leaving some birds behind to breed here on the North Coast. Songbirds that spend the winter in the Southern Hemisphere are called "*neotropical* migrants." Many of these birds are declining because of stressors occurring both in their summer and winter environments.

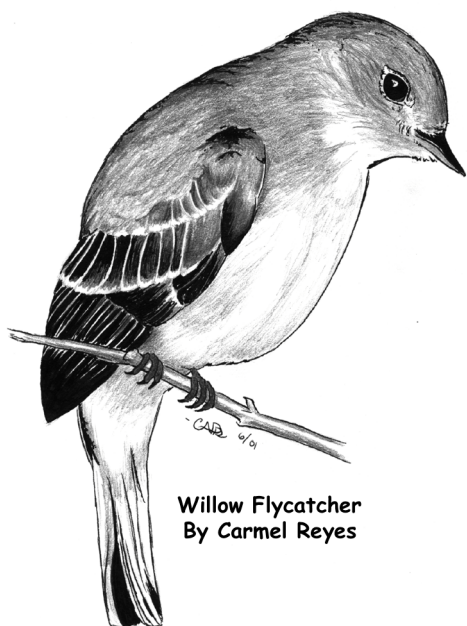
Inventory Techniques for Most Song Birds

Keeping track of all the song birds you see or hear can be a real fun hobby. Many birders enjoy the sport of bird watching locally and beyond. Song birds can be identified by sight, song, or call. A tape is available from Mad River Biologists of CNCB bird songs and calls (707-839-0900 or MadRivrBio@aol.com). If you become familiar with the sights and sounds of our local birds, you may be able to recognize some of the following focal species in the field. If you notice birds nesting, or exhibiting nesting behavior, you should make note of when and where any evidence of breeding occurred. Nesting behavior includes nesting, courtship, carrying nest materials, and carrying food. Be careful not to disturb any breeding birds you may discover.

A technique for inventorying birds at a specific location is called a *point count*. A point count is conducted by standing in one spot with binoculars in hand. Birds are identified by sight and sound and recorded by common name. Usually point counts are conducted for 10-20 minutes before moving on to a new point within a survey route. Be sure to record the amount of time you spend at one point, the activities of birds you see, your name, the date and time, and anything else interesting, like the vegetation on which the birds were perched for example.

Riparian Woodland Song Birds

Willow Flycatcher



Willow Flycatcher
By Carmel Reyes

Life History and Habitat

The willow flycatcher (*Empidonax trailii*) is a rare summer resident of California. Professional birders have discovered some individuals on the North Coastal Basin. This bird was listed as a California Endangered species in 1991. It is also considered US Forest Service Sensitive.

This flycatcher is found in wet meadow and montane riparian habitats. It most often occurs in broad, open river valleys or large mountain meadows with lush growth of shrubby willows. The willow flycatcher makes short flights for flying insects from exposed perches in willow thickets or from low perches in adjacent meadows. Dense willow thickets are required for nesting and roosting. Low, exposed branches are used for singing posts and hunting perches. In the Sierra Nevada, the willow flycatcher was consistently absent from otherwise apparently suitable areas where the lower branches of willows had been browsed heavily by livestock.

Willow flycatchers build an open, cup-shaped nest that is placed in an upright fork of willow or other shrub, or occasionally on a horizontal limb, at a height of .5 to 3.0 m (1.5 to 10 feet). The nest is usually near a languid stream, standing water, or a seep. Willow flycatchers are most numerous where extensive thickets of low, dense, willows are on the edge of wet meadows, ponds, or backwaters. The male courts the female by chasing her.

Willow flycatchers spend the winter in Mexico and Panama. They arrive in California in May, and depart in August.

Conservation

Willow flycatchers formerly bred commonly in willow thickets throughout most of lowland and montane California, however numbers have declined drastically in recent decades due to cowbird *parasitism* and habitat destruction. Heavy grazing of livestock apparently reduces numbers of willow flycatchers.

Inventory Technique

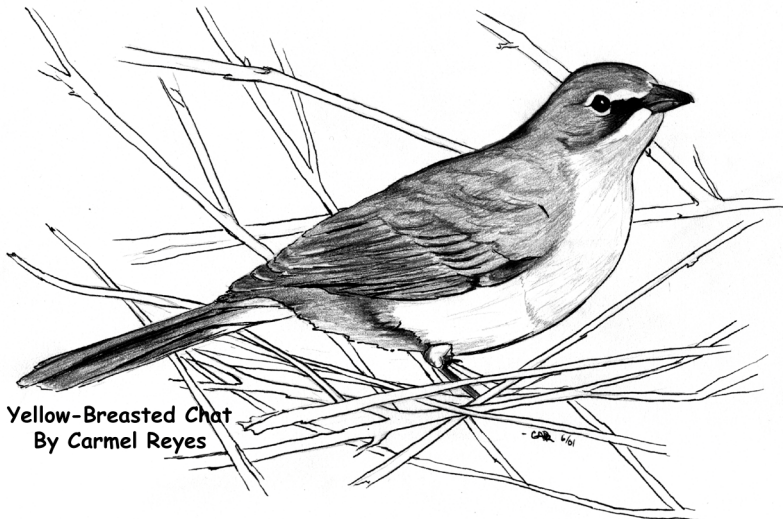
Willow flycatchers are very difficult to tell apart from other flycatchers in the *Empidonax* genus. Even to the eye of a professional birder, the *Empidonax* flycatchers look almost identical. The willow flycatcher, true to its name, is most commonly found by careful surveying of its shrubby willow habitat. With your bird book in hand, a megaphone with a cassette player, and a tape of flycatcher calls, you may be able to encourage a willow flycatcher to show itself!

Steps to finding Willow Flycatchers

- 1) Materials: Hand-held cassette player, megaphone, tape of willow flycatcher calls, binoculars, field guide, and a birding partner (four eyes better than two).

- 2) Locate willow thickets.
- 3) Walk through the thickets playing calls.
- 4) Scan willow thickets with binoculars or the unaided eye. Willow flycatchers will respond to the calls by coming out of the thicket to perch and look for the intruder. You may also notice a flycatcher as it hunts for flies. The bird will jump from its perch, make a loop-di-loop, and return to its perch, often with a fly in its beak.
- 5) Record location, response behavior, and species of brush when you discover a willow flycatcher. You should record how much time you spend engaged in surveying for flycatchers as well.

Yellow-breasted Chat



Yellow-Breasted Chat
By Carmel Reyes

Life History and Habitat

A California Species of Special Concern, the Yellow-breasted chat (*Icteria virens*) is an uncommon resident and migrant in California and in the foothills of the Sierra Nevada. The yellow-breasted chat frequents dense, brushy thickets and tangles near water, and thick understory in riparian woodland. The yellow-breasted chat spends the winter in Mexico and Guatemala. It arrives to California in April and departs in late September.

The yellow-breasted chat eats insects and spiders, and whatever else it can glean from foliage of shrubs and low trees. The chat requires riparian thickets of willow and other brushy tangles near watercourses for cover. It usually nests 2-8 feet above the ground in dense shrubs along a stream or river. Males court females by rising from a high perch with their heads raised and legs dangling, singing a complex song, hovering, and then dropping back to perch.

Conservation

Loss and degradation of riparian habitat have caused a marked decline in the breeding population in recent decades in California. Parasitism by brown-headed cowbirds also has contributed to decline.

Yellow Warbler

Life History and Habitat

Another California Species of Special Concern, the yellow warbler (*Dendroica petechia*) is an uncommon summer resident of Northern California. The yellow warbler breeds in riparian woodlands from the coastal and desert lowlands up to 8,000 feet in the Sierra Nevada. It also breeds in montane chaparral, and in open ponderosa pine and mixed-conifer habitats with substantial amounts of brush. Numbers of breeding pairs have declined dramatically in recent decades in many lowland

areas. The yellow warbler spends the winter in Mexico, the Bahamas, Peru, Bolivia, and the Brazilian Amazon. It arrives to California in April and is usually gone by October.

The yellow warbler is usually found in riparian deciduous habitats in summer: cottonwoods, willows, alders, and other small trees and shrubs typical of low, open-canopy riparian woodland. In migration, the yellow warbler is seen visiting woodland, forest, and shrub habitats. The nest is usually an open cup placed 2-16 feet above ground in a deciduous sapling or shrub. A yellow warbler's territory often includes tall trees for singing and foraging, and a heavy brush understory for nesting.

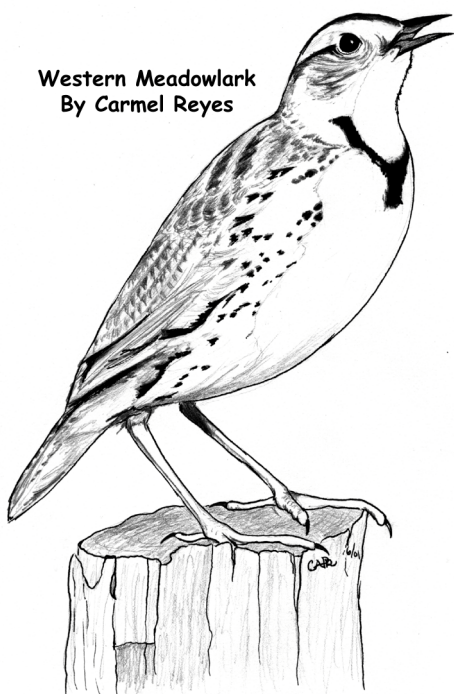
Conservation

The yellow warbler is food for small mammals, *accipiters*, *corvids*, and snakes. *Brood parasitism* by brown-headed cowbirds is heavy and apparently has been a major cause for decline in numbers in lowland areas in recent decades.

Oak Woodland/Grassland Song Birds

Western Meadowlark

Western Meadowlark
By Carmel Reyes



Life History and Habitat

The Western meadowlark, *Sturnella neglecta*, is a common resident of grasslands in California. This song bird occurs in herbaceous cropland habitats with sufficient ground cover for concealment. Where such habitats form an understory, open woody and brushy habitats are also used. The meadowlark requires relatively dense, grassy vegetation tall enough for concealment. Meadowlarks use trees, fences, shrubs, and mounds for lookout and song perches. Meadowlarks hide their nests in a depression on the ground among the grasses and *forbs*. This bird spends the winter in Mexico.

In courtship, the male spreads and drags his tail, *nape feathers* erect, bill pointed down, wings partly open, while softly singing, it then flies on rapidly vibrating wings, and hovers slightly above vegetation.

Conservation

Heavy grazing and cultivation, especially in summer, is detrimental to the habitat of the meadowlark.

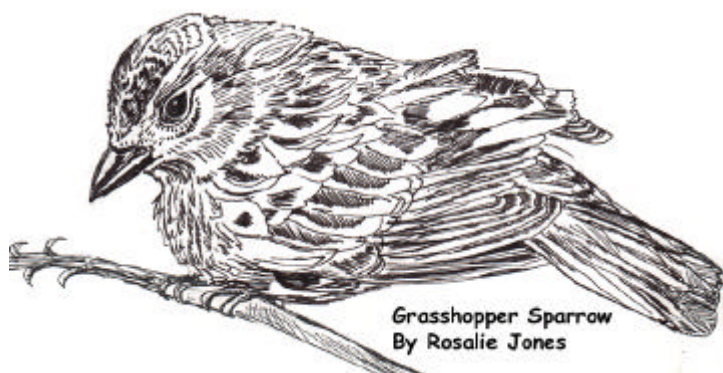
Grasshopper Sparrow

Life History and Habitat

The grasshopper sparrow (*Ammodramus savannarum*) is an uncommon local resident and breeder in the foothills and lowlands west of the Cascade-Sierra Nevada crest from Mendocino south to San Diego Counties. The grasshopper sparrow occurs in dry, dense grasslands, especially those with a variety of grasses, tall forbs, and scattered shrubs for singing perches. The grasshopper sparrow

winters in South America and the Greater Antilles. Summer residents arrive in California March to May, and depart by August or September.

The grasshopper sparrow feeds primarily on insects, especially crickets and grasshoppers.



It also eats other invertebrates, as well as grass and forb seeds. The grasshopper sparrow breeds in nests of grasses and forbs in a slight depression in the ground, hidden at the base of an overhanging clump of vegetation. Courtship displays include a low fluttering flight by the male, silent or with song, the latter answered by a trill from the female. Male may chase female while singing.

Conservation

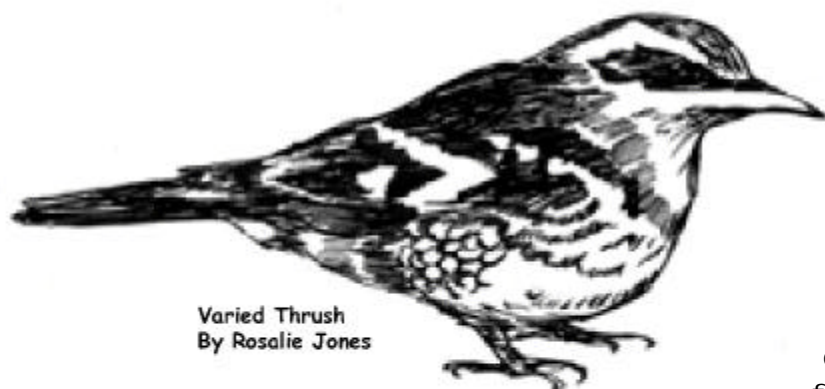
The grasshopper sparrow is declining in many areas, especially in Florida and the Appalachians. Mowing cultivated grasslands often destroys nests. Despite loss of cover, birds will stay and then suffer increased losses from predators.

Mature Coniferous Forest Song Birds

Varied Thrush

Life History and Habitat

In California, the varied thrush (*Ixoreus naevius*) breeds only in dense coniferous forests of Del Norte, Humboldt, Trinity, and Siskiyou Counties. The varied thrush is closely related to the American robin, and they can sometimes be seen foraging with each other. The varied thrush prefers breeding in dense-canopied, mature stands of redwood forest, but it also breeds in coastal



Douglas-fir forests. The song of the varied thrush is an eerie, bell-like, prolonged whistle that slowly fades away, and then is repeated at a different pitch, higher or lower than before. This should be a very familiar sound to those who spend time in the forests of the north coast from California all the way up to Alaska.

The varied thrush is omnivorous. It eats berries and other fruits, seeds, acorns, earthworms, snails, and other small terrestrial invertebrates. The varied thrush lives in dense, mature coniferous forests with damp, shaded floors providing important cover for nestlings as they learn to forage and fly. In the non-breeding season, habitats used to forage become more diverse, but always near woodlands or other vegetation that provides cover. The varied thrush is an important food source for a wide variety of bird and mammalian predators.

Conservation

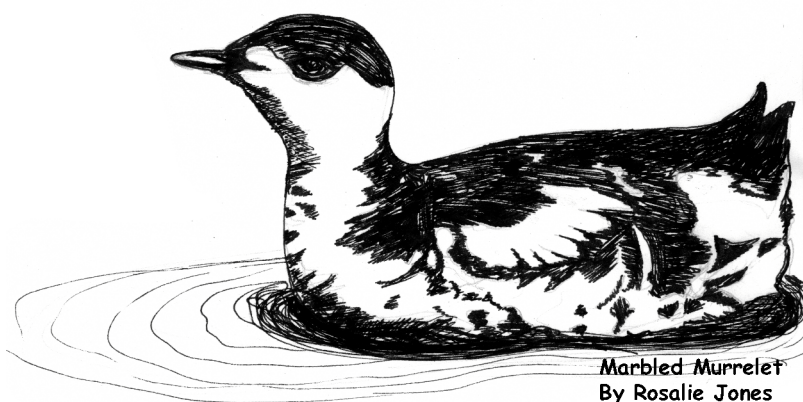
Habitat loss and fragmentation due to silvicultural practices have occurred over much of the varied thrush's range. Because of their narrow habitats during the breeding season, there has been concern regarding possible declines in their distribution and abundance (Hansen et al 1993 *in* Beck et al 2000). Beck et al (2000) found that varied thrushes are generally absent from small *fragments* (less than 40 acres) of mature coastal redwood forest in Northern California. Abrupt forest edges, such as those produced by clearcuts, may reduce habitat suitability for varied thrushes possibly explaining their absence from small forest fragments during the breeding season (Beck et al 2000).

Inventory Technique

The varied thrush is a fairly common resident on the North Coast throughout the year, but may sing more during the spring at the beginning of the breeding season. They can be identified by their eerie whistle-like call, the striking blue-gray plumage on their *dorsal* side, and the contrasting orange-rust markings on their wings. You may want to take note of places where you see and hear varied thrushes, as well as Swainson's and hermit thrushes. These birds all have beautiful calls. The Swainson's thrush is a *polytonal* rush of ascending notes, as compared to the hermit thrush, which sings a rush of descending notes.

IV C. Sea Birds, Shorebirds, and Other Water Birds

Marbled Murrelet



Life History and Habitat

The marbled murrelet (*Brachyramphus marmoratus*) is listed as a federally Threatened and California state Endangered species. It is a small sea bird, which nests in the large moss-covered branches of ancient coniferous trees usually within 50 miles from the coast. Little was known about the marbled murrelet up until shortly before

its state and federal listings in 1992. Species accounts written before this date often have very little useful information on habitat and breeding requirements for the murrelet.

Conservation

Pacific Lumber Company owns most of the remaining unprotected critical habitat for the California North Coast population of the marbled murrelet. The decline of marbled murrelets in Northern California is directly related to the loss of over 95% of this region's ancient forests. Protecting all remaining ancient forest within fifty miles of the coast may be necessary to sustain a viable population of marbled murrelets in the CNCB.

California Forest Practice Rules: Section 919.11 Marbled Murrelet Protective Measures (Coast)

"Where there is evidence of an active murrelet site in or adjacent to the THP area, as defined in "Addendum to Surveying for Marbled Murrelets at Inland Forest Sites: A Guide for California Coastal Forests" CJ Ralph, April 1991 or where there is evidence of a potential impact to a murrelet, the Director shall consult with DFG as to whether the proposed THP will result in a "take" or "jeopardy" (pursuant to the California Endangered Species Act) of the murrelet before the director may approve or disapprove a THP. Biological Assessments submitted with the THP that are prepared according to the Department of Fish and Game (DFG) Guidelines for Consultation (F&GC Sec.2090) shall be provided to the DFG during consultation. If DFG determines *jeopardy* or *take* will occur as a result of operations proposed in a THP, the Director shall disapprove the THP unless the THP is accompanied by authorization by a wildlife agency acting within its authority under the state or federal endangered species acts."

Inventory Technique

A certification process is required to credibly survey for marbled murrelets. A birder can become certified by undergoing training and testing which is locally conducted by Mad River Biologists, or other wildlife consulting firms and private biologists.

Surveys for marbled murrelets are conducted during the spring and summer, at dawn and dusk when the parent bird delivers food from the ocean to its nest, mate, and offspring. At this time, parents will swap shifts, and the parent who stayed at the nest will depart for the ocean to forage for food. A survey site should be visited four times in a year for two-consecutive years to determine if murrelets are present at a site. When determination of occupancy is the survey objective, ten site visits are recommended to determine occupancy with a 95%-probability level.

If you become familiar with the sight and sound of the marbled murrelet, you can conduct the **technique for surveying for marbled murrelets** as follows:

- 1) Materials: hand-held voice-activated tape recorder, note pad, binoculars, and compass
- 2) Start survey at least one-half hour before first light.
- 3) When a marbled murrelet is sighted, record on the tape the time, activity, and direction of flight.
- 4) When a marbled murrelet is heard, record on the tape the time and direction the call was heard.
- 5) Activities noted should include if the bird is stationary, vocalizes, and/or is in flight (including distance from tops of trees, direction of flight, manner of flight).

Snowy Plover

Life History and Habitat

Charadrius alexandrinus, the snowy plover, is a small shorebird that may be found on sandy marine and estuarine shores in the CNCB. The snowy plover is a federally threatened species. It spends its days gleaning for insects and *amphipods* from the dry sand of upper beaches along the coast. It also occasionally forages in wet sand for young sand crabs. The snowy plover crouches motionless on the sand and relies on camouflage for cover.

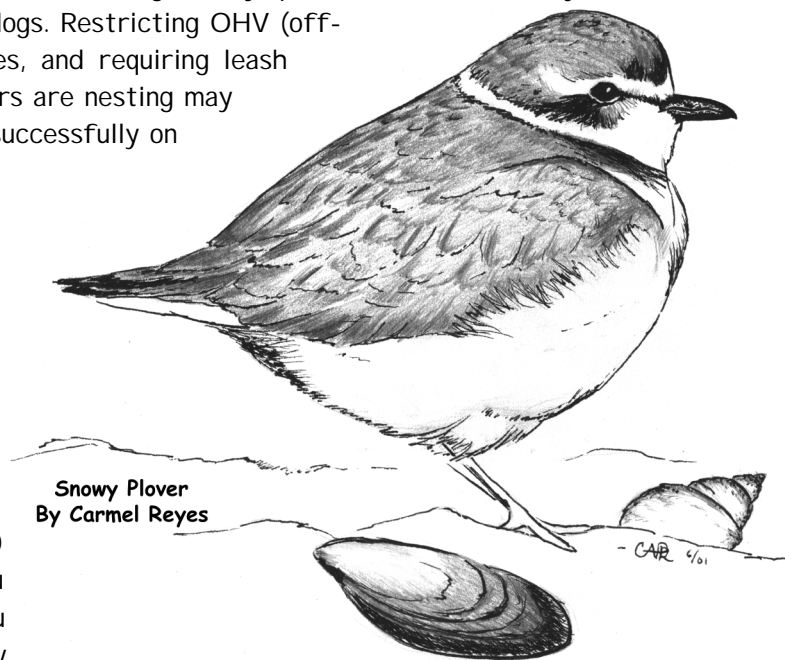
The snowy plover requires a sandy or gravelly substrate for nesting. Nests are shallow depressions in the sand or soil, sometimes lined with small pebbles, glass fragments, or gravel. It frequently locates its nest near or under objects such as driftwood, rocks, or defoliated bushes. Nests may also be on barren ground with no nearby cover.

Conservation

Gulls, ravens, coyotes, skunks, and dogs are important predators of adults, eggs, and young. Snowy plovers nesting on sandy marine beaches are threatened by constant contact with humans using these areas for recreation. Nesting snowy plovers are extremely vulnerable to vehicular use and dogs. Restricting OHV (off-highway vehicles) use on beaches, and requiring leash laws for dogs where snowy plovers are nesting may aid the snowy plover in nesting successfully on beaches of the North Coast.

Inventory Technique

Surveys for snowy plovers can be conducted by hiking sandy coastlines of the North Coastal Basin, and using binoculars to scan sandy areas for snowy plovers. As you walk down the beach, stop and scan approximately every 50 - 100 yards. Record how much time you spent surveying, the area you surveyed, and the location of any snowy plovers you find.



Heron and Egret

Life History and Habitat

Great blue herons (*Ardea herodias*), black-crowned night herons (*Nycticorax nycticorax*), snowy egrets (*Egretta thula*), and great egrets (*Casmerodius albus*) are all members of the Ardeidae family of birds. These water birds are year-long residents of the North Coastal Basin, especially in the Humboldt Bay area. Most herons and egrets roost at night and nest in trees, which are usually near water, but may be as far as 20 miles from daytime foraging areas. Herons and egrets can be seen foraging during the daytime in shallow estuaries, fresh and saline emergent wetlands, along rivers and lakeshores, mudflats, salt ponds, irrigated croplands, and pastures. Nests for great blue herons and great egrets receive some protection under the California Forest Practice Rules.

Inventory Technique

Location of nests and night roosts is important in identifying critical habitat for these water birds. If you discover an *Ardeid* nest, write down the date, location, and species. If you see egrets flying towards the forest every night, try to figure out where they are roosting, and record the location. Black-crowned night herons usually spend most of the day perched in trees in colonies called a *rookery*. These can be found in dense vegetation and trees, near or on the banks of wetlands and estuarine rivers. If you find a rookery, record the location.

Conservation

Protection of nests and roosts is important to the conservation of critical habitat for herons and egrets. Nests of great blue herons and great egrets are protected by law.

California Forest Practice Rules: section 919.3, 939.3, 959.3

“The following requirements shall apply to active nests, and not to nest sites containing only abandoned nests. Buffer zones shall be established for all nest trees containing active nests. For the Great Blue Heron and the Great Egret, the buffer zone shall consist of the area within a 300-foot radius of a tree or trees containing a group of five or more active nests in close proximity as determined by the DFG. The following year-round restrictions shall apply within the buffer zone. For the Great Blue Heron and Great Egret, all nest trees containing active nests shall be left standing and unharmed. Critical periods are established for each species as follows: For the Great Blue Heron and Great Egret, the critical period is March 15 until July 15. During this critical period, timber operations within the buffer zone shall be staged with a gradual approach to the nest.”

IV D. Predatory Birds

Many predatory animals can be indicators of ecological integrity as their role at the top of the *food chain* requires not only good habitat for themselves, but also for many of the species upon which they prey. The health of an entire community may be reflected in the abundance of predatory animals. Imagine the hawk soaring in the sky swooping down upon a squirrel and eating it. The squirrel was fat from eating acorns from the mature oak trees. A mature forest provides enough food for an abundant population of *herbivores*, and abundant herbivores will provide prey for the predators.

Predatory birds are also sensitive to pollutants contaminating the environment. If a crop is dusted or herbicides are sprayed on the forest, insects may be one of the first animals ingesting the herbicides, which will stay in their body. A fish will come along and eat lots of insects, thus concentrating the poison in its body. When the eagle swoops into the river and eats some fish, the already concentrated levels will become even more heavily concentrated. This may directly kill the bird, or it may cause reproductive failure. This phenomena is called *bioaccumulation*. DDT and other pesticides have put the bald eagle, peregrine falcon, and other predatory birds on the endangered species list.

Many predatory birds that are indicators of ecological integrity are also protected under the Endangered Species Act (ESA) and other environmental laws. Care should be taken in surveying for these species as not to harass them, as this is a violation of the ESA. Predatory birds, especially the hawks, can be extremely defensive of their nests. Keep this in mind when you are walking through the forest. Biologists working with goshawks and other raptors will commonly wear a protective helmet to avoid injury.

Northern Goshawk

Life History and Habitat

The Northern goshawk, *Accipiter gentilis*, is considered both US Forest Service Sensitive and a California Species of Special Concern. It has been petitioned several times for federal listing, but currently has no protected status under the ESA. The goshawk breeds in the North Coast Ranges through the Sierra Nevada, Klamath, and Cascade Mountains. Unlike other accipiters, the goshawk remains yearlong in breeding areas as a scarce to uncommon resident. The goshawk prefers middle and higher elevations, and mature, dense conifer forests.

The goshawk hunts in wooded areas using a short glide, perch, and scan technique. It will fly about 20-30 yards and perch in the lower branches of tree. The goshawk will scan the area for prey, and then glide to the next tree if there is nothing suitable to catch and pluck. Prey is caught in the air, on the ground, or in vegetation, using a searching flight or a rapid dash from its perch.

Goshawks usually hunt in wooded areas with high canopy closure, and an open understory. The goshawk feeds on birds from robin to grouse in size. Small mammals, such as squirrels and rabbits are also often taken. Goshawks typically pluck their prey at “pluck posts” which could be on the ground, on a log, root wad, or snag, as well as in the limbs of trees.

Goshawks usually nest on north slopes, near water, in the densest part of stands. They are usually located in the fork of a large horizontal limb close to the trunk, in the lower branches of the live canopy 6-24 yards above the ground. Goshawks re-use old nests, and maintain alternate nest sites. Goshawks begin breeding by mid-June in Northern California. Young may leave the nest as late as mid-August. They are extremely defensive of their nest, and especially the larger females, will attack intruders, including humans.

A goshawk territory or home range is approximately 1.6 to 39 square kilometers (0.6 – 15 square miles). Goshawk home ranges usually include dense, mature conifer and deciduous forest interspersed with meadows, other openings, and riparian areas. Nesting habitat includes north-facing slopes near water. Goshawks are probably scarce and seldom found in the North Coastal Basin.

Inventory Technique

Goshawks are easiest to find during the breeding season, as they are extremely defensive of their nest at this time. To survey for goshawks, you will need to obtain a repeated recording of their *defensive and begging calls*, and a megaphone attached to tape recorder to broadcast these calls. These items can be borrowed from LEGACY-TLC. Surveys should be conducted during the months of June and July. Broadcast of adult *alarm calls* should be used during the nesting period, and *wailing/begging* calls during the *post-fledging period*. Wailing/begging calls have been used with variable success during the courtship and incubation stages. Surveys should not be conducted during rainy or windy weather. Surveys are



conducted in two ways. One is to drive down a road that transects suitable habitat. Stop every 0.2 miles and broadcast calls for ten minutes in four directions. Take time in between directions to listen for a response. The other, more extensive survey technique requires several surveyors walking *line transects* through suitable habitat. Surveyors spaced approximately ten yards apart, sweep through suitable forest habitat on a given *bearing* looking for pluck posts, *white wash*, *pellets*, goshawks, and their nests. Goshawk calls are broadcasted from stationary points for two minutes out of every ten minutes during the sweeping survey.

If a goshawk responds, surveyors should attempt to follow the hawk. If the hawk is acting extremely agitated? staying in the same stand, and swooping surveyors? chances are extremely good that the nest is in the very near vicinity. If a goshawk flies nearby with a vocal response, record the bearing of flight, a nest may be in 50 – 200 yards in that direction.

In a road survey for goshawks, calling stations should be approximately 0.2 miles apart from each other (on your odometer). Familiarize yourself with the technique for surveying for spotted owls. Goshawks are natural predators of spotted owls. Never use both calls during one survey. Always space hawk and owl surveys in the same area at least one week apart.

Precautionary Advice

Be extremely careful of nesting goshawks. Goshawks have long *talons* and will use them if threatened. If you discover the location of a goshawk nest, record where it is to the best of your knowledge, and remove yourself from the area immediately, as to not overly harass the nesting birds. Remember your presence could cause the goshawks to abandon their nest. Approaching nests prior to June 1st and during bad weather could cause severe stress for breeding birds and young nestlings.

Conservation

Important components of goshawk habitat include mature forest, prey abundance, water, and an open understory, as well as edge with other habitats and forest openings. Protecting these components will provide habitat for goshawks and many other species associated with mature forest.

California Forest Practices Act: Section 919.3, 939.3, 959.3

"The following requirements shall apply to nest sites containing active nests and not to nest sites containing abandoned nests. Buffer zones shall be established around all nest trees containing active nests. The buffer zones shall be designed to best protect the nest site and the nesting birds from the effects of timber operations. For the Northern Goshawk, the buffer zone shall be a minimum of five acres in size. When explained and justified in writing, the Director may increase the size of the buffer zone to a maximum of 20 acres when necessary to protect nesting birds. The following year-round restrictions shall apply within the buffer zone. For the Northern goshawk, designated nest trees, screening trees, perch trees, and replacement trees shall be left standing and unharmed. Only the commercial thinning sanitation-salvage, and selection regeneration methods are permitted in the buffer zone. Critical periods established for each species and requirements shall apply during these critical periods as follows: For the Northern goshawk, the critical period is from March 15 until August 15. During this critical period, no timber harvest operations are permitted; however, new road construction is permitted if the Director determines that there is no feasible alternative. Exceptions may be approved by the Director after consultation with the CDFG to allow hauling on existing roads that normally receive use within the buffer zone during the critical period."

Bald Eagle and Golden Eagle

Life History and Habitat

The bald eagle (*Haliaeetus leucocephalus*) is listed as federally Threatened under the ESA, California Endangered, and California Fully Protected. It is a permanent resident of the North Coastal Basin. About half of the wintering population in California is in the Klamath Basin. Golden eagles (*Aquila chrysaetos*) are listed as California Fully Protected and a California Species of Special Concern. The golden eagle is an uncommon permanent resident and migrant throughout California. Habitat for the golden eagle is usually rolling foothills and mountainous areas.

The bald eagle requires large bodies of water or free-flowing rivers with abundant fish and adjacent snags or other perches. The bald eagle swoops from perches or soaring flight to pluck fish from the water. It also pounces on or chases water birds, especially injured ones. Groups may feed gregariously, especially from *spawning* fish. Golden eagles eat mostly rabbits, and rodents, as well as

birds, reptiles, and carrion. Golden eagles need open terrain for hunting; grasslands, deserts, savannahs, and early successional stages of forest and shrub habitats.

Bald eagles nest in large, old-growth or dominant, live trees with open branches, especially ponderosa pine. Nests are found most frequently in stands with less than 40% canopy closure, but with some *foliage* shading the nest. The bald eagle often chooses the largest tree in a stand on which to build a stick platform nest. Nests are generally located 50-200 feet above ground, usually just below the tree crown. The nest is usually located near a permanent water source. Statewide, 87% of nests were located within one mile of water. The bald eagle breeds from February through July, golden eagles breed from late January through August, both with an average *clutch size* of two chicks. Golden eagles nest on cliffs of all heights and



Golden Eagle
By Rosalie Jones

in large trees in open areas. Like bald eagles, they build large platform nests, often three yards across and one yard high. Golden eagles use rolling foothills and mountain terrain, wide arid plateaus deeply cut by streams and canyons, open mountain slopes, and cliffs and rock outcrops for breeding.

The bald eagle is extremely vulnerable to pesticide-induced eggshell thinning. Bald eagles compete with and steal prey from osprey. Territories have been abandoned after disturbance from logging, recreational development, and other human activities near nests. Golden eagles may desert nests during early incubation if disturbed by humans.

Inventory Technique

If you see either of these birds, you should record when, where, activity of the bird, and flight direction. If the bird is in flight with prey, it is especially important to note the direction of flight as the bird is probably heading towards the nest. If you find a nest, be sure to record the location of the area as closely as possible. Using a *GPS* helps to be exact. Also, it may help to flag the location with surveyor's tape or some other noticeable marker. Presence of either of these birds may be enough to provide government biologists with information necessary to warrant a *take* of California protected species in areas where development is planned.

Precautionary Advice

Information on the location of nesting endangered species should be carefully safeguarded. This kind of information needs to be shared with the California Department of Fish and Game (on private lands), and public management agencies such as the US Forest Service or Bureau of Land Management if the nest is found on public lands. You may wish to share this information with the Humboldt County Breeding Bird Atlas, or conservationists working in your area. Remember that harassing or harming either of these species is in violation of Federal and/or State laws.

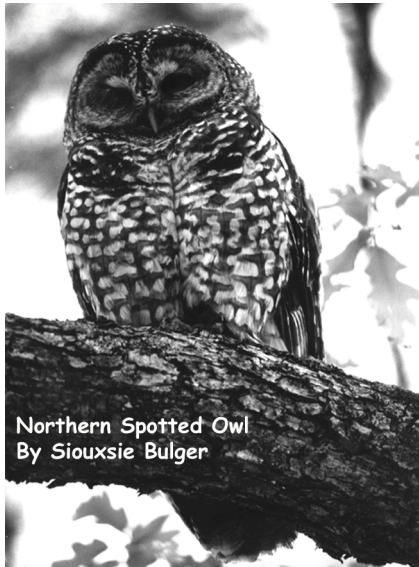
Conservation

Bald eagles require good *perch* trees, especially large trees with dead tops, over fish bearing bodies of water. These trees should be retained for their use, as well as to protect the body of water from the ill effects of canopy removal and nearby logging, such as increased temperature and siltation. For both bald and golden eagles, active nest trees are protected by law. Historic nests should also be protected.

California Forest Practice Rules: Section 919.3, 939.3, 959.3

"Buffer zones shall be established around all nest trees containing active nests. The buffer zones shall be designed to best protect the nest site and nesting birds from the effects of timber operations... For the Bald Eagle and Peregrine Falcon, the buffer zone shall be a minimum of ten acres in size. The Director may increase the buffer zone to 40 acres in size so that the timber operations will not result in a "take" of the species. For the Golden Eagle, the buffer zone shall be a minimum of 8 acres in size... The following year-round restrictions shall apply within the buffer zone. For the Bald Eagle, no clear cutting is allowed in the buffer zone. Selection, commercial thinning, sanitation salvage, and the shelterwood regeneration method except for the removal step, are permitted if all trees are marked prior to pre-harvest inspection. All nest trees containing active nests, and all designated perch trees, screening trees and replacement trees, shall be left standing and unharmed. For the Golden eagle, no clear cutting is allowed within the buffer zone. All nest trees containing active nests, and all designated perch trees, screening trees and replacement trees, shall be left standing and unharmed. Critical periods are established for each species and shall apply during these critical times as follows: For the Bald Eagle, the critical period is January 15 until either August 15 or four weeks after fledging, as determined by the director. During this critical period, no cutting is allowed within the buffer zone. For the Golden Eagle, the critical period is January 15 until April 15, and extended from April 15 until either September 15 or until the birds have fledged from occupied nests."

Northern Spotted Owl



Northern Spotted Owl
By Siouxsie Bulger

Life History and Habitat

The Northern spotted owl (*Strix occidentalis caurina*) is an uncommon, permanent resident of the North Coastal Basin in suitable habitat. The spotted owl is listed as federally Threatened and a California Species of Special Concern. In Northern California, the spotted owl resides in dense, mature, multi-layered mixed conifer, redwood, and Douglas-fir habitats, from sea-level to 7,600 feet. Within the fog belt, spotted owls can tolerate living in lower quality habitat.

Spotted owls feed in forested habitats upon a variety of small mammals, including flying squirrels, woodrats, mice and voles, and a few rabbits. They also eat small birds, bats, and large arthropods. The spotted owl usually searches for prey from a perch and swoops or pounces on prey in vegetation or on the ground. Spotted owls *cache* extra food.

Spotted owls use dense, multi-layered canopy cover for roost seclusion. Roost selection appears to be related closely to *thermoregulatory* needs; spotted owls are intolerant of high temperatures. They prefer to roost in forests with dense overhead canopy on north-facing slopes in summer.

Spotted owls usually nest in a tree or snag cavity, or in the broken top of a large tree. Less frequently, they will nest in large mistletoe clumps, abandoned raptor and raven nests, in a cave or crevice, on cliffs, or the ground. Mature, multi-layered forests are required for breeding. Nests are usually placed 30-180 feet above the ground. Spotted owls require blocks of 100-600 acres of mature forest with permanent water and suitable nesting trees and snags. In Northern California, it apparently prefers narrow, steep-sided canyons with north-facing slopes.

Conservation

Great horned owls and goshawks are potential predators of adults and young. Spotted owls require mature forests with large trees and snags. They are very sensitive to habitat destruction and fragmentation.

In spite of massive survey efforts and protections required under the ESA and California Forest Practice Rules, the spotted owl is still declining across its range.

Within the fog belt of the California North Coastal Basin, spotted owls will nest, forage, and disperse in mature, second-growth forest. However in order to maintain functional foraging and dispersal habitat, the canopy needs to be maintained at a minimum of 40% closure. For nesting and roosting, the canopy needs to be maintained at a minimum of 80% closure. Outside the fog belt, spotted owls do not usually occur in second-growth forest (Rocky Gutierrez, personal communication).

Inventory Technique

Extensive surveys for spotted owls have already been conducted in many areas of the North Coastal Basin. By law, timber harvest plans must be surveyed for spotted owls prior to approval. Foresters must prove that their Timber Harvest Plans will not result in a “take” of northern spotted owl, and other listed species. In order to do this, the Registered Professional Forester (RPF) must hire a Private Consulting Biologist (PCB) who is registered and approved by the US Fish and Wildlife Service (USFWS) to give a consultation to the RPF and CDFG that mitigates the effects of timber harvest on spotted owls. If you are interested in conducting surveys on your property or you suspect spotted owls may have not been discovered in a THP please read and follow the following technique, modified from the “Protocol for surveying proposed management activities that may impact northern spotted owls” which is endorsed by the USFWS.

In order to determine the presence or absence of spotted owls, a strict protocol must be undertaken. The protocol for surveying Timber Harvest Plans is as follows. All spotted owl habitat within 1.3 miles of the proposed activity area should be surveyed. Surveys are typically conducted during the breeding season from March through September. Surveys need to be conducted for a minimum of two years to provide a higher likelihood of determining presence or absence of spotted owls. At least three surveys should be conducted in one year. If more surveys are conducted, chances of finding an owl that was missed during previous surveys will increase.

Establishing a Survey Area

Develop transects and/or call points to cover all spotted owl habitat within the delineated survey area. Establish calling stations and survey routes to achieve complete coverage from more than one calling point. Calling stations should be spaced approximately 1/4 to 1/2 mile apart, depending on topography and background noise levels. Take advantage of prominent points within the survey area when establishing call points with intermediate calling stations.

For each visit, whether results are positive or negative, record the following information.

- 1) Brief description of survey route.
- 2) Survey start and stop time and total time of survey.
- 3) Weather conditions (including estimated wind and rain).
- 4) Survey results at each call station: note all spotted owl detections including sex and age if possible, time of response, type of location (audio, visual or both. Did you see the owl?), direction of bird from your position.

- 5) You should also record sightings of, or responses by, barred owls, great horned owls, northern goshawks, or any other raptor species. The presence of these birds may affect spotted owl responses.
- 6) For each survey visit, regardless of results, map the following information on a topographic map:
 - a) route surveyed and stations called, and
 - b) all spotted owl response or observation locations. For multiple or moving owls, map all response locations and number to correspond with survey results. Map locations of other raptors as well.

Survey Methods

Spot calling: Set up a series of calling points 1/4 to 1/2 mile apart along the road transects. When possible pick prominent points that cover large areas. Spend at least ten minutes calling at each point. Spend more time if the topography prevents you from hearing birds that might respond from the previous call point. Be sure the entire survey area is adequately covered.

Continuous walking surveys: Walk the designated route playing the tape and pausing at prominent points and at regular intervals throughout the area to conduct informal stations of ten-minute duration.

The following instructions should be followed using either method:

- 1) Unless you are skilled at voice calling spotted owls, it is recommended that a surveyor use a cassette tape with recorded spotted owl calls, a tape player, and a hand-held megaphone (one can be borrowed from LEGACY-TLC). You should be able to broadcast the calls and be heard from at least a 1/4 mile away.
- 2) Start the tape and let it run for three to seven calls, listen for a response for a minute or two, then play another set of calls.
- 3) Continue this process for at least ten minutes at each calling station.
- 4) Negative results from inexperienced voice callers may not be adequate for evaluating spotted owl presence/absence.
- 5) Conduct surveys between sunset and sunrise.
- 6) DO NOT SURVEY UNDER INCLEMENT WEATHER conditions such as high winds, rain, heavy fog, or high noise levels that would prevent you from hearing responses.
- 7) Visits should be spaced at least five days apart.
- 8) At least two visits should be conducted before June 30th.
- 9) Surveys may be conducted during the day where there are no roads or foot trails to traverse at night, or where there are other safety concerns.
- 10) DO NOT "HOOT" ANY MORE THAN IS NECESSARY. BY STIMULATING THE OWLS TO MOVE AROUND, YOU MAY INCREASE THEIR RISK OF PREDATION. USE CONSERVATIVE JUDGEMENT AND HOOT ONLY AS MUCH AS IS NEEDED TO DETERMINE STATUS.
- 11) EXCESSIVE CALLING NEAR A NEST SITE MAY CAUSE HARASSMENT BY BRINGING THE FEMALE OFF THE NEST.
- 12) If you detect a spotted owl or two at night, you may want to call any biologist assisting you that evening when you return home. In this way, a follow up visit may be possible the next day to determine nesting status of detected owls. Do not conduct this technique on your own unless you are experienced with interacting with spotted owls and finding their nests.

IV E. Rodents

The North Coastal Basin is home to many species of wildlife from the class Rodentia. The rodentia includes mice, voles, rats, squirrels, porcupines, and beaver. Other species like shrews and moles, which look similar to rodents, are from the Insectivora class. Rodents and insectivores are an important part of the food chain. They are food for many *carnivorous* animals, including several other focal species. Rodents are also great *dispersers* of plant seeds and *spores* of fungi and lichens that they eat. Some rodents are *keystone species*, as their role in a community may be essential for community processes to continue.

Red Tree Vole



Life History and Habitat

An endemic species of the North Coastal Basin of California, the red tree vole (*Phenacomys longicaudus*) is considered a California Species of Special Concern and a Federal Species of Concern. The red tree vole is distributed along the North Coast from Sonoma County north to the Oregon border, being more or less restricted to the fog belt. It is reported to be rare to uncommon throughout its range, but the difficulty of locating nests and capturing individuals makes abundance hard to assess. It lives in old growth and other forests, mainly Douglas-fir, redwood, and montane hardwood-conifer habitats. The red tree vole is prey for the northern spotted owl and other carnivores.

The red tree vole almost exclusively forages on Douglas-fir and grand fir needles. Needles and twigs are gathered primarily during the night and may be consumed where found or brought to the nest. Needle *resin ducts* are removed. The remaining part is eaten, and the resin ducts may be used to line the nest cup.

Males nest most frequently in a tree nest constructed of fir needles, or, less frequently, in shallow burrows at the base of fir trees, beneath the litter. Females seem to spend most of their lives in the trees constructing large-domed nursery nests? mostly of Douglas-fir needles, but also including *feces*? from 6-150 feet above the ground. Large nests usually belong to females, whereas smaller nests usually belong to males. Nests may be occupied by succeeding generations, increasing in size with each generation. Nests of Douglas-fir needles are constructed in trees, preferably tall trees. Nests may be situated on the *whorl* of limbs against the trunk, or at the outer limits of branches.

The home range of the red tree vole probably encompasses one to several fir trees, with females often living in one tree and males visiting several trees.

Inventory Technique

Most rodents are inventoried through live-capture or snap traps (snap traps are lethal). Density is estimated by marking and recapturing individuals (or killing them). However, red tree

voles are very difficult to capture probably because they eat fir needles and most bait will not attract them.

Red tree voles can be inventoried by locating their nests. To find red tree vole nests, walk through the forest, scanning the lower limbs of the canopy above. If you are working alone or in a group, survey the forest along a compass bearing or transect, with each transect being approximately 15 yards apart. Look for masses of fir needles usually taking on bulky irregular shapes. The nest will often be built among and on top of multiple branches, usually next to the *bole* of the tree. Take a photograph of each nest you find and take a small sample of nest material, if possible. Nest material may also be found on the ground under the nest. Nest material is mostly comprised of the resin ducts from fir trees. The fir needles comprising the nest of a red tree vole are distinctive. Be careful not to confuse red tree vole nests with wood rat or bird nests. Wood rats build a rather large nest out of twigs and leaves, this is usually located on or near the ground in the low branches of a tree. Bird nests are more rounded and evenly shaped, with a distinct cup. Red tree vole nests are comparable in size to large bird nests. The nest will almost always be in a fir tree.

Make sure to keep track of how much time and area you cover in your search for red tree vole nests. This will help in determining a relative density of red tree voles in the survey area.

Conservation

Protecting nest trees will help individual red tree voles. More research needs to be conducted on the effects of *habitat fragmentation* on red tree voles and other rodents. Habitat fragmentation may negatively affect the long-term viability of red tree vole and other rodent populations.

There is concern about the red tree vole because of our very limited knowledge about the species' distribution, its apparent low abundance in younger stands, its limited dispersal capabilities, and its affinity for late successional forests. Fragmentation of forest habitat by project activities, including timber harvest, may be limiting the amount of suitable habitat available and the ability of individuals and genetic material to move between patches of suitable habitat that remain. Little is known about the distribution properties of maintaining functional landscape connectivity for rodent populations, however maintaining a minimum canopy closure of fifty percent would probably increase the survival of young red tree voles dispersing to other areas of the forest.

Northern Flying Squirrel

Life History and Habitat

Glaucomys sabrinus, the northern flying Squirrel, is a common year-long resident of coniferous and riparian-deciduous forests of the North Coast, Klamath, Cascade, and Sierra Nevada Ranges and the Warner Mountains.

Northern flying squirrels are omnivorous. They eat seeds, nuts, and fruits of conifers, oaks, other trees, and shrubs. They also eat lichens, fungi, arthropods, eggs, and birds. Flying squirrels forage in trees and on the forest floor. They are *nocturnal*, and forage mostly at night.

Flying squirrels use cavities in mature trees, snags, and downed logs for cover, and nest in cavities of trees and snags. Flying squirrels are somewhat gregarious nesters, and often several individuals will bed down in the same cavity to share body heat and safety in numbers.

Flying squirrels live near rivers and streams in mature, dense coniferous forest intermixed with various riparian habitats. Large trees and snags are required. In the Sierra Nevada, home range of a mother-young group was five acres. Clearcutting and loss of snags probably have

contributed to a decline in flying squirrel numbers. Large owls, especially spotted owls, catch flying squirrels as they glide from tree to tree. Flying squirrels are also preyed on by domestic cats, bobcats, martens, and other weasels.



Inventory Technique

To assess density of flying squirrels is a difficult technique not suggested for the amateur naturalist. If you want to see flying squirrels, find a large snag with several nest cavities. At around sunset, seat yourself with your back leaning up against the snag, or lay down under the snag. Keep your eyes on the cavities above. As the sky gets dark, you may see a flying squirrel or several emerge from the cavities and glide off into the encroaching darkness. If you see a flying squirrel, you are pretty lucky. Very few people get a good look at one of these cute little fuzzy creatures. Some people who sit in trees are raided every night by troops of hungry flying squirrels. If your cat has ever caught a flying squirrel and brought it home, you may want to record the date when you found it on a piece of paper, and save it with the

remains in a freezer bag in the freezer. This will help with identification when the biologist arrives; who may choose to make a study skin out of the remains. *If you are setting track plates* for forest carnivores, you may detect some squirrel tracks on the soot or contact paper. Make sure to save these tracks along with any other interesting tracks you get (*see inventory techniques for Pacific fisher*).

Conservation

Flying squirrels need cavities for cover and breeding. Snags and large trees are important components of flying squirrel habitat. Snags, seed trees, and downed logs should be retained for wildlife values. Snags, mature trees, and downed logs are also important components of habitat for many other species living in the forest environment.

Flying squirrels may also have difficulty repopulating forest fragments that are surrounded by clearcuts. Retaining over 50% canopy closure in a connected mosaic across the landscape may help isolated populations of flying squirrels and other dispersal-limited wildlife to disperse or migrate across the landscape.

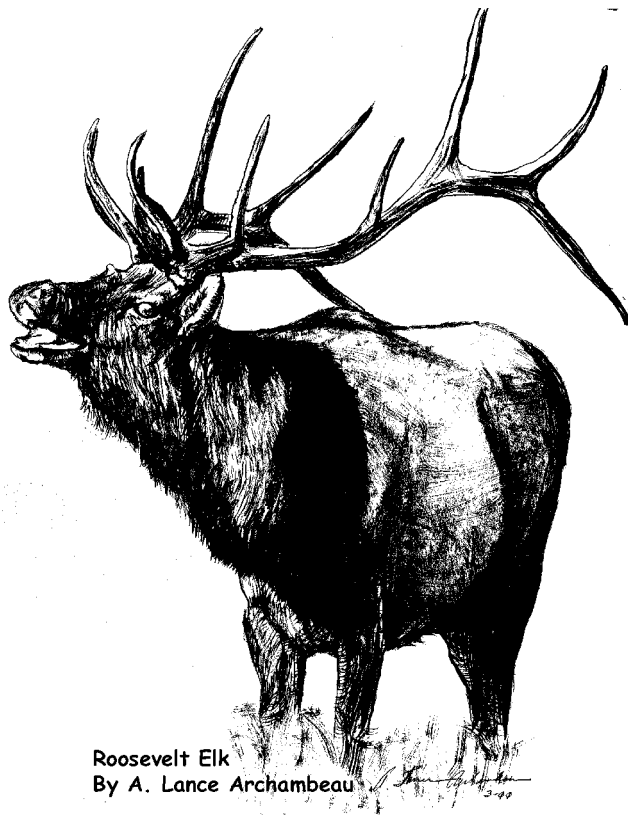
Tony Hacking, the District Biologist on the Orleans Ranger District of Six Rivers National Forest, uses a small chainsaw to create nest cavities in hardwood trees. These cavities are made by slicing off a narrow section of tree and bark, that gets hinged back on as a natural cover over the cavity created inside the bowel of the tree. Upon returning to chainsaw cavities, he has discovered some of them occupied by one to three flying squirrels. Tony hopes that he is helping spotted owls by creating homes for one of its favorite dinners: flying squirrels. If you want details on how to do this, please contact Tony. If you try this without proper training, you may likely harm or kill the hardwood tree.

IV F. Hooved Mammals (Ungulates)

Roosevelt Elk and Tule Elk

Life History and Habitat

The tule elk (*Cervus elaphus*) and Roosevelt elk (*C.e. roosevelti*) once roamed over many areas of the North Coastal Basin. Many places within our bioregion are named after these hooved mammals. Roosevelt elk are now found in the northern extent and tule elk in the southern extent of the CNCB. Elks undoubtedly once occupied "Elk Ridge," "Elk River," and other similarly named places. The aboriginal peoples as well as early white settlers hunted elk as a main staple in their diet. Currently, Roosevelt elk and tule elk occupy only very few areas within the North Coastal Basin. Roosevelt or tule elk herds roaming within protected public lands include Point Reyes National Bird Observatory, Sinkyone State Park, Redwood National and State Parks, and Six Rivers National Forest. Herds have been growing in numbers and have spread into adjacent lands in some areas of the North Coastal Basin.



Roosevelt Elk
By A. Lance Archambeau

Roosevelt elk breed in open brushy stands of many deciduous and conifer habitats with abundant water. They feed in riparian areas, meadows, and herbaceous and brush stages of forest habitats. Elk are herbivorous and graze and browse different vegetation including grasses, forbs, tender twigs and leaves of shrubs and trees, fungi, some *mast*, and aquatic vegetation. At Prairie Creek in Humboldt County, grasses made up 56-76%, and browse 21-34% of the forage consumed.

Roosevelt elk require mature stands of deciduous and coniferous forest habitats. Dense brush understory is used for escape and thermal cover. These habitats are particularly important on south-facing slopes for cover in winter. Calving occurs in areas with available water and brushy vegetation that provide dense cover near openings, and seclusion from human impacts. Roosevelt elk use uneven-aged stands that include old growth, herbaceous openings, and water. These elk do not travel far from the cover of the forest.

Populations of elk require seclusion from human interference, protection from poaching, and management to prevent local over-population. Some competition for food and cover may occur between elk and domestic livestock. Some fences may be a movement barrier to elk. Elk have been known to raid gardens and orchards of human inhabitants living near herds in the CNCB.

Inventory Technique

If you discover any elk tracks you should record when and where the tracks were found. If you see an elk, record what sex it is, number of forks on one antler, etc. Bull elk? or males, the sex with the antlers? tend to wander further away from the central herd than do the cows (females). If you see a cow and calf, record that information in your notes as well.

IV G. Mammalian Carnivores

Mammalian carnivores play a really important role in the ecological processes of the communities they inhabit. In their position at the top of the food chain, they provide a gauge of the health of entire community due to their dependence on other populations and processes. Carnivores maintain healthy populations of prey species. Forest carnivores are also vulnerable to habitat alteration and exploitation, and have historically been trapped as fur bearers by humans. If the needs of wide-ranging carnivores are met, often the needs of many more species lower on the food chain will also be fulfilled, the so-called *umbrella effect*.

We do not know nearly enough about forest carnivores to adequately provide for their needs and eliminate conflicts with humans. These species are mostly far ranging, elusive, shy, and inconspicuous, occur in low densities, and are active mainly at night (Kucera and Zielinski 1995).

Two mammalian carnivores which were present in Northern California within the last hundred years but have gone extinct include the timber wolf and the grizzly bear. Little chance exists for the reintroduction of the grizzly bear, an animal that can only be found in California on our state flag. Wolves may have a better chance for reintroduction, and have been reintroduced in other parts of their historic range in North America. Habitat models being developed by C. Carroll (unpublished Ph.D. thesis) suggest that suitable habitat is left for both of these extinct species as close as the Klamath-Siskiyou Mountains.

Mountain Lion



Life History and Habitat

At one time the range of the mountain lion (*Felis concolor*) was perhaps the most extensive of any terrestrial mammal in the Western Hemisphere, extending from the southern Yukon of Canada to the tip of Chile. Its range has declined dramatically in the eastern and mid-western United States, however, it is still relatively wide-spread in the west. The mountain lion, also known as a cougar, panther, or puma, is a widespread, uncommon resident of California, ranging from sea level to alpine meadows.

Found in nearly all habitats on the North Coast, cougars are most abundant in riparian areas and brushy stages of most habitats.

Cougars are carnivorous and predate upon mule deer, white-tailed deer, rabbits and hares, rodents, porcupines, skunks, coyotes, and, occasionally, domestic stock animals. Grouse, turkey, fish, insects, grass, and berries also have been reported in their diet. Cougars usually stalk prey on ground, locating by scent. Cougars kill large prey by stalking within a few yards and then leaping onto it and biting at the base of the skull.

Mountain lions use caves and other natural cavities, and thickets in brush and timber for cover, as well as *denning*. Mountain lions require extensive areas of riparian vegetation and brushy stages of various habitats, with interspersions of irregular terrain, rocky outcrops and tree/brush edges.

Mountain lions are active yearlong, and are mostly nocturnal and *crepuscular*. Male home ranges usually are a minimum of 15 sq. miles. Female home ranges are 3-12 sq. miles. Fragmentation of habitats by spread of human developments and associated roads, power transmission corridors, and other support facilities, restricts movements and increases association with humans. These changes are detrimental to mountain lion populations.

Inventory Techniques

Take photographs of any mountain lion tracks you find. Include something in the picture like your hand, a coin, or a ruler, so that the size of the track can be estimated. All cats walk with their claws retracted, unlike dogs, so tracks of cats do not leave claw marks. Look at your pet cat's tracks. If you see sign of, or hear these elusive creatures, make note of when and where. If you see a mountain lion, note the location and the direction in which the animal was traveling; you may also want to call your neighbors.

Precautionary Advice

As anyone knows who lives or works in mountain lion country, these animals are large enough to kill humans, yet they will probably avoid contact with most humans. Avoid leaving bait or other meat near your camp or homestead. If you do see a mountain lion in close proximity, **do not run**. Spread your arms out and wave them, and yell at the animal. This will probably scare the cat away. This technique may also work with bears. (Author's note: I have survived the bluff charge of a grizzly bear once using this technique.) In places where there are conflicts between lions and humans, it may help to clear brush away from the house. This will make stalking unseen difficult for the big cat. Clearing brush away from the home is also good practice for people living in wildfire country.

Conservation

Mountain lions are widespread in forested, mountainous areas of the Western United States. To maintain viable populations, lions require areas of abundant prey and cover, and relatively little human activity. Two issues are of great concern in conservation of mountain lions on the North Coast of California: 1) provision of appropriate habitat and adequate prey, and 2) reduction of conflicts with humans.

Where humans are present and alter habitats or prey abundance, or "over harvest" lions, lion population density may decrease and become vulnerable to local *extirpation*. Adequate corridors for dispersal and interaction of sub-populations must be provided to maintain population viability. Highways can reduce the effectiveness of forested corridors as dispersal routes. Mountain lion requirements for dispersal corridors have not been well studied nor defined; however, they appear

to be easier to meet than those for other large, far-ranging forest carnivores, such as grizzly bears and wolves.

Badger

Life history and Habitat

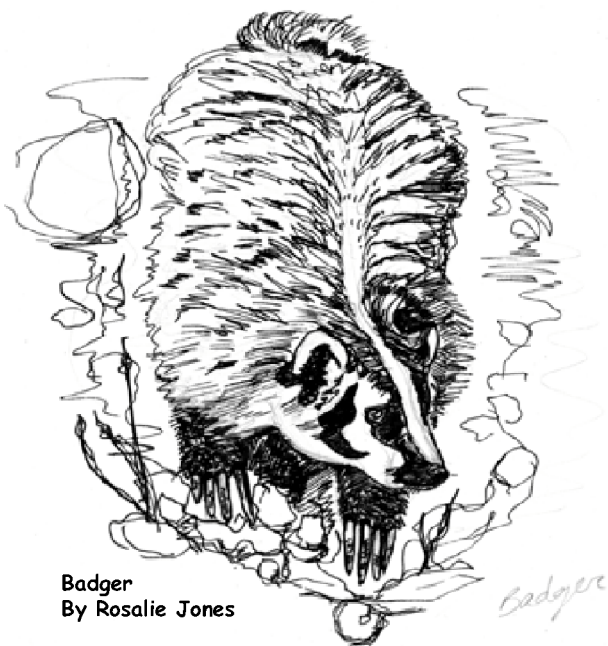
The badger (*Taxidea taxus*) is an uncommon, permanent resident found throughout most of the state, except the northwestern most corner. It is a resident in the North Coastal Basin. The badger is listed as a California Species of Special Concern, as well as a Harvest Species. The badger is most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with loose, crumbly soils.

Badgers are carnivorous. They eat *fossorial* rodents (rodents that live underground): rats, mice, chipmunks, especially ground squirrels, and pocket gophers. Badgers also eat some reptiles, insects, earthworms, eggs, birds, and carrion.

Badgers dig burrows in the ground for cover and for birthing young. Badgers frequently re-use old burrows, although some may dig a new den each night, especially in summer. Young are born

in burrows dug in relatively dry, often sandy, soil, usually in areas with sparse overstory cover. Home range estimates vary geographically and seasonally.

Badgers are highly specialized fossorial mustelids that help control small mammal populations. The badger is somewhat tolerant of human activities, however, predator control using indiscriminate trapping and persistent poisons causes extensive losses.



Badger
By Rosalie Jones

Inventory Technique

Badgers can be found in the grasslands and oak woodlands of the North Coastal basin. Their burrows may be found in loose soils. The average dimensions of a badger burrow are eight inches to a foot in diameter and elliptical in shape (Murie 1975). In locations where their burrows are found, one can set track boxes

using the same technique for detecting martens and fishers. Keep good notes on possible burrows that you find. Badger burrows have larger holes than most other fossorial animals. Other burrowing creatures include ground squirrels, moles, pocket gophers, and burrowing owls.

Conservation

Important issues in the conservation of badger include: limiting predator control and use of poisons, as well as plowing and cultivating fields. Another factor may include forestation of once open prairies that are dependent upon fire to maintain structural and species composition.

Mid-sized Forest Carnivores from the Mustelidae Family

The Humboldt marten and the Pacific fisher are both mid-sized forest carnivores from the family which includes weasels, ferrets, skunks, badgers, otters, and wolverines. Both the marten and fisher are important indicators of ecological integrity, as they may require functional landscape connectivity to maintain viable populations. Presence of these wide-ranging forest carnivores is indicative of a diverse, abundant, and inter-connected landscape. In order to protect even one individual marten or fisher, our communities must work together with our neighbors in other watersheds to protect the integrity of the landscape.

Humboldt Marten

Life History and Habitat

The Humboldt marten (*Martes americana humboldtensis*) is considered a distinct subspecies of the American marten. This subspecies, which once ranged along the coast roughly from the California-Oregon border south to Sonoma County, was thought to be extinct since the closing of its trapping season in the 1950's. Within the last five years, a small population of martens was discovered within the historic range of the Humboldt marten. At this time, however, the US Fish and Wildlife Service, reports that there is not enough information to warrant the listing of this subspecies.



Humboldt Marten?
Six Rivers National Forest

The American marten, a US Forest Service Sensitive Species, is an uncommon to common, permanent resident of the Sierra Nevada, Klamath, Cascade Mountains, and North Coast regions. Optimal habitats are various mixed-evergreen forests with more than 30-40% crown closure over the landscape, large trees, and snags. Martens may associate with forests containing high shrub cover, especially where ericaceous berries may be found in abundance. Shrubs provide cover, berries, and prey. Martens are mostly carnivorous, taking primarily small mammals: tree squirrels, chipmunks, mice, shrews, rabbits, hares, and pikas. Spring through autumn, martens often eat birds, insects, and berries. Martens also eat fish, and will forage along the edge of the water. They also forage on the ground, and in trees, snags, and rock areas. Martens may tunnel under snow. They search and pounce on or chase prey. Martens will use their forepaws to remove birds

from tree cavities.

Martens use cavities in large trees, snags, stumps, logs, or burrows, caves, and crevices in rocky areas for cover and as *natal* dens. Less commonly, martens will den in woodpiles, cabins, and other human artifacts. They also may den under snow near logs, stumps, or other objects. Natal dens are lined with leaves, grass, mosses, or other vegetation.

Martens require a variety of different aged stands, particularly old-growth conifers and snags, which provide abundant cavities for denning and nesting. Martens tend to travel along ridgetops, and rarely move across large areas devoid of canopy cover. Small clearings, meadows, and riparian areas provide foraging habitats, particularly during snow-free periods.

Martens are active yearlong, and mostly nocturnal and crepuscular, with some *diurnal* activity. One male home range may overlap several female home ranges.

Martens are occasionally prey of fishers, bobcats, great horned owls, and eagles. They are agile climbers, and mostly *arboreal*. Population levels appear to follow primary prey abundance. Martens are sensitive to human disturbance, and are trapped easily. Large clearcuts, extensive even-aged forest management, and destruction of mature stands are detrimental to these mustelids.

Conservation & Inventory Technique

See Pacific fisher below.

Pacific Fisher

Life History and Habitat

The Pacific fisher (*Martes pennanti*) is an uncommon resident of the Sierra Nevada, Cascades, and Klamath Mountains, and is also found in a few areas in the North Coastal Basin of California. The fisher is considered a California Species of Special Concern, Forest Service Sensitive and a federal Species of Concern. The fisher is usually found in mixed forests with a diversity of tree species and ages. It occurs in intermediate to large tree stages of coniferous forests and deciduous riparian habitats with a high percentage of canopy closure across the landscape. The diverse diet of the fisher probably requires a mix of forested habitat types for optimal habitat. Suitable habitat for fishers consists of large areas of mature, dense forest with snags and greater than fifty percent canopy closure (Quigley, ed. 1998)

Fishers are largely carnivorous and eat rabbits and hares, rodents (mice, porcupines, squirrels, mountain beavers), shrews, birds, fruits, and carrion. Fishers hunt on the forest floor and in trees. They are opportunistic and search for small mammals, then pounce on them or chase them. Fishers also dig out prey.

Fishers use cavities in large trees, snags, logs, rock areas, or shelters provided by slash or brush piles. They den

in a variety of protected cavities, brush piles, logs, or under a fallen tree. Hollow logs, trees, and snags are especially important for natal dens.

The fisher is active yearlong, and is mostly nocturnal and crepuscular, with some diurnal activity. In California, Buck et al (1979) found male fishers have average home ranges of 5.4 sq. miles and female fishers had average home ranges of 3.6 sq. km (2.5 miles). Fishers can travel relatively long distances, and daily movements of 5 to 6 km (4-5 miles) have been documented repeatedly. Barriers to movement include large non-forested openings and highways. Maintenance of links between individuals and populations will require elimination or reduction of these barriers. Riparian corridors are especially important habitat, serving as travel corridors and providing rich habitat for fisher prey.



Conservation

The following is excerpted from "Forest Carnivore Conservation and Management in the Interior Columbia Basin" (Quigley, ed. 1998). Conservation for marten as outlined in the text includes three of the same conservation issues as for fisher. However, riparian corridors are not mentioned as an issue for marten conservation in this literature source.

The status of fisher in the Western United States is poorly known but generally perceived as precarious and declining. Systematic habitat alteration and overexploitation have reduced the historical distribution of fishers in suitable habitat of the CNCB to isolated and fragmented populations. Current populations may be extremely vulnerable to local and regional extirpation because of their lack of connectivity and their small numbers.

There are four issues central to the conservation of Pacific fishers in the CNCB.

- 1) **Conservation of late successional, mature forest at low to mid elevations.** Past decades of timber harvest in many areas of the basin have fragmented forest habitat, thereby reducing the contiguous area and creating barriers to movement. Fishers can probably tolerate small patch cuts or other small-scale disturbances, provided these occur in a larger *matrix* of relatively dense, closed canopy, mature forest. Such openings might even increase value of habitat by providing a diversity of prey, which will support a diverse diet for fishers.
- 2) **Maintenance of links between populations.** Barriers to movement include large non-forested openings and highways. Maintenance of links between populations will require elimination or reduction of these barriers.
- 3) **Maintenance of riparian corridors** for use by individuals and populations.
- 4) **Trapping pressure and human disturbance.** Trapping season on this fur-bearing game animal has been closed since the 1950's in the state of California, however, poachers and other trappers may still take some fishers and martens.



Inventory Technique

Fishers are highly elusive and difficult to track unaided. However, a carbon-sooted aluminum track surface has been used in a variety of ways to detect mammalian carnivores. To set *track plates*, you should carefully follow the government protocol, as this will provide standardized data to determine the probability of presence or absence of fishers, martens, and other forest creatures. The protocol is described in detail in "American Marten, Fisher, Lynx, and Wolverine: Survey Methods for Their Detection" (Zielinski and Kucera 1995). The protocol can be fulfilled by following these steps:

Materials

- 1) Track boxes
- 2) Aluminum plates
- 3) Skunk-it lure
- 4) Chicken wings
- 5) Acetylene torch (or) oil lamp (or) candle

- 6) Con-Tact paper
- 7) Duct tape
- 8) Clear document protector sheets
- 9) Flagging tape
- 10) USGS topographic maps
- 11) Predicted Probability of Fisher Detection Model/Map (Carlos Carroll 1997)

Placement of Boxes

- 1) If you study Carlos Carroll's model for Predicted Probability of Fisher Detection, you can set your boxes in high-predicted probability areas.
- 2) Obtain a USGS Topographic map of the areas you want to set track boxes.
- 3) Pick four one-square-mile sections that form a four-square mile sample unit.
- 4) Within the sample unit, pick locations for at least six track boxes. They need to be at least 1/2 mile away from each other, and no more than two boxes per square mile (unless you are setting more than eight boxes in a unit).

Setting up the Boxes

- 1) Sooting the plates:
 - (a) Acetylene torch: Turn the oxygen off, and using the torch on low, you will get a fine stream of black smoke from the flame. Use this smoke to soot the aluminum plate.
 - (b) Oil lamp: Turn the wick up high and soot the plate in a windless area.
 - (c) Candle: Soot the plate in a windless area.
- 2) Applying the Con-Tact paper:
 - (a) Tear 1/4" duct tape strips about an inch long and set them aside.
 - (b) Cut the Con-Tact paper into sections that are 10" wide (an inch longer than the aluminum plate). Next cut the 10" pieces of Con-Tact paper in half.
 - (c) Peel back the corners of the Con-Tact paper and place the duct tape strips so that they are oriented pointing outwards from the long edges of the Con-Tact Paper. Rub the corners of the waxy paper back over the tape.
 - (d) Fold an inch of the Con-Tact paper over the one edge of the sooted-aluminum sheet and rub the tape so it sticks to the back of the plate. Make sure to leave enough space at the top of the plate to place the chicken. Firmly flatten the paper over the plate. Fold the other side over and rub the tape.
- 3) *Carrying plates in the field:* Place two or more plates together, sooted sides facing each other, and clip or tape them together. If you are losing a lot of soot you can place a blank plate in between the sooted plates.
- 4) *Setting boxes in the field:*
 - (a) For systematically chosen box locations, you will need to use a map, compass, and altimeter to navigate to approximately the correct location.
 - (b) Pick a spot near a log or tree in approximately the area selected on your USGS map. The box should be set against a log or base of a tree.
 - (c) Set up the track box. You can duct tape it together or use strips of a tire inner tube tied around the box.
 - (d) Pile branches and forest duff on the box to conceal it, stabilize it, and discourage animals from entering the box from the rear.
 - (e) Peel off the waxy paper on the Con-Tact paper, put the chicken wing on it, and slide it in the box.

- (f) Make sure to flag a path back to your box.
- 5) *Station Visits and Data Collection:*
 - (a) Visit the stations every other day for a minimum of eight visits or 16 days.
 - (b) Replace the plates and the chicken at every visit, unless the plate is clean, and the chicken is not foul. (That is foul, not fowl!)
 - (c) Use the data sheet provided in Appendix 1. During each visit, record for each station: date, days since previous visit, box condition (intact or inoperable), weather since last visit (rain or no rain), bait (present or not), lure (present or not), presence of ants or maggots, and species names of visiting critters.
- 6) You will need to accurately plot your box locations on the USGS topographic map.
- 7) Please fax tracks to AFI, 707-923-4486, attn: FCTP if you need help in identifying them.

Precautionary Advice

Mustelids are extremely shy and have an excellent sense of smell. To avoid scaring them away from your boxes, do not urinate or smoke cigarettes near box locations. You should take care to do these and other smelly human activities at least 1/4 mile from your boxes. Also, leave your dog, cat, or other pet at home. Remind all the volunteers helping you of this issue before they check the box.

V. Habitat Assessment

Plant Community Survey and Inventory Techniques

In order to determine what types of habitat are found in a landscape, we must use objective survey techniques. Vegetation sampling is the basis of identifying and defining the extent of habitats present in the area being inventoried. Visual estimates of vegetation communities are generally adequate for characterizing land in an ecological inventory. The convention used in this manual is a habitat assessment or *relevé*, a visual vegetation/wildlife habitat estimation technique used to classify and map large areas in a limited amount of time. The *relevé* is particularly useful when observers are trying to quickly classify the structure, composition, and range of diversity of plant communities and wildlife habitats over large units of land.

The information gathered in repeated plant *sampling* clarifies the identification of plant communities, enhancing the observers' recognition and understanding of the composition of the surrounding landscape. From this knowledge of habitat composition and structure comes a greater understanding of the ecology of an area and the dynamic physical and biological processes that shape it.

This citizen's forest habitat assessment was created to fulfill the following purposes:

- 1) Be simple enough to be conducted by citizen volunteers with some training.
- 2) Take minimal time and effort.
- 3) Create awareness of the "tools of the trade" for habitat assessment and ecological inventory.
- 4) Identify areas with high habitat potential for wildlife.
- 5) Provide a standardized technique for assessing forested habitat.
- 6) Verify accuracy of *spectrally classified* vegetation maps created from satellite imagery, especially late-seral (greater than 24 inches *DBH*) forest classification.

Selecting a Stand to Sample

A *stand* is the basic physical unit of vegetation in a landscape. It has no set size. Some vegetation stands are very small, such as alpine meadow or tundra types, and some may be several square kilometers (1 km = .62 miles) in size, such as desert or forest types. A stand is defined by two main unifying characteristics:

- 1) It has compositional integrity. Throughout the site the combination of species is similar. The stand is differentiated from adjacent stands by a discernable boundary that may be abrupt or indistinct, and,
- 2) It has structural integrity. It has a similar history or environmental setting that affords relatively similar horizontal and vertical spacing of plant species throughout.

The structural and compositional features of a stand are often combined into a term called *homogeneity*. For an area of vegetated ground to meet the requirements of a stand it must be homogeneous.

Stands to be sampled may be selected by assessment prior to a site visit (delineated from aerial photos or satellite images for example), or may be selected on site (during reconnaissance to determine extent and boundaries, location of other similar stands, etc.).

Depending on the project goals, you may want to select just one or a few representative stands for sampling (e.g., for developing a classification for a vegetation mapping project), or you may want to sample all of them (e.g., to define a rare vegetation type and/or compare site quality between the few remaining stands). (Unpublished CNPS report)

Selecting a Plot to Sample Within in a Stand

Because most stands are large, it is difficult to summarize the species composition, cover, and structure of an entire stand. We are also usually trying to capture the most information with the least amount of effort. Thus, we are typically forced to select a representative portion to sample.

The main thing to remember when sampling a vegetation stand is that you want to select a sample that, in as many ways possible, is representative of that stand. This means that you are not randomly selecting a plot; **on the contrary, you are actively using your own best judgement to find a representative piece of the stand.**

Selecting a plot requires that you see enough of the stand you are sampling to feel comfortable in choosing a representative plot location. Take a brief walk through the stand and look for variations in species composition and in stand structure. In many cases in hilly or mountainous terrain look for a vantage point from which you can get a representative view of the whole stand. Variations in vegetation that are repeated throughout the stand should be included in your plot. Once you assess the variation within the stand, attempt to find an area that captures the stand's common species composition and structural condition to sample. (Unpublished CNPS report)

Establishing a Plot

Once an appropriate, representative plot location is chosen, its specific area and boundaries are established. Within forested environments, a circular-shaped plot of 10 meter radius (approx. 33 feet) is sufficient to describe the stand type and capture the diversity of vegetation.

Plot boundaries are determined by:

- a) Plot center: Track plate, spotted owl detection, or any point on the landscape where habitat is to be assessed, or map verified, or

- b) Four transects, oriented to the cardinal points (N, E, S, W), beginning at plot center and extending 10 meters (approx. 33 feet) to the plot edge (this delineates a circular plot edge and sampling transects).

General Plot Information

The following items appear on each data sheet and should be collected for all plots:

Date: Date of sampling.

Surveyor Name: Name of person(s) who observes and records plot sampling.

Phone Number, Address, City, Zip: OPTIONAL

Watershed: Indicate in which watershed the survey is taken.

Landowner: Name of landowner or agency acronym if known. Otherwise, list as private.

USGS Quad MAP: Name and number of the USGS map the survey is located on; note series (15' or 7').

Latitude and Longitude: Degrees north latitude and east longitude.

UTMN and UTME: Northing and easting coordinates using the Universal Transverse Mercator (UTM) grid as delineated on the USGS topographic map; to nearest 0.01 km (33 feet).

Township, Range, Section County: Located on USGS map.

Slope: Degrees, read from clinometer or compass, or estimated; averaged over survey.

Aspect: Degrees from true north (adjust declination), read from a compass or estimated; averaged over survey.

Elevation: Recorded in feet or meters. Please indicate units.

Macrotopography: Characterize the large-scale topographic position of the survey. This is the general position of the sample along major topographic features of the area.

Site history: Briefly describe the history of the stand, if known.

Additional comments: Feel free to note any additional observations of the site, or deviations from the standard sampling methods. If additional data were recorded, please indicate so here.

Photographs: For back-up visual documentation, take photographs of general plot area, each transect line, questionable vegetation species, special habitat elements, etc. Additional photographs of the stand may also be helpful.

Estimating Cover

There are many ways to estimate plant cover. To a novice, it may seem incomprehensible and foolhardy to stand in a meadow of fifty different species of plants and systematically be able to list by cover value each one without actually “measuring” them in some way.

Of course, our minds make thousands of estimates of various types every week. Estimating plant cover can be done by anyone with an open mind and an “eye for nature.”

It is very helpful to work initially with other people who know and are learning the technique. In such a group setting, typically a set of justifications for each person's estimate is made and a “meeting of the minds” is reached. This consensus approach and the concomitant calibration of each person's internal scales are very important parts of the training for any cover estimate project.

An underlying point to remember is that estimates must provide some level of reliable values that are within acceptable bounds of accuracy. As with any scientific measurement, the

requirement for accuracy in the vegetation data is closely related to the accuracy of the information needed to provide a useful summary of it.

Put into a more immediate perspective: **to allow useful and repeatable analysis of vegetation data, one does not need to estimate down to the exact percent value the cover of a given plant species in a given stand.** (Unpublished CNPS report)

Tree Cover and Composition

Forested plots, as well as their accompanying community associations and ecology, are best described by the dominant tree species they contain. For each plot, attempt to visually estimate and record:

- 1) **Species** of the three dominant mature tree types within the canopy overstory.
- 2) **Individual overstory species canopy closure:** percentage of plot covered by each of the three dominant, overstory tree types, visually estimated to plus or minus five-percent accuracy.
- 3) **Total overstory species canopy closure:** percentage of plot covered by all three dominant, overstory tree species, combined, visually estimated to plus or minus five-percent accuracy.
- 4) **Species** of the three dominant tree types within the canopy understory.
- 5) **Individual understory species canopy closure:** percentage of plot covered by each of the three dominant, understory tree types, visually estimated to plus or minus five-percent accuracy.
- 6) **Total understory species canopy closure:** percentage of plot covered by all dominant, understory tree species, visually estimated to plus or minus five-percent accuracy.
- 7) Overall average California Wildlife Habitat Relationships (**CWHR**) **size class** of trees within the plot.

CWHR Tree size classes

Size Class 1	tree saplings
Size Class 2	1-6 inches diameter at breast height (DBH)
Size Class 3	6-11 inches DBH
Size Class 4	11-24 inches DBH
Size Class 5	24-36 inches DBH
Size Class 7	>36 inches DBH

- 8) **Multi-storied canopy:** Forest canopies that have distinct upper and lower tree-crown layers are referred to as *multi-storied canopies*. Estimate canopy closure percentage for the upper and lower stories and record their individual values as described in numbers 2,3,5 and 6 above. Total overstory and understory estimates (#'s 3 and 6), combined, should not total more than one hundred percent.

- 9) **"In" trees:** determine "in" trees as per the "circular variable plot" technique.

"Circular Variable Plot" Technique

Use a Basal Area Factor (BAF) prism or cruise-all to determine "in" trees from plot center.

- a) These devices measure the approximate basal area of trees in a stand when the number of "in" trunks in a plot is multiplied by the basal area factor used.
- b) While standing at the plot center, pickup the BAF device and look through while holding at 25 inches from your eye or chin. For the "Cruise-All," look through it using the opening or view marked "20" (BAF).
- c) "In" trees include all trees where the top and bottom split of the trunk are touching when you look through the device.

For all "in" trees, attempt to record:

- d) **Species** of “in” trees, if known, or record conifer or hardwood designation.
- e) **Diameter at Breast Height (DBH)** measurement.
Measuring DBH: Measure tree circumference (girth) 4.5 feet above the ground, and divide by π (3.14) to determine the diameter of an in tree, or use a “diameter tape.”
(Circumference/ π) at 4.5 feet above ground
- f) **Condition:** Living (green, living leaves and branches present) or dead (no living leaves and branches, standing dead snag).

Shrub Cover and Composition

For the three dominant shrub species, attempt to record:

- 1) **Species**
- 2) **Percent shrub cover/closure:** Visually estimate the percentage of the plot covered by each of the three dominant shrub types.
- 3) **Shrub cover class:** Visually estimate percent cover of all shrubs, combined, within a plot:
CWHR Shrub cover classes

S	sparse	10-24% cover
P	open	25-39% cover
M	moderate	40-59% cover
D	dense	60-100% cover
- 4) (Optional): Take one **photograph** of each of the four transect directions from plot center. Have a friend stand in your field of view at a distance of 10 meters (33 feet) from you; this will give the picture a comparison of size and scale.

Herbaceous Cover

If an herbaceous layer is present, record:

- 1) **Species** of known plants, or annual/perennial grassland and/or herb designation.
- 2) Percent of **herbaceous ground cover** for entire plot.

CWHR Herbaceous Cover Classes

S	sparse	2-9% cover
P	open	10-39% cover
M	moderate	40-59% cover
D	dense	60-100% cover



By Noël Soucy

Ground Cover

Visually estimate the percentage of ground covered by:

- 1) litter (leaves, needles, branches, etc.),
- 2) herbaceous plants,
- 3) rock (including coarse gravel), and
- 4) soil or sand.

Canopy Closure

- 1) Measure canopy closure with a spherical densiometer. If you don't have a densiometer, you can use a toilet paper tube wrapped with two rubber bands. Wrap the rubber bands around

the tube so that they make a perpendicular cross in the center of the tube hole at the top and bottom.

- 2) While looking straight up through the tube, if you line up the crosshairs at both ends of the tube, you should see the field of view is divided into four quarters by the rubber bands. This will help you estimate the percentage of sky you can see.
- 3) While under the canopy, estimate the percentage of sky that you can see through the hole in the tube. Write down the value you get.
- 4) The first reading is at plot center. Repeat this technique along transects in each of the four directions at 10 feet, 20 feet, and 30 feet from the plot center.
- 5) Record all your values and average them. If you subtract your value for percent sky away from 100%, you should get a fairly precise estimate for percent canopy closure.
- 6) Record canopy closure class based on CWHR classification:

CWHR Tree cover classes

S	sparse	10-24% cover
P	open	25-39% cover
M	moderate	40-59% cover
D	dense	60-100% cover

- 7) You can learn to visually estimate canopy closure with some practice.

Special Elements Information

Downed logs and snags (standing dead trees):

- 1) Try to determine **species** of each snag or downed log.
- 2) Record **size class** of each, use same size classes as for live trees.

Evidence of disturbances:

Record:

- 1) any **stressor type(s)** present:
 - a) intrinsic (e.g. signs of fire, flood, disease, etc.)
 - b) extrinsic (*See extrinsic stressor types.*)
- 2) extent of impact
 - a) light
 - b) moderate
 - c) heavy
- 3) relative age

Presence/absence of:

- 1) cones/acorns
- 2) lichens, mushrooms, mosses, etc.
- 3) fruit/berries

Distance to:

- 1) nearest water/riparian area
- 2) nearest road and type (skid, unpaved, paved, etc.)

BAF:



5

10

20

STRING: looped so that BAF device is extended
25 inches away from eye or chin

Instructions:

- 1) Trace this device onto cardboard or plastic
- 2) Cut out outside, and white area inside (where "40" is located)
- 3) Loop string through handle
- 4) Measure "in trees" from plot center. Use thickest area (near "5") for a BAF of 5, thinner "10", and thinnest "20" for respective BAF's. See instructions for using BAF/cruise-all/prism instructions in Chapter V. Habitat Assessment.

Basal Area Factor (BAF) Device "Cruise All"

VI. Mapping Special Elements in the CNCB

Special Elements include old-growth or late-seral forest, locations of rare and threatened species, *roadless* and *wilderness* areas, wetlands and seeps, landscape linkages, and special places with high aesthetic, cultural, spiritual, or recreational importance, and other entities considered having high conservation value.

A few important reasons to incorporate these areas into a protected area network include: providing *refugia* for rare and threatened species, maintaining ecosystem viability and processes, water quality, flood control, and protecting intrinsic and cultural values of the wildlands.

This section provides techniques for using maps, mapping roads and roadless areas, and assessing landscape linkages.

Using Maps for Field Inventory

Maps can be easy to use, following a few guidelines. For orienteering properly, you will need a map, compass, and altimeter. You can obtain topographic and vegetation maps as well as habitat models for your region from LEGACY-TLC (*see contact information in the front of this manual*). Aerial photographs, topographic maps and ownership maps are available from the Mattole Restoration Council for the Mattole (707-629-3514, mrc@inreach.com). Expect to pay for the creation of maps.

- 1) Use a **compass** to orient your map the right direction. Orient your map by:
 - (a) Set the declination on your compass to 18 degrees (for our area).
 - (b) Rotate the compass circle to line up the edge or sight of the compass with true north, then rotate the whole compass until the magnetic arrow fits into the hollow red arrow.
 - (c) Orient your field map to the north so that it parallels the edge of your compass
- 2) If you are using a **topographic map** (one with the elevational contour lines) the following may help you to orient yourself to the map:
 - (a) An **altimeter** can help you find what contour line you are on, or how much elevation you have gained or lost while hiking on a bearing from a known point.
 - (b) Elevational lines along ridges form "u's" which "point" downslope.
 - (c) Elevational lines along creeks and rivers form "v's" which "point" upstream.
 - (d) In the North Coastal Basin, knowing your watershed and its tributaries may be one of the easiest ways to navigate in a landscape. Finding the confluence of two marked watercourses or a watercourse and a road is a good way to locate your self.
 - (e) Some buildings may be marked with small squares on USGS topographic maps
 - (f) Most peaks are marked with their elevation. You can orient yourself exactly by *triangulating* off three known points within view. Peaks may serve well for this purpose.
- 3) If you are using a **vegetation map** from *spectrally-classified* LANDSAT satellite imagery, the following may be helpful:
 - (a) This image is made by taking a satellite image and training the computer to recognize the *spectral signatures* of the different vegetation types. The vegetation types are classified by establishing a "seed" area on the map that is representative of a vegetation type. The seed is grown to encompass every area that the computer recognizes as having the same spectral signature.
 - (b) Spectrally classified vegetation maps are at the cutting edge of *remote sensing* and *GIS*, and their accuracy is in need of field verification. If you recognize any areas that have been

inappropriately classified, circle the area in question and be sure to note the correct vegetation classification on your map. A major problem is referred to as “shadow forest.” Since most satellite photos are taken at 10:00 AM, shadows on NE aspects can make younger forests look more mature to a computer.

4) **Habitat Models:**

- (a) LEGACY-TLC has habitat models available for the following species: Pacific fisher, marten, and Roosevelt elk. Models that will be available in the future include: mountain lion, spotted owl, marbled murrelet, willow flycatcher, wolf, grizzly bear, and badger.
- (b) Habitat models are used to predict the probability of detection of a species across the landscape.
- (c) Depending on the species, many attributes are used to predict their presence. These attributes include: habitat type, seral stage, road density, slope, aspect, presence of snags, distance to water, proximity to human settlements, etc.
- (d) Habitat maps can be used for prioritizing survey efforts and conservation and land acquisition.

Assessing Landscape Linkages

Linking areas of ecological integrity across a landscape is a strategy for long-term recovery of threatened ecosystems and species throughout a region. The principle governing the Redwoods to Sea project was to connect together? or provide linkages? between the core wild areas of Humboldt Redwoods State Park (the largest ancient redwood forest in the world), and the King Range National Conservation Area (the longest, unroaded coastline in the lower 48 states), through the middle Mattole area. This section explains how to identify such landscape linkages, whether they be at the same scale as the Redwoods to Sea wildlife corridor, or on a smaller, subwatershed level.

Primary Functions of Linkages:

- 5. Provide dwelling habitat as extensions of reserves.
- 6. Provide for seasonal movement of wildlife.
- 7. Provide for *dispersal* and genetic interchange between *cores*.
- 8. Allow for latitudinal and elevational range shifts with climate and seasonal change.

Essential Elements of Landscape Linkages:

- a) Low road density.
- b) Low human activity.
- c) Large and/or interconnected areas of high vegetation cover (esp. riparian areas).
- d) Specific landforms for particular species.
- e) Specific habitat or important food resources for species.
- 8) Canopy closure.
- 9) Presence of old-growth and mature forest.

- f) Viable underpasses for wildlife to bridge busy roads.
- g) Short distance between core reserves.
- h) Occurrences of focal species.

Assess Linkage Boundaries and Qualities:

- 1) Conduct surveys for focal species, find historical information on focal species occurrence.
- 2) Scope the linkage area between core reserves traveling a route that will afford the best views of the area.
- 3) Divide the linkage into subareas.
- 4) Visit each subarea taking photographs, recording observations on your log, and on the map regarding the essential elements of linkages.
- 5) Note location and extent of essential elements on map: lowest road density, lowest human activity, and key habitats or landforms (including underpasses).

Putting the Pieces together: Components of Conservation Area Design

All of the information gathered using the techniques described in this manual can be used in regional, landscape-scale conservation planning. Elements of LEGACY's methodology for creating a regional conservation area design include:

- ? **Special Elements Mapping and Analysis** (fine filter approach) Rare species, special places, and other entities considered to have high conservation value.
- ? **Focal Species Analysis** (identifies available suitable habitat) Mapping and modeling of select wildlife species.
- ? **Representational Analysis** (coarse filter approach) Represent all common vegetation communities in some kind of protected area.
- ? **Community Networking** Watershed-level conservation plans.
- ? **Vision Map** Landscape-level conservation strategy.

Mapping Roads and Roadless Areas

If you are seeking to adopt a *roadless* area to have it established by Congress as Wilderness, then you may want to contact Lynn Ryan at AFI (707) 923-4475 or Ryan Henson from the California Wilderness Coalition (CWC). CWC is campaigning for the establishment of Wilderness Areas in California. CWC can be reached at POB 2346, Burney, CA. 96013, (530) 335-3183.

To field check roadless areas, the major goals are to identify:

- 5) The actual boundary of the roadless area.
- 6) The status of roads and other developments immediately around the roadless area.
- 7) The amount of roads in an area.
- 8) Any errors on and/or the accuracy of your maps.

You can characterize a roadless area by taking photographs, completing survey forms, writing an observation log, and annotating a map.

Field checking is the process we use to determine whether or not the wild areas identified in the aerial photo surveys are truly wild and meet the legal definition of "wilderness" developed by Congress in 1964. Field checking consists of going into the woods and following the draft wilderness boundaries on the topographic maps and carefully documenting all human-caused intrusions with notes and photographs. For each intrusion, one must determine whether or not the disturbance is so

great that it must be excluded from the potential new wilderness area. In addition to documenting damage, volunteers must also try to note and photograph the positive wilderness attributes such as wildlife, scenery, pristine streams, etc. When the field checking is completed for an area, volunteers have the responsibility to draw the semi-final wilderness boundaries for it. You may leave a permanent mark on California's conservation history by drawing the lines used by Congress to define new wilderness areas.

Materials for Mapping Roadless Areas	
<ul style="list-style-type: none"> -USGS Topographic maps (make extra 8.5 x 11 photocopies for use in the field) -Survey forms -Camera -Film (2 rolls/day) -Compass -Clipboard/notebook -A ziplock to protect notes and maps from rain, sweat, and food -Pen/pencils -Highlighters -Permit (if necessary) -Vehicle (if you don't have a 4wd, you can do more hiking/biking) -Field guides 	<p>Optional</p> <ul style="list-style-type: none"> -Binoculars -GPS unit -Mountain bike -cyclometer for bike/pedometer -Flagging tape

Survey Travel Ways in Each Roadless Area

- 5) Travel to the end of each mapped and unmapped *travel way* that goes towards the roadless area. Record locations of all spur-travel ways. For each travel way, record notes regarding the overall conditions of the travel way, presence of closures, any notable disturbances, erosion problems, or bad culverts.
- 6) If a mapped travel way is mapped incorrectly (has lengthened, etc.), correct the map. If a mapped travel way is not found, indicate so on your map and in your log.
- 7) Complete a survey form for each travel way that goes towards/enters the roadless area and is longer than 100 yards. For a travel way that is less than 100 yards and/or goes away from the roadless area, mark its location on the map, take a photograph of its beginning, and mention its presence on the travel way form for the travel way to which it connects.
- 8) Mark non-motorized foot and pack trails on your map and in your log. Check them for evidence of All-Terrain Vehicles (ATV) and motorcycles. If you find such use, follow the trail to where the evidence ends and record your findings with photos.

Draw the Roadless Area Boundary on Your Map

Based on your findings, use a red highlighter to delineate the actual roadless area boundary on your field map. Make it as large as possible by "*cherry-stemming*" roads and including closed roads and illegal travel ways. Use a yellow highlighter to show the routes you traveled.

Measuring Road Density

Using your USGS topographic map, choose a square mile section to measure roads. For driveable roads, you can use your odometer to measure the amount of road in each square mile section. For areas that are not accessible by motor vehicle, you can estimate the road mileage by using a pedometer or cyclometer. Road density is measured in miles of road per square mile.

VII. Literature Resources

(These literature resources can be found at the Humboldt State University Library)

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Photo and Drawing Credits

A. Lance Archambeau Roosevelt elk drawing

Rosalie Jones: Salamanders, grasshopper sparrow, Marbled murrelet varied thrush, golden eagle, badger, flying squirrel drawings-

Redwood Sciences Lab: Fisher on tree, Marten on tree. Photos from motion detecting cameras, Six Rivers National Forest.

Carmel Reyes: Snowy plover, pond turtle, rubber boa, meadowlark, willow flycatcher, yellow breasted chat drawings, pileated woodpecker, mountain lion drawings.

Noel Soucy: Habitat images and photographs.

VIII. Ecological Inventory Terms Glossary

abundant Number of individuals in species population exceeds the amount necessary to maintain a viable population.

accipiter A forest hawk from the *Accipitridae* family of Birds. In North America, accipiters include three species of hawks which are adapted to living and foraging in the forest. These hawks are the Northern goshawk, Cooper's hawk, and sharp-shinned hawk.

aestivation Dormancy or sluggishness that occurs in some animals during a period when conditions are hot and dry. Aestivation is analogous to hibernation in cold environments and normally lasts the length of the dry period or season.

alarm call A warning call or sound given by an animal in response to an intruder nearby its nest or den.

alluvial floodplains An area of land bordering larger watercourses which is formed from transported and deposited organic and soil-based materials (alluvium). These floodplains can be inundated with water seasonally, depending on the nature and extent of the flooding.

amphipods see arthropods

aquatic Pertaining to water.

aquifer A water bearing rock, rock formation or group of formations

arboreal An organism which is adapted to spending all or part of its lifetime in trees.

ardeid A bird from the taxonomic family of herons and egrets.

arthropods Arthropoda is a highly diverse *Phylum* of joint-limbed animals, which includes the crustaceans (crabs and lobster), arachnids (spiders), insects, centipedes, and millipedes.

aspect Compass bearing and /or general direction (i.e. southwest facing).

associate Species presence in an area is linked or associated to presence of physical or biological attributes.

association A group of species living in the same place.

basin See watershed

bearing The compass degree of a given direction from true north a bearing must be between 0 degrees (north) and 359 degrees.

begging call A sound or call usually given by a female bird or her nestlings to encourage the male or both parents to bring food to the nest.

bioaccumulation The accumulation of toxins in the bodies of animals at the top of the food chain.

biodiversity Biological Diversity? the diversity of life which includes: species richness, ecosystem complexity and genetic variation.

bole The main stem of a tree, including the trunk.

brood parasitism A brood parasite is a species of bird that lays its eggs in the nest of another bird, displacing or killing the hosts offspring. Ex. Brown-headed cow bird.

cache A hidden stash of food.

canopy The part of a terrestrial plant community in which a distinctive habitat is formed in the upper, denser regions of the taller plants. Usually refers to tree and shrub dominated habitats.

canopy closure A measurement of the amount of coverage a canopy produces.

carnivorous An organism that eats mostly flesh or meat.

carrion The decomposing flesh of a dead animal.

CDFG/DFG California Department of Fish and Game.

chaparral A habitat type which is primarily composed of evergreen woody shrubs

cherry stemming A road that extends into a wilderness area or a proposed wilderness area, and is surrounded by wilderness.

classification scheme Refers to the method used for identifying and classifying vegetation.

climax The endpoint of a successional sequence; a community that has reached a steady state under a particular set of environmental conditions.

closed-cone habit A description of coniferous trees that produce cones which are sealed by resins and saps. Closed cones usually only disperse seed when exposed to fire.

clutch size The number of eggs laid in a bird nest.

CNPS California Native Plant Society

codominant Trees with crowns forming the general level of forest canopy and receiving full light from above, but comparatively little light from the sides. Codominants usually have medium sized crowns, but are crowded on the sides.

community An assemblage of species at a particular time and place.

community structure The form and organization of vegetation within a plant community. Also refers to vegetation patterns within plant communities.

conifer A type of tree that bears cones (not flowers) and has needle or scale-like evergreen leaves.

connectivity A measure of how connected or spatially continuous a corridor or matrix is.

cores The central and largest areas of high ecological integrity designated for conservation in a reserve network.

corridor A corridor can be described as a dispersal or migratory route for faunal interchange that is comprised of habitat that has the appropriate physical and biological attributes necessary to sustain fauna passing through the area and/or living there. In conservation biology, wildlife corridors are one way of describing or creating landscape connectivity, whether or not corridors

actually create functional landscape connectivity for wildlife is highly theoretical and needs to be studied regionally.

corvids Birds from the taxonomic family including crows, ravens, jays, and magpies.

cover Referring to habitat providing hiding places under or in trees, shrubs, rocks, logs or other features.

crepuscular An animal which is mostly active at dawn and dusk.

crown closure See *canopy closure*.

cultivation The working of ground for agricultural purposes.

cumulative impacts Those impacts as defined in 14 CCR 15355 (California Code of Regulations). Refers to the accumulation of impacts within a given area, usually a watershed, from several different, independent activities.

DBH Diameter of a tree at breast height, 4.5 feet.

deciduous A description of trees that lose their leaves on a regular basis, usually during the winter.

defensive call A call or sound that is made when an intruder comes near the nest, possibly followed by an attack to scare off the intruder.

den The shelter or retreat of a wild animal, lair. A cave considered as a hiding place or refuge.

desiccated Thoroughly dry; dried out.

detrital layer/detritus A layer of soil litter formed from fragments of dead material (e.g. plant matter, dung, animal, and insect corpses).

diatoms A microscopic algae in which the cell wall (frustule) is composed of silica and consists of two halves, one of which overlaps the other like a lid of a box. Frustules are often delicately ornamented. Most diatoms are unicellular, but some are colonial or filamentous. Most are photosynthetic.

dispersal The tendency of an organism to move away, either from its birth site (natal dispersal) or breeding site (breeding dispersal). Rates of regional dispersal depend on the interaction of several factors, notably the size and shape of the source area, the dispersal ability of the organisms, and the influence of environmental factors.

dispersers Animals that distribute seeds and other things by eating them, and passing them after digestion. Some spores can be carried on the animal's feet, fur or feathers. Salmon disperse the nutrients from the ocean back to the headwaters of the rivers where they spawn and die.

distribution 1. The geographical area within which a species or other group or taxon of organisms occurs. 2. The arrangement of organisms within an area. 3. The dispersal of organisms through an area

disturbance A force that causes significant change in structure and/or composition through natural events such as fire, flood, wind, or earthquake, mortality caused

by insect or disease outbreaks, or by human-caused events.

disturbance regime The frequency of disturbance in a landscape.

diurnal species A species that is primarily active during the daytime.

dominant See dominant vegetation.

dominant vegetation The species having the most influence on community composition and form, which also can be the largest and/or most abundant plant species within a plant community.

dorsal The back side of an animal. (Opposite of ventral—the underside or belly of an animal.)

ecological integrity The capability of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of natural habitats of the region.

ecosystem A unit comprising interacting organisms considered together with their environment.

edaphic Of the soil, or influenced by the soil. Edaphic factors that influence soil organisms are derived from the development of soils and are both physical and biological (e.g. mineral and humus content, and pH).

edge The place where plant communities or where successional stages or vegetative conditions within a within a plant community come together

endemic species An organism that is restricted to a particular geographic region, due to factors such as isolation and/or soil and climatic conditions.

ephemeral Not permanent, only present part of the year. An ephemeral watercourse may only have visible water above ground during the rainy season.

ercads Plants of the family *Ericaceae*. Some Pacific Northwest ercads include Pacific madrone, manzanita, huckleberry, blueberry, salal, Rhododendron, and Azalea.

ESA Endangered Species Act, federal and state legislation that provides protective status to species designated as threatened and endangered.

estuarine Referring to estuary habitat, a coastal body of water that has a free connection with the open sea and where fresh water, derived from land drainage, is mixed with sea water. Estuaries are often subject to tidal action.

even-aged stands An area of forest in which the vegetation is of the same age and origin, usually due to its establishment after a local disturbance (e.g. fire or logging).

evergreen A description of vegetation whose leaves are present and functioning year round.

exothermic Releasing as opposed to absorbing heat. Exothermic animals are often called "cold-blooded."

exotic species An introduced, non-native species.

exotics Not native- originated or evolved from some other place.

extirpation The process of a species becoming locally, regionally, or globally extinct.

extrinsic stressor A human-caused disturbance which threatens the overall health of a plant community, and/or organisms associated with that community.

fire ecology The dynamic of fire and its component parts (i.e. plant physiology and structure) in plant communities including the cycles of fuel buildup, burning, and regeneration.

fledgling period The period of time in which young birds fledge or fly away from the nest.

floodplain Flat areas of land near a river, which are flooded periodically. Typically, flood plains are characterized by their fertile soils that have accumulated from deposits left during previous flood events.

flora (adj. floral, floristic) All the plant species which make up the vegetation of a given area.

focal attributes Habitat features that are indicative of ecological integrity.

focal species Species which when present in a landscape are indicative of ecological integrity.

foliage The leaves on a plant.

food chain An abstract representation of the passage of energy through populations in the community.

forbes Non-grassy, herbaceous species of plants.

fossorial An animal species adapted to burrowing and foraging underground.

fragmentation In ecology; the act of disturbing a landscape, so that the remnants of undisturbed habitat are separated spatially.

freshwater marshes Wetlands formed by freshwater sources such as seeps, streams, and rivers.

functionally intact An community that has maintained its ecological function or processes.

genera Plural for genus.

genus A taxonomic category ranking below a family and above a species, used in taxonomic nomenclature (scientific names), either alone or followed by a Latin adjective or epithet, to form the name of a species.

GIS Geographic Information System; an organized collection of computer hardware, software and geographic data designed for capturing, storing, updating, manipulating, analyzing and displaying all forms of geographically referenced information.

glaciation Time during which an area of land is covered by glaciers

GPS Global Positioning System; a device used to determine location based on triangulating a position from overhead orbiting satellites.

gradient The entire range of variation for an environmental factor, a spectrum of change when measuring an environmental variable (e.g. moisture, salinity, temperature, pH, etc.).

gregarious The tendency of animals to form groups which possess a social organization (e.g. schools of fish, flocks of birds, herds of mammals).

ground cover Vegetation, usually grasses and herbaceous plants, that grow close to the ground and form the lowest layer of cover in a plant community.

habitat The living place of an organism or community, characterized by its physical or biotic, living properties.

habitat fragmentation see fragmentation

hardwood Trees which produce flowers (not cones) and generally exhibit a spreading crown.

herbaceous Refers to herbs: small, non-woody, seed-bearing plants which either die at the end of a growing season (annual herbs) or live for multiple years (perennial herbs).

herbivore An animal that eats mostly plants.

home range The area around an animal's home that is used for feeding and daily activities.

homogenous Lacking variation, consistent.

hybridization To produce hybrids; the offspring of genetically dissimilar parents; especially the offspring produced by breeding plants or animals of different varieties, species or races.

hydrologic pattern The pattern of water flow through aquatic, terrestrial, and atmospheric environments.

indicator species A species that is tightly linked to specific biological elements, processes, or qualities; is sensitive to ecological changes; and is useful in monitoring habitat quality. A species that is of narrow ecological amplitude with respect to one or more environmental factors and which is, when present, therefore indicative of a particular environmental condition or set of conditions.

insectivorous An animal or plant that eats mostly insects.

intergrade Transition between adjacent plant communities or series where vegetation types overlap.

intermittent streams Small watercourses that have no surface water flow during part of the year.

intertidal The area between the highest and lowest tidal levels on the coast.

intrinsic stressor A natural disturbance which threatens the overall health of a plant community, and/or organism associated with that community. (e.g. flood, fire, windstorm, pestilence, disease, etc.).

invertebrate All species or higher taxa within the *Animalia* kingdom which lack a true spinal cord or vertebral column (backbone).

keystone species A species that enriches ecosystem function in a unique and significant manner through their activities, and the effect is disproportionate to their numerical abundance. Their removal initiates changes in ecosystem structure and often a loss of biodiversity (Miller et al 1998/99). (e.g. The Coho salmon is an important food resource for many species, and also contributes to nutrient cycling from the ocean back to inland areas where it migrates at the end of its life to reproduce.)

lacustrine wetland Freshwater wetland found in a lake or pond.

landscape The overall land area formed by the mosaic of interacting plant communities and their component living and non-living elements as well as accompanying natural processes.

landscape linkages Functional landscape connectivity; i.e. a corridor or matrix providing functional habitat for the sustenance and/or movement of organisms

large woody debris A structural element of forested habitats or associated riparian, and aquatic habitats that includes large-downed logs and other woody debris.

larvae The worm-like forms of insects in the early stages of development. The larval stages follow emergence from the egg, and lead to metamorphosis into an adult.

larval The state of being a larvae.

late seral Functional characteristics of late-seral stands include large trees, snags, and large downed logs. These stands of dominant and codominate trees that meet the criteria of WHR class 5M, 5D or 6 with an open, moderate, or dense canopy closure classification, often with multiple canopy layers. Refer to WHR description in the text.

lichen Any of numerous plants consisting of an algae, either green or blue-green, and a fungus, usually of the class Ascomycetes, both living in symbiosis.

line transects A survey technique involving multiple surveyors along a line moving in one direction (compass bearing). Surveyors are spaced so that most of the area is visible, and the entire survey area can be combed for survey items, such as feathers or rare plants.

litter The accumulating layer of dead and decomposing plant parts (branches, leaves, etc.) on the ground in forest communities.

liverwort Any of numerous green, nonflowering plants of the class Hepaticae within the division Bryophyta.

mast The nuts of forest trees accumulated on the ground.

matrix The most extensive and most connected landscape element type present, which plays the dominant role in landscape function. Also a landscape element surrounding a patch. Federal lands outside reserves, withdrawn areas, Managed Late-Successional Areas and Adaptive Management Areas.

mitigation measures- Modifications of actions taken to: 1) avoid impacts by not taking certain actions or parts of an action; 2) minimize impacts by limiting the degree or magnitude of the action and its implementation; 3) rectify impacts by repairing, rehabilitating, or restoring the affected environment; 4) reduce or eliminate impacts over time by preservation and maintenance operations during the life of action; or, 5) compensate for impacts by replacing or providing substitutes resources or environments.

montane Higher-elevation, mountain habitat.

multi-storied canopy A forest comprised of trees of different heights, forming more than layer of canopy.

nape The dorsal side of the head and neck.

natal Pertaining to the act of birth.

natural processes Physical processes (hydrology, weathering, fire, flood, etc.) and biological processes (decay, nutrient cycling, reproduction, migration, etc.) that occur within and characterize habitats and plant communities.

neotropical migrant An animal, usually a bird, that migrates to South America for the winter and returns to breed in North America in the spring and summer.

nocturnal A species that is primarily active at night.

obligate Able to survive in only one environment.

old growth Refers to late-seral or mature forest community structure including its component attributes (mature and/or senescent live trees, standing snags and downed logs, etc).

omnivorous A species that eats plants and animals.

organic matter Fragments of plant, animal, fungal, and bacterial-based material found in soils, water, litter, etc.

overstory The upper layer of canopy formed by the dominant vegetation types.

patch A nonlinear surface area differing in appearance from its surroundings.

peak discharges The period of time at which the greatest volume of flowing water or other liquid flows through an area

pellets The undigested remains of prey items coughed up by birds.

perch A tree branch or an other high place where a bird or other animal comes to rest. Birds and other animals also use perches while hunting to locate prey.

perennial A plant that lives for more than one growing season.

phase A characteristic form or appearance that occurs in a cycle or that distinguishes some individuals of a group.

plant assemblages see plant community

plant community A grouping of vegetation that exhibits similar structure, composition, and function, also broad, landscape-scale vegetation types and assemblages.

point count A bird surveying technique in which surveyors spend a standardized amount of time listening for and observing birds while recording the species of birds they hear and see from one location or point.

polytonal In music, a polytone is composed of several notes played simultaneously, forming a chord.

population size The number of individual organisms of a species found in an area, which are capable of interbreeding.

population viability The probability that a species population will survive for a specific length of time; calculation of population viability should consider natural disturbances and processes of associated plant community.

precipitation regime The time, frequency, amount, etc. of all the forms of water that fall to the ground.

productivity The rate at which biomass is produced, mainly by green plants, within an ecosystem, or the rate

or amount of accumulated organic material in a community.

protocol An accepted technique which results in standardized data to fulfill a specific purpose or answer a specific question.

raptor A predatory bird from one of several orders of birds, including Strigiformes (owls), and Falconiformes (eagles, falcons, hawks, vultures and condors).

refugia habitat providing sanctuary for wildlife and other organisms

regeneration Regrowth of vegetation after disturbance within a plant community.

relevé A visual vegetation/wildlife habitat estimation technique.

relief In geography; the variations in elevation of any area of the earth's surface.

remote sensing

resin ducts The resin bearing ducts or veins found in plant leaves and other tissues.

riparian The unique habitat found on the land immediately bordering a freshwater or brackish watercourse. Pertaining to a river bank.

riverine Name of classification used for river habitat.

roadless area An area with no roads

rookery An area where a flock of birds roosts and/or rears their young.

roost A perch where birds rest during the period of day or night when they are not active.

salinity gradient The decreasing or increasing amount of salt found across a body of water.

Salmonids A fish from the taxonomic family of salmon.

sampling Selecting a sample. A method or technique for measuring variables.

savannah Refers to habitat characterized by isolated trees surrounded by a herbaceous, grassland, or shrub matrix.

sediment deposition The accumulation or build-up of soil and other sediment on the banks or flood valleys of a watercourse

seepage The slow, but often steady flow of water between one water body and another. The term refers to the emergence of groundwater into a stream channel, or leakage to underlying aquifers through stream beds.

seeps Localized water flow that emerges from the ground over a wider, continuous area than a spring.

senescent Dead or dying vegetation

series A unit of vegetation named after the plant species that is dominant in the layer with the greatest amount of cover.

serpentine soils Soils that contain high levels of magnesium and iron and low levels of certain essential plant nutrients. These soils often contain unique plant species not found on adjacent soils and vegetation.

shrub A woody plant that branches near ground level into several main stems, so that no clear trunk is present.

Shrub stems do not die back at the end of the growing season.

snags Any standing dead, partially dead, or defective trees within a forest. Hard snags are composed of sound wood, soft snags are composed of wood in advanced stages of decay and deterioration and provide excellent habitat for numerous organisms.

soil mosaic Several soil types overlapping each other in a landscape.

spawning The releasing of eggs by aquatic animals such as; mollusks, fish, and amphibians.

special elements Attributes or features that are indicative of ecological integrity (see focal attributes).

special status species Species with federal or state protection status, including; endangered, threatened, special concern, rare, Forest Service Sensitive, Survey and Manage, or harvest species.

species associations Fine-scale units of vegetation based on groups of plant species that commonly occur together. Associations are often identified by characteristic species in the understory that co-occur with dominant series layers.

species composition Component plant species which form a plant community.

spectral classification In Remote Sensing, a computer is trained to recognize the spectral signature (the light reflected by) a vegetation type or other object, and then classify or group all areas with a similar signature. Both satellite images and aerial photographs can be spectrally classified.

spectral signature The specific wavelengths of light reflected by an object.

springs A flow of water above ground level that occurs where the water table intercepts the ground surface.

stand A grove of trees or a group of plants.

stand recruitment The addition to a plant population (usually refers to tree species) from all causes (i.e. reproduction, immigration, planting).

stressor Disturbance to a vegetative community.

subcanopy The lower canopy in a forest with a multistoried canopy.

subdominant Not dominant. In plant communities, a subdominant species of plant or group of plants would not occupy as much space as a more common or abundant species.

successional stage A phase within a series of dynamic developmental changes in plant communities by which one group of vegetation is replaced by another, whether gradual or through disturbance.

succulent Juicy; fleshy and soft.

superficial flow Moving water is visible above ground.

swale A low tract of land, especially moist or marshy ground.

take To harm, harass, pursue, hunt, shoot, wound, kill, trap, capture, collect or to attempt to engage in any such conduct with regard to a federally listed species.

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talons The 'claws' of a bird of prey.

talus A slope formed by the accumulation of debris, a sloping mass of debris at the base of a cliff.

terrestrial Referring to the land; land based.

thermoregulation To maintain a constant temperature.

tiered canopy A canopy formed by multiple distinct crown layers that may or may not intergrade together.

travel way A corridor or trail used by organisms to move from one location to another.

triangulation Using three or more known or visible points to find an exact position on a map.

ultra-basic soils Soils which are alkaline.

umbrella effect Protecting the habitat for one species with large area requirements, simultaneously protects the habitat for other species living within the same habitat.

understory The vegetation which forms the lower canopy levels in forest and woodland communities.

USGS United States Geographic Service

vegetation The physical arrangement and composition of plant species in a given area.

wailing call See begging call.

watercourse Refers to flowing surface water and its form (i.e. streams, creeks, rivers, etc.). California Dept. of Fish and Game has further defined watercourses by three classes: Class I includes watercourses which are fish bearing with year-round flow, Class II includes fish bearing with intermittent flow, and Class III includes

non-fish bearing watercourses with intermittent flow (dries up during part of the year).

watershed The area which is drained by a river or stream and its tributaries.

wet meadows Waterlogged areas where grasses dominate.

whitewash The urine of birds, which is usually chalky white or other colors depending on the bird and its diet.

whorl Radiating branches or other stems off of the main stem or bole of a plant or tree.

wilderness area Areas designated by Congressional action under the 1964 Wilderness Act. Wilderness is defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or for a primitive and confined type of recreation; include at least 5,000 acres or are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, educational, scenic, or historical value as well as ecological and geologic interest.

woodland Habitat characterized by widely spaced (less than 30 percent canopy closure), mature trees whose crowns do not touch

Appendix I. Data Collection Forms (following pages)

**REDWOOD/ MIXED EVERGREEN/ OAK WOODLAND/ RIPARIAN WOODLAND/ MONTANE
FOREST HABITAT ASSESSMENT FORM**

Survey Date: _____ - _____ - _____ Survey I.D. #: _____
 Surveyor name/s: _____ Phone #(____) _____
 Address: _____ City: _____ Zip: _____
 Watershed: _____ Landowner: _____
 USGS 7.5 Quad Name: _____ Quad #: _____

Latitude: _____ North Township: _____ Slope: _____
 Longitude: _____ West Range: _____ Aspect: _____
 UTM: _____ m East Section: _____ Elevation: _____
 UTM: _____ m North County: _____ Macrotopography: _____

Site History: _____

Additional Comments: _____

TREE COVER				
Tree #	Species (<u>H</u> ardwood or <u>C</u> onifer)	Percent Ground Cover	DBH (Circ. / 3.14) @ 4.5 feet	Size Class
			() / 3.14=	
			() / 3.14=	
			() / 3.14=	
			() / 3.14=	
			() / 3.14=	
			() / 3.14=	
			() / 3.14=	
			() / 3.14=	
			() / 3.14=	
			() / 3.14=	
			() / 3.14=	
			() / 3.14=	
			() / 3.14=	

CANOPY CLOSURE				
	Closure @ 10ft.	Closure @ 20 ft.	Closure @ 30 ft.	Average % closure
East Transect				
South Transect				
West Transect				
North Transect				
Plot Center	-----	-----	-----	
	Total canopy closure for entire plot (canopy closure class)			

CWHR Tree Size Classes

Size Class 1- tree saplings
 Size Class 2- 1-6 inches DBH
 Size Class 3- 6-11 inches DBH
 Size Class 4- 11-24 inches DBH
 Size Class 5- 24-36 inches DBH
 Size Class 7- >36 inches DBH

SC|CWHR Tree Cover Classes

S sparse 10-24% cover
 P open 25-39% cover
 M moderate 40-59% cover
 D dense 60-100% cover

Please send completed data forms to:
 Ecological Inventory Project
 POB 4931, Arcata, CA 95518

SHRUB COVER		
Shrub #	Species	Living or Dead
Total Shrub cover for entire plot (shrub cover class)		

HERBACEOUS COVER	
Species (grass or herb)	Cover Class

SPECIAL ELEMENTS		
Size Class	# of Snags	# down Logs
Four (11-23 inches)		
Five (24-35 inches)		
Seven (>36 inches)		
Disturbance type(s) present?	Extent of impact	Relative age
Present in plot?	YES	NO
Fruit or berries		
Acorns		
Cones		
Lichens		
Mushrooms		
	Nearest above ground water	Nearest road (paved/unpaved?)
Distance to:		

CWHR Shrub Cover Classes

S	sparse	10-24 % cover
P	open	25-39 % cover
M	moderate	40-59 % cover
D	dense	60-100% cover

CWHR Herb. Cover Classes

S	sparse	2-9 % cover
P	open	10-39 % cover
M	moderate	40-59 % cover
D	dense	60-100% cover

Extrinsic Stressors

Road Building Overharvesting
 Timber Harvest Estuarine Degradation
 Grazing Exotic Introductions
 Water Projects Hatchery Effects
 Urbanization Human Disturbance
 Pollution Fire Suppression
 Mining

Macrotopography

Ridge top
 Upper 1/3 of slope
 Middle 1/3 of slope
 Lower 1/3 of slope
 Toeslope (alluvial fan)
 Entire slope
 Bottom/plain
 Bench
 Terrace (former shoreline floodplain)
 Backslope (cliff)
 Basin/wetland
 Wash (channel bed)
 Draw
 Mesa/plateau
 Dune/sandfield
 Other (describe)

Please send completed data forms to:
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SALAMANDER, AMPHIBIAN AND REPTILE SURVEY DATA FORM

Surveyor's name/s _____

Surveyor's Phone # _____ Date _____

Survey Name or Watershed _____

Legal Description of Survey Area: Quad Name _____ Township _____ Range _____

Site Location (1/16 section) _____ 1/4 _____ 1/4 UTM Northing _____ UTM Easting _____

Site Number (*1) _____

Site Description (*2) _____

Survey Description (*3) _____

Other sites in Survey Area (*4) _____

Precipitation in last 48 hours (Y or N) _____

Write down the number of each species you find under the appropriate environmental attribute during a search of one site in a survey area.

Species Found	In log	Under log	Under leaves	Under rock	In the open	In live vegetation	In water (*5)
California Slender Salamander							
Oregon Ensatina							
Clouded Salamander							
Black Salamander							
Pacific Giant Salamander							
Del Norte Salamander							
Southern Torrent Salamander							
Red-bellied Newt							
Tailed Frog							
Red-legged Frog							
Yellow-legged Frog							
Western Toad							
Western Pond Turtle							
Rubber Boa							
Sharp-tailed Snake							
Ring-necked Snake							

*(1) Assign a number to each site you search in a survey area

*(2) Talus slope, Aquatic, Forest floor, other?

*(3) Type of survey: Time constrained search, coarse woody debris search, aquatic search,

*(4) Describe Water type: River/Creek Watercourse type (I, II, or III), Seep/spring (S), Marsh (M), Lake/pond (L)

Surveyor's name/s _____
 Surveyor's Phone # _____ Survey Date _____
 Survey Name or Watershed _____
 Legal Description of Survey Area: Quad Name _____ Township _____ Range _____
 Site Numbers (1) _____
 Survey Description (2) _____
 Survey Length- Start Time _____ End Time _____ Total Minutes _____
 Weather _____ Precipitation in last 48 hours? (Y or N) _____

[illegible]

- Comments:**

Please send completed data forms to:
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MARBLED MURRELET SURVEY FORM

Surveyor's name/s and level of experience (1) _____

Surveyor's Phone # _____ Survey Date _____

Survey Name, Watershed, or THP # _____

Legal Description of Survey Area: Quad Name _____ Township _____ Range _____

Site Location (1/16 section) _____ 1/4 _____ 1/4 UTM Northing _____ UTM Easting _____

Precipitation in last 48 hours (Y or N) _____

Start Time _____ End Time _____ Total Minutes _____

Is this an approved or active THP? _____

You should record this information on to a hand held recorder during a Marbled Murrelet survey, and than transcribe it here afterwards.

#	Time	Detection Type (2)	Bird Activity (3)	Bearing (4)	Bearing (5)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

9) Untrained (1), Trained (2)

10) You Hear it (H), You SEE it (S) or both

11) Flying (F), Singing (S), Perched (P)

12) The direction of flight if the bird is flying.

13) The direction the bird is in relation to you, the surveyor.

Comments:

Please send completed data forms to:
Ecological Inventory Project
POB 4931, Arcata, CA 95518

SNOWY PLOVER SURVEY FORM

Surveyor's name/s and experience (1)_____

Surveyor's Phone # _____ Survey Date _____

Legal Description of Survey Area: Quad Name_____ Township_____ Range_____

Survey Length- Start Time_____ End Time_____ Total Minutes_____

What stretches of beach did you survey? _____

Weather_____Precipitation in last 48 hours? (Y or N)_____

Plover #	Location: UTM coordinates or Section
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

F. Untrained (1), Trained (2)

Comments:_____

Please send completed data forms to:
Ecological Inventory Project
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SPOTTED OWL, GOSHAWK, EAGLE or OTHER RAPTOR SURVEY FORM

Surveyor's name/s and level of experience (1) _____

Surveyor's Phone # _____ Survey Date _____

Survey Name, Watershed, or THP # _____

Legal Description of Survey Area: Quad Name _____ Township _____ Range _____

Survey Description _____

Sites Visited _____

Precipitation in last 48 hours (Y or N) _____

Start Time _____ End Time _____ Total Minutes _____

Is this an approved or active THP? _____

Species	Time	Detection Type (2)	Bird Activity (3)	Bearing (4)	Bearing (5)

1. Untrained (1), Trained (2)
2. You Hear it (H), You SEE it (S) or both
3. Flying (F), Calling (C), Perched (P)
4. The direction of flight if the bird is flying.
5. The direction the bird is in relation to you, the surveyor.

Comments: _____

Please include copies of any photos you have.

Please send completed data forms to:
Ecological Inventory Project
POB 4931, Arcata, CA 95518

RED TREE VOLE SURVEY DATA FORM

Surveyor's name/s _____
Surveyor's Phone # _____ Survey Date _____
Survey Name or Watershed _____
Legal Description of Survey Area: Quad Name _____ Township _____ Range _____
Survey Description _____
Sites Visited _____
Precipitation in last 48 hours (Y or N) _____
Start Time _____ End Time _____ Total Minutes _____

Mark the nest trees with flagging. You should take photographs and/or samples of each vole nest you find, and write the record number on the photo back / specimen bag.

Record number	Location (1)	Describe the nest (2)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

1. Section or UTM coordinates
2. Include tree species and nest height.

Comments:

Please send completed data forms to:
Ecological Inventory Project
POB 4931, Arcata, CA 95518

TRACKPLATE DATA FORM

Surveyor's Name/s-_____ Surveyor's Phone #-_____

Station Name, Description, or Sub-Watershed_____

Legal Description of Sample Unit: Quad Name_____ Township_____ Range_____

Four Section Numbers for Sample Unit: _____, _____, _____, _____

Station Location (1/16 section) _____ 1/4 _____ 1/4 UTM Northing _____ UTM Easting _____

Sample Unit # _____ Station # (*1) _____ Type (*2) _____

Start Date _____ Duration _____

	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6	Visit 7	Visit 8	Visit 9
Days since last visit									
Box Condition (*3)									
Bait (*4)									
Lure (*5)									
Precipitation (*6)									
Conspicuous Ants (*7)									
Species 1 (*8)									
Species 2									
Species 3									
Species 4									
Species 5									

Comments:_____

3) Assign a number for each track station in your sample unit

4) Plastic (P), Wood (W), or Open (O)

5) Intact (OK), or Inoperable (I)

6) Present (P) or Absent (A)

7) Present (S-Skunkit, G-Gusto) or Absent (A)

8) Yes (Y) or No (N) in the previous 48 hours

9) Yes (Y) or No (N)

Four-letter acronym; use most precise taxonomy possible. (e.g. MAAM- Marten; MAPE-Fisher; SPGR- Spotted skunk; MEME- Striped skunk, PRLO- Raccoon; BAAS- Ringtail cat; URAR- Gray fox; TASP- squirrel and chipmunk species; GLSA- Flying squirrel; MICE- unidentifiable mouse-sized mammal; LIZD-unidentifiable lizard.). List in alphabetical order.

Fax interesting tracks to AFI 707-923-4486, attn: FCTP.**For track images on the web, check out Redwood Sciences Lab website:**<http://www.rsl.psw.fs.fed.us/projects/wild/zielinski/bztracks.html>

Please send completed data forms to:
Ecological Inventory Project
POB 4931, Arcata, CA 95518

ROADLESS AREA / PROPOSED WILDERNESS AREA ROAD/TRAIL TRAVELWAY SURVEY

Field Checker Names and Phone # _____

Proposed Wilderness _____ Trail name _____

National Forest and/or general vicinity _____

Road directions. Please get mileage between intersections. Is the route suitable for standard passenger vehicles?

Average driving time _____ from _____

Trail directions. Please give approximate distances between points and note trail condition, steep places, campsites, water sources, hazards, points of interest. Is it suitable, even part way, for young children? Backpack or dayhike or both? Will it be too hot in summer? Is access restricted seasonally by snow or high water? Interesting plants? Or anything else you want to add.

Car camping facilities nearby.

Send an additional copy of this form to:

Susan Nolan

California Wilderness Coalition

POB 115

Bayside, CA. 95524

(707) 839-9135

Please send completed data forms to:
Ecological Inventory Project
POB 4931, Arcata, CA 95518

FIELD DATA PRIVACY POLICY

We agree to share the field data we collected, which therefor belongs to us.
The following are terms upon how we are willing to share this data.

Check the following for which you agree that LEGACY-TLC can use your data:.

_____ For use by LEGACY-TLC only.

_____ For use by other non-profit organizations.

_____ For use by community members.

_____ For use by government agencies.

_____ For other use:

_____ For use by any and all who want it.

Signed:

Date:

Field Surveyor Name:

Mailing Address:

Phone Number:

Email Address:

Survey Descriptions:

Please send completed data forms to:
Ecological Inventory Project
POB 4931, Arcata, CA 95518

Appendix 2. Extrinsic Stressors

Water Projects

Water projects include the presence of dams, channelization measures, and water diversions that have the following effects on native aquatic species:

Dams have been identified to:

- 1) Reduce the downstream volume of water in aquatic habitats thus reducing the amount of breeding and rearing (suitable) habitat available to species;
- 2) Disrupt the natural hydrologic regime of aquatic habitats thus inducing rates of channelization with corresponding losses of riparian and suitable habitat; and
- 3) Prevent the passage of migrating fish species where adequate fish ladders are absent.

Channelization measures have restricted natural meandering of watercourses thus reducing aquatic and riparian habitat and increased scouring of the current watercourse channel, reducing habitat quality.

Diversions have been identified to reduce the downstream volume of water in aquatic habitats thus reducing the amount of suitable habitat available to species.

Urbanization

Urbanization includes the loss of natural habitat to a variety of development activities (conversion to homes, agriculture, pasture, etc.) that affect native species by: reducing the amount of habitat available to species (especially in lowlands, valleys, and the coastal plain), increasing fragmentation effects, increasing exotic species introduction, and increased pollution.

Pollution

Pollution includes many forms of degradation (e.g. chemical runoff, excess sediment loads, thermal) mainly caused by industrial and agricultural activities that affect native species by depositing large amounts of contaminants into aquatic habitats, degrading water quality enough to negatively alter the growth, reproduction, and survival of many species.

Mining

Two major types of mining occur in the CNCB: gravel and mineral mining. Gravel mining involves the removal of substrate from aquatic habitats faster than it can be replaced by natural processes by reducing the amount of suitable habitat available mainly to fishes. Mineral extraction occurs at various scales, targeting multiple types of minerals (e.g. nickel, gold) within the CNCB. The major effects of these types of mining include habitat destruction and hazardous chemical deposition.

Overharvesting

Overharvesting involves the removal of individuals from a population of a particular species faster than they can be replaced by natural reproduction. This reduces the abundance of species and thus the number of individuals available to participate in reproductive activities required for the continued persistence of the species.

Estuarine Degradation

Estuarine degradation involves the general degradation of estuarine habitats, mainly from pollution, urbanization, and dredging activities that affect native aquatic species by decreasing the

amount of suitable habitat available. Estuaries represent critical stop-over habitat for many species of water birds and plays a variety of roles for multiple fish species.

Exotic Introductions

Introductions of exotic species (mostly plants and fish) have occurred throughout the CNCB with the following effects on native species: competition with and replacement of native species reducing their growth, survival, and reproduction, and changing the structure and composition of several communities.

Hatchery Effects

Many native aquatic species (primarily fish populations) are “enhanced” through hatchery activities that increase the number of individuals available to both recreation and reproduction. This affects native aquatic species by introducing fish that: increase competition with native stocks and reduce the genetic integrity of native stocks. (Hatchery fish are usually produced from stocks that are not native to the aquatic habitat in which they are planted. These individuals usually have a genetic quality that is inferior to those of the native individuals, and after successful interbreeding occurs, offspring are produced that are less capable of maintaining the species into the future).

Human Disturbance

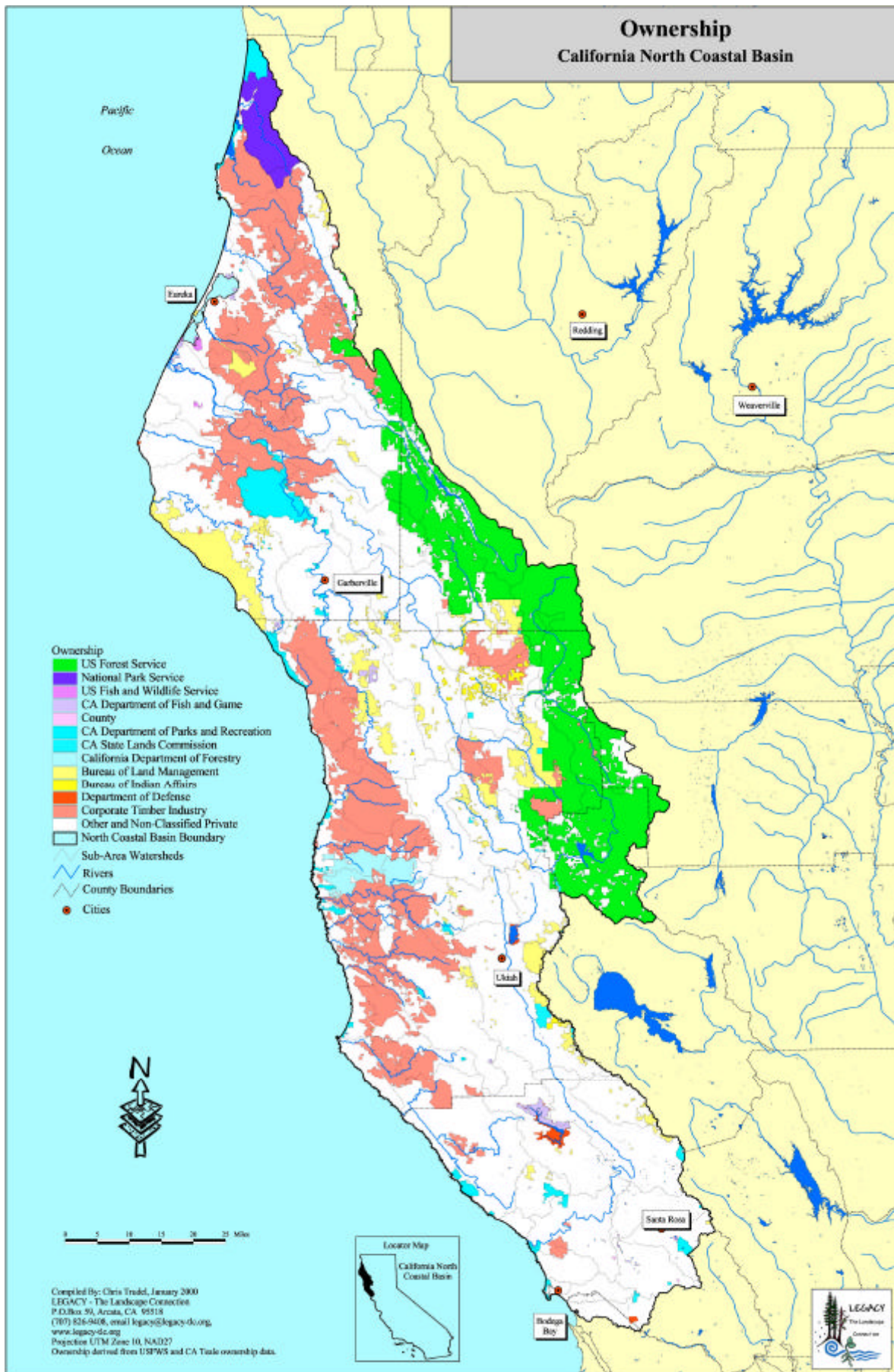
Many habitats often receive large amounts of recreational pressure, such as rafting, catch-and-release fishing, and off highway vehicle (OHV) use. These disturbances can have dramatic (e.g. OHV degradation of sensitive dune communities) or subtle (e.g. snowy plover abandonment of beach and dune sites due to human disturbance) effects. Disturbance of individuals can cause abandonment of key sites or reduction in the amount of time they spend feeding, resting, and reproducing, potentially reducing their growth and survival.

Fire Suppression

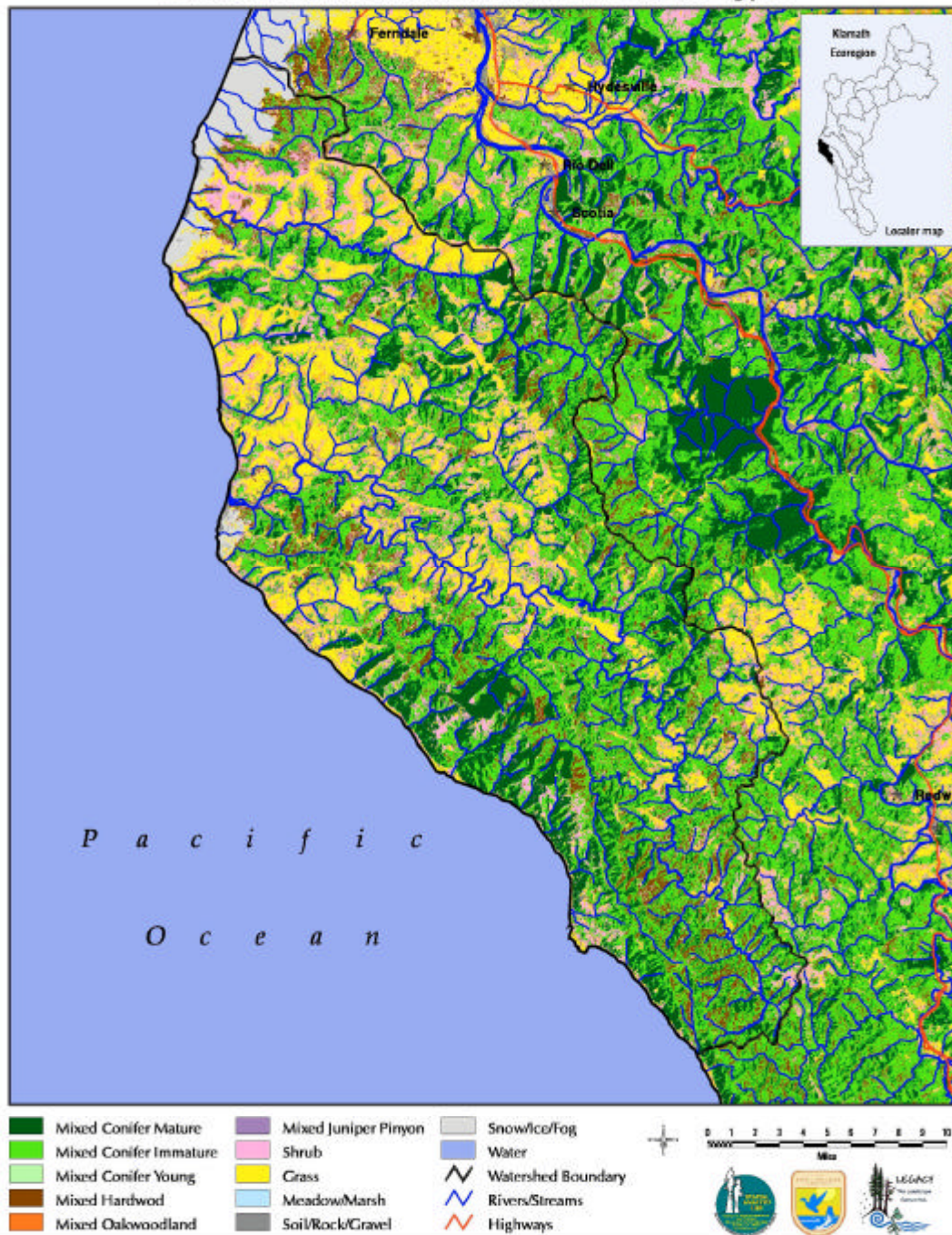
This includes the direct suppression of fire as well as landscape alterations designed to decrease fire potential and intensity (e.g. fire and fuel breaks in chaparral). Fire suppression has different effects ranging from threatening the existence of entire communities, such as closed-cone cypress, to causing forests to become much more dense with younger trees.

Appendix 3. Maps (following pages)

Ownership California North Coastal Basin

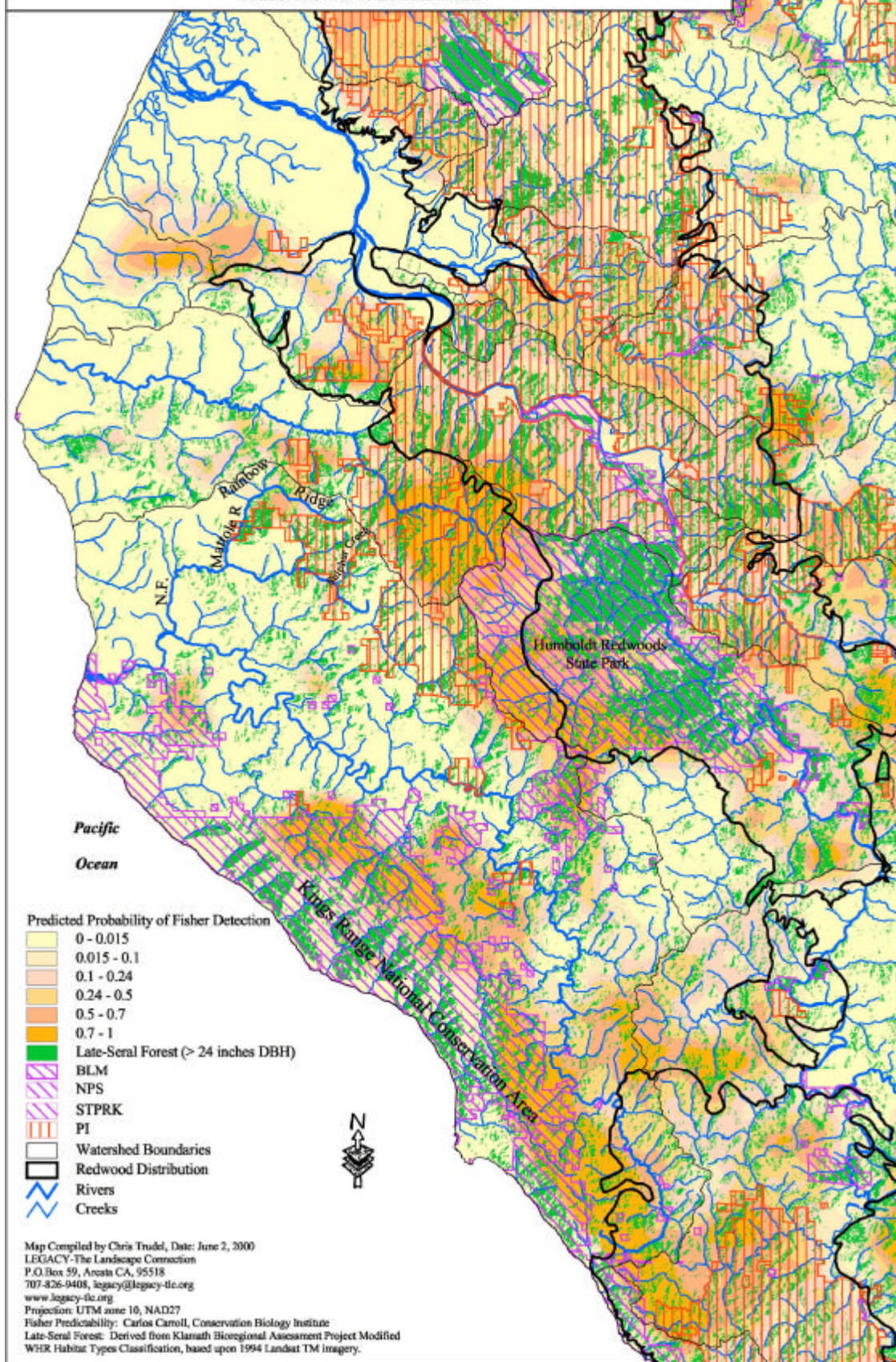


Mattole Watershed Modified WHR Habitat Types



Mattole coastal watersheds, Klamath Ecoregion. This map depicts land cover in June 1994, modified from the California Wildlife Habitat Relationship habitat types.
Composed by: Chris Trudel and Curtice Jacoby, LEGACY: The Landscape Connection, Arcata, CA, printed December, 1998.

Predicted Probability of Fisher Detection and Late-Seral Forest
 North Humboldt and Mateel Vicinities
 California North Coastal Basin



Appendix 4. Charts

Chart 1. Focal Species and Their Habitat Associations. *(Draft under review.)*

Focal	Redwood	Mixed Evergreen	Montane/ Subalpine Forest	Oak Woodland	Closed Cone Pine and Cypress	Chapparral	North Coast Shrub	Coastal Salt Marsh	Coastal Prairie	Beach and Dune	Lowland Riparian Woodland	Riverine	Estuarine	Lakes and Ponds	Springs, Streams, Marshes
Northern spotted owl	x	x	x	x											
Northern goshawk		x	x												
Cooper's hawk	x	x	x	X											
sharp-shinned hawk	x	x	x	X											
golden eagle						x									
bald eagle	x	x	x	?							x	x	x	X	
varied thrush	x														
marbled murrelet	x	x	x												
pileated woodpecker	x	x	x												
yellow breasted chat											x				
yellow warbler											x				
ardeid roosts/nests											x				
Western snowy plover										x					
Pacific fisher	x	x													
Humboldt marten	x	x													
Northern flying squirrel	x	x	x												
white-footed vole	x														
red tree vole	x	x													
shrew-mole	x	x													
all bat species	x	x	x	x						x					
ringtail cat	?														
Pt Arena Mountain		x					x			x					
Badger									x						
Mountain lion	x	x	x	x											
Southern torrent	x	x													x
clouded salamander	x	x													
Pacific giant	x	?													x
Del Norte salamander	x														
black salamander	x	x													
California newt												X		x	X
red bellied newt		?		x								x		x	X
tailed frog	x	x										x			X
yellow legged- frog															X
Northern red-legged												x		x	x
western toad														x	x
NW pond turtle												x		x	x
rubber boa															
Coho												x	x		
summer steelhead												x	x		
pink salmon												x	x		
chum salmon												x	x		
river lamprey												x	x		
coastal cutthroat												x			
green sturgeon												x	x		
Russian River tule												x	x		
California roach												x	x		
Hardhead												x	x		
winter steelhead												x	x		

Chart 2. Focal Species Types. (Draft under review.)

	Keystone Species	Umbrella Species	Flagship Species	Habitat Quality Indicator	Wilderness Quality Indicator	Prey Species	Wide-Ranging	Regional Endemic	Dispersal Limited	Area Limited	Resource Limited	Process Limited
Northern spotted owl		X	X				X	X	X	X		
Northern goshawk			X	X			X			X		
Cooper's hawk				X			X					
sharp-shinned hawk							X					
golden eagle			X				X					
bald eagle			X				X					
varied thrush				X		X	X			X		
marbled murrelet		X		X			X			X	X	
pileated woodpecker			X	X			X				X	
yellow breasted chat				X			X					
yellow warbler				X			X					
Ardeid roosts/nests				X			X					
Western snowy plover		X		X								
grizzly bear (extinct)	X	X	X	X	X		X	X	X	X		
Pacific fisher		X	X	X	?		X		X	X		
Humboldt marten		X	X	X	X		X	X	X	X		
Northern flying squirrel				X		X	X		X			
white-footed vole						X		X				
red tree vole						X		X	X			
shrew-mole												
all bat species						X						
ringtail cat							X					
Pt. Arena mountain								X				
American badger							X					
mountain lion					X		X		X	?	?	
southern torrent				X					X			
clouded salamander				X					X			
Pacific giant salamander				X			X		X			
arboreal salamander				X					X			
Cal. tiger salamander				X					X			
California newt				X					X			
red bellied newt				X				X	X			
Tailed frog				X					X			
Foothill yellow-legged				X					X			
Northern red-legged frog				X					X			
Western toad				X					X			
NW pond turtle				X					X			
Rubber boa									X			
Coho	X	X	X	X		X	X		X		X	
Summer steelhead	X	X	X			X	X		X		X	
pink salmon	X					X	X		X		X	
chum salmon	X					X	X		X		X	
river lamprey						X	X		X			
coastal cutthroat	X	X	X			X			X		X	
green sturgeon							X		X			
Russian River tule perch								X				
California roach		X						X	X			

Chart 3. Species with Special Status in the California North Coastal Basin

	Federally Endangered	Federally Threatened	Federal Species of Concern	Federal Candidate for Listing	California Endangered	California Threatened	California Candidate for Listing	California Species of Special Concern	California Fully Protected	Protected under California Forest Practice Rules	Law suit/s filed for Listing	Harvest Species	Survey and Manage Species	U.S. Forest Service Sensitive
Karok Hesperia			x										x	
Coastal Cutthroat				x				x						
Coho Salmon		6/5/97												
Summer		5/31/0												
Spring-run				x			x							
Southern Torrent			X					x						
Del Norte			X					x			x		x	
Tailed Frog			X					X						
Red-legged Frog			X					X						
Foothill Yellow-			X					X						
Rubber Boa						6/27/71								x
Western Pond			x					X						
Willow Flycatcher					1/2/91									
Yellow-breasted								X						
Yellow Warbler								X						
Marbled Murrelet		9/30/9			3/12/9									
Snowy Plover		4/5/93						X						

Great Blue Heron										x				
Great Egret										x				
California Brown	10/23/70				6/27/7									
Northern Goshawk								X		x	x			x
Cooper's Hawk								X						
Sharp-shinned								X						
Northern Harrier								X						
Black-shouldered								X						
Osprey								X						
Golden Eagle								x	X	x				
Bald Eagle	3/11/67	8/11/9			6/27/7				x	x				
Swainson's Hawk					4/17/83									
Northern Spotted		6/22/9								x				
Great Gray Owl					10/2/8									
Peregrine Falcon	10/13/70				6/27/71									
Red Tree Vole			X					x					x	
White-footed Vole			x					x						
Roosevelt Elk												x		
Mountain Lion								X				x		
Badger								X				x		
Pacific Fisher								X						X
Marten								x						x

*1 Southern California sub-species

*2 Federally de-listed in 1999.

Chart 4.Stressors

	Red wood	M ix ed E v er - G r e e n	Oa k Wo od lan d	Clo se d C o n e P i n e a n d C y p r e s s	Monta ne/ Subalp ine Forest	Chap aral	Ripa rian Woo d- Land	North Coast Scrub	Coast Prairie	Coast Salt mars h	Bea ch and Du ne	Riverin e	Estuari ne	Lakes and Ponds	Springs, Fresh- water Marshes, Streams	Vernal Pools
Road building	X	X	X	X	X	X			X		O H V u s e	X	X	X	X	
Timber Harvest	X	X			X							X	X	X	X	
Grazing			X	X			X	X	X			X	X	X	X	X
Water projects							X			X		X	X	X	X	
Urbaniz ation	X		X				X	X		X	X	X	X		X	X
Pollutio n										X		X	X	X	X	
Mining				X								X	X			
Overhar vest	X	X		X								X	X			
Estuari ne degrada tion										X		X	X			
Exotic introduc tions	X	X	X			X			X	X	X	X	X	X	X	X
Hatcher y effects												X	X			
Human Disturb ance	X	X	X			X	X		X	X	X	X	X			X
Fire Suppress ion	X	X	X	X	X	X		X	X							