# Chapter 3. Affected Environment (Environmental Setting) and Interim Management of the Reserve

## Physical Environment

### Location

The 7,400-acre Reserve is located in the northwestern Coast Ranges of California near Humboldt Bay in Humboldt County (figure 1-1), part of California's north coast region. It is reached year round by Elk River Road from the city of Eureka (6 miles) or seasonally for BLM tours by the Newburg Road from the town of Fortuna (4 miles). These two-lane rural county roads connect to U.S. 101, which links the San Francisco Bay Area to the Eureka Bay area. The Reserve is located in rugged upland terrain, extending over two sets of parallel ridges and drainages (figure 3-1). It includes the headwaters of three streams: South Fork Elk River, Little South Fork Elk River, and Salmon Creek (figure 3-2). The entire Reserve drains to Humboldt Bay.

### Climate

Climate in the 100- to 1,500-foot-elevation valleys and ranges comprising the Reserve is typically characterized by cool, wet, maritime atmospheric conditions with rainy winters and cool to warm, cloudy or foggy, low-precipitation summers. Annual precipitation at the Reserve is estimated to be 39 inches, mostly in the form of rain, although snowfall occasionally occurs. Fog drip is common in summer and ameliorates harsh summer temperatures and moisture extremes during critically dry periods. Temperature ranges at the Reserve are moderated by proximity to the Pacific Ocean. Average monthly highs at Eureka range from 61.5 °F in summer to 54.8 °F in winter. Lows range from 52 °F in summer to 42.1 °F in winter. Wind is highly variable, but

prevailing westerlies from the Pacific Ocean in summer and southwesterly flow during cyclonic storms in winter are typical and bring humid conditions. Periodically, however, easterly wind from the hot interior of California creates dry conditions for multi-day periods in summer or fall.

As with all of California, precipitation tends to vary substantially from year to year in response to global atmospheric and oceanic conditions. Annual precipitation has ranged from 18 to 74 inches in Eureka. El Nino conditions bring a wetter, longer rainy season, and La Nina conditions bring low rainfall. Sequences of both dry and wet years have been observed historically, and longer such sequences have been inferred from paleoclimatological studies. During the summers of drought periods, offshore wind can create very dry conditions in the Reserve's forests.

## Geology and Soils

Two main types of rocks occur in the Reserve—the older and more resistant sedimentary rocks of the Yager Formation and a sequence of geologically younger rocks known as the Wildcat Group. The Yager and Wildcat rock units can be viewed as two distinct units—an underlying hard "basement" (the Yager Formation) overlain by a mantle of softer younger rocks (the Wildcat Group). The older Yager rocks are well cemented and resistant to erosion while the Wildcat rocks are very soft, weakly cemented, and very susceptible to erosion. The Wildcat Group typically underlies most of the forested areas and upper slopes within the Reserve, and the Yager Formation is only exposed in the stream bottoms and inner gorges of the main tributaries (figure 3-2). (DOI BLM 1999b, 2000; Ogle 1953; Kilbourne 1985; Kilbourne and Morrison 1985)

Stream channel deposits derived from the Yager Formation are typically composed of hard sandstone and conglomerate pebbles, cobbles, and boulders, with smaller amounts of sand and silt. Soils formed from the Yager sediments have abundant rock fragments and sand components and the soils are well drained and moderately resistant to erosion.

The Wildcat Group is composed of soft, poorly consolidated marine sandstones, siltstones, and claystones. All these rocks are weakly cemented, highly erodible, and prone to slope movement, and small streamside landslides are especially common on these younger rocks within the Elk River and Salmon Creek watersheds. These landslides are most often caused by streambank erosion, which destabilizes oversteepened hill slopes in stream corridors. The soft rocks of the Wildcat are also easily eroded and broken down into their fine components—sand, silt, and clay. The Wildcat rocks are the most susceptible to surface or sheet erosion where rock exposures lack vegetative cover, especially along recently built logging roads, landings, and skid trail networks. Fine sediments from these exposed unvegetated areas are transported during rainstorms and are eventually deposited in streams.

Based on past geologic reports and recent field inventories of potential erosion sites, future erosion and sediment delivery to streams within the Reserve can be expected to be highest for rocks of the Wildcat Group. These rocks are the dominant rock types in the Reserve, the most easily eroded, and the most susceptible to fill failures.

Most of the past logging and road building activities within the Reserve have taken place on rocks of the Wildcat Group. Old roads and landings along the inner gorge area of the South Fork of Elk River, and roads and landings located just upslope of the inner gorge in the Salmon Creek drainage pose the highest risks of failure in the near future. The most serious erosion hazards are abandoned stream crossings on roads and road fill perched over stream channels. These erosion hazards have a high potential to deliver large amounts of sediment directly into streams, which would result in damage to aquatic habitat.

Soils developing on the rock units within the Reserve (loams to clay loams of the Larabee and Hugo Series) have good nutrient availability, moisture holding capacity, and fertility. They are capable of producing substantial forest biomass where slopes are stable and soil surfaces are protected from raindrop impact and runoff. In areas of past logging, even where soil has been highly disturbed, the Wildcat derived soils generate new vegetation quickly. The soft rocks break down quickly into soil size particles, and the numerous fractures and unconsolidated character of the rock allow roots to penetrate easily. The Wildcat siltstones and claystones hold water for long periods of time, allowing for better regrowth of vegetation and a rapid recovery of landslide and erosion sites.

## Minerals

Locatable mineral potential within the Reserve is very low. Potential for oil and gas reserve is moderate. There are existing oil and gas leases within the southwest corner of the Reserve. The federal government retains one-half of the mineral interest in the original Pacific Lumber Company lands now within the Reserve, with the remaining interest subject to a proposed purchase into federal ownership. The mineral estate for lands previously held by Elk River Timber Company are entirely in federal ownership.

# Social Environment

## Adjacent Land Use

Lands adjacent to the Reserve are predominantly commercial timberlands, owned and managed for timber production by the Pacific Lumber Company (PALCO) and Simpson Timber Company (STC). Timber harvests are presently taking place or are planned on lands near the Reserve.

Lands along Elk River Road, from the edge of Eureka to the northwest tip of the Reserve at the Reserve's Elk River Trailhead, are in rural residential use. Lands along the Newburg Road from Fortuna to the edge of PALCO's forests are also in rural residential use, with homes closely bordering the roadway. At the end of the Newburg Road, a locked gate prevents unauthorized access onto Felt Springs Road, which is a log-haul road owned and maintained by PALCO. Felt Springs Road accesses the southern boundary ridge and traverses the southeastern portion of the Reserve to adjoining timberlands. An easement granted to BLM secures a restricted public right of access by motor vehicle along this road, which is regulated by BLM.

## Timber Management History

The Reserve's watersheds are typical of the north coast region where intensive management of the land for timber production has occurred over the last four decades or longer (figure 3-3), although logging began in the Reserve in the late 1800s. Until 1999, the upper Salmon Creek, upper South Fork Elk River (Elkhead Springs area), and upper Little South Fork Elk River watersheds were owned and managed for forest product production by PALCO, and the lower Little South Fork watershed and South Fork Elk River corridor were under the ownership of Elk River Timber Company. In 1999, private timberlands in both areas were transferred to the Secretary of Interior for preservation purposes and now comprise the Reserve.

PALCO lands in the upper Salmon Creek watershed remained uncut and unroaded through the 1960s. In the mid- to late 1970s, more than approximately 500 acres in the headwaters of Salmon Creek were roaded for timber access, and some areas along the roads were harvested. By 1981, several hundred acres of land just upstream from the adjoining STC property had been shelterwood or seed-tree harvested and tractor yarded. Although these harvests represented the first entry in the upper Salmon Creek watershed, much of the upper watershed still remained in a natural condition.

By 1987, some new road construction, road reconstruction, and about 40 acres of clear-cutting had occurred in the upper Salmon Creek basin. In the early 1990s, a road was constructed over the divide from the Salmon Creek watershed into the headwaters of the Little South Fork Elk River. Along with approximately 1.5 miles of road construction, about 15 acres of old-growth redwood forest was harvested along the road alignment. Between 1987 and 1994, harvesting (mostly by tractor yarding) and road construction continued on PALCO lands, and perhaps half or more of the upper Salmon Creek watershed was harvested. From 1994 to 1999 some additional road reconstruction and upgrading was performed on PALCO lands in the upper basin, but by then, roading and harvesting had been significantly curtailed over the entire area.

By 1974, road construction and timber harvesting occurred in the lower Little South Fork Elk River watershed. Most of the lower lands in this watershed were clearcut with tractor yarding and are composed of second-growth forest. Subsequent road entries were made as recently as the 1990s, when the upper portion of this watershed was clearcut.

The Upper South Fork River watershed (Elk Head Springs area) has been entered for timber harvesting at several different times. Logging haul roads were built in the 1970s, and the upper area was harvested at that time. The eastern part of the watershed was clearcut with tractor yarding in the 1980s, but the majority of the watershed was only partially harvested at that time. Between 1987 and 1994, the areas that had been partially harvested were clearcut.

# Biological Resources

## Watershed and Aquatic Habitat Conditions

### General Watershed Conditions

Approximately 60% of the Reserve (4,400 acres) was entered for timber harvest prior to its designation as a Reserve. This harvesting required the development of over 35 miles of roads (figure 3-1), widened periodically to serve as log landings, and the falling, skidding, and removal of large forest trees. Nearly 9% of the harvested area was disturbed for roads and landings, which included 122 stream crossings (figure 4-1). An estimated 49 major road-induced landslides are now present (PWA 2001). Except for some locations where various selection harvest methods were employed (i.e., *seed-tree harvested* areas), forest canopies were completely removed in harvested areas (clearcut). Overall, the entry for timber harvest significantly degraded watershed conditions in terms of its ability to intercept, store, delay, and filter runoff. The unharvested portion of the Reserve (3,000 acres), however, comprises a dense old-growth forest and exhibits pristine watershed conditions.

Because most of the Reserve was harvested by tractor logging, most of the log haul roads were placed near streams (because logs must be dragged downhill). Direct rainfall and concentrated runoff entrain sediment from road and landing surfaces and generally deliver it directly to nearby

streams. In many locations, gullies form where runoff is concentrated, further increasing sediment generation, or saturated road and landing fills fail directly into streams. Where roads cross the numerous streams on the Reserve, culverts or "Humboldt crossings" (logs placed in the stream parallel to streamflow) were installed. As these roads have not been maintained for several years, many of these stream crossings have become plugged. Plugged culverts can impound runoff and subsequently erode large sections of roadbeds, delivering additional sediment to the stream system. The relationship of road systems to stream sedimentation has been well documented (Furniss et al. 1991, Amaranthus et al. 1985, Reid and Dunne 1984, Beschta 1978, Megahan and Kidd 1972, Brown and Krygier 1971).

Skid trails are also extensive within the Reserve. Most of the older skid trails have revegetated, while most of the more recent ones are still very visible. The headwaters of the South Fork Elk River (Elkhead Springs area) has the highest density of skid trails in the Reserve; one area has 94 miles of skid trail per square mile of land. In some cases, skid trails divert water onto exposed soils or unstable areas, which results in additional surface erosion or mass failure, both contributing additional sediment to streams.

Sediment sources in the Reserve, as well as potential plans for watershed restoration, have been addressed by Pacific Watershed Associates (PWA) in three reports (2000a, 2000b, 2001). Much of the data in this section is taken from the PWA inventories.

## General Aquatic Habitat Conditions

Aquatic habitats in the Reserve include the headwaters of Salmon Creek, approximately five miles of the South Fork Elk River, including its headwaters at Elkhead Springs, and the entire Little South Fork Elk River. South Fork Elk River supports coho salmon, chinook salmon, steelhead, and cutthroat trout within the Reserve boundaries. The lower 0.25 mile of Little South Fork Elk River also supports both salmon and steelhead, but a barrier prevents migration into the upper reaches of the drainage (figure 3-5). In the Reserve, Salmon Creek does not now support anadromous runs of these species, but they are present downstream of the Reserve. Migration barriers may be preventing access to the Reserve (non-anadromous cutthroat trout are found within the Reserve). These streams also support resident rainbow trout, sculpin, and threespine stickleback.

All of these streams are well shaded, have cold water temperatures, and have ample large woody debris within the stream channels. Within the Reserve boundaries, the temperature of Salmon Creek never exceeds 60° F, and temperature of Little South Fork Elk River appears to remain below 65° F in summer. Salmon Creek has numerous deep pools with a large amount of large woody debris where it passes through old-growth forest. However, fine sediment (silt) covers channel-bottom substrates. South Fork Elk River contains many pools, some of which are deep, but it contains large amounts of fine sediment as well. South Fork Elk River (including the Little South Fork) appears to carry high sediment loads during the rainy season. Sediment introduced into all three streams has most likely decreased the size and depth of many pools relative to the unharvested condition, tending to somewhat elevate water temperatures (Fuller pers. comm.).

Fine sediment observed in all of these streams is sufficient to

- inhibit salmon from digging spawning redds (nests),
- limit water flow through the redds (which can cause eggs or newly hatched fish to suffocate),
- inhibit newly hatched fish escape from spawning gravel,

- limit primary photosynthetic production,
- depress benthic invertebrate abundance, and
- increase gill erosion.

## Conditions within Specific Watersheds

### Upper Little South Fork Elk River Watershed

The 1,500-acre upper Little South Fork Elk River watershed is almost entirely covered with unharvested, old-growth forest. This heavily vegetated, undisturbed watershed produces high-quality streamflow to help maintain suitable aquatic habitat conditions in the downstream reaches of the South Fork Elk River. Sediment loads are relatively small, and aquatic habitats are generally in pristine condition. The watershed was penetrated by a single logging road near the end of the timber harvesting era (referred to herein as the *Headwaters Old-Growth Road*). This 0.9-mile road with three stream crossings was partially decommissioned and recontoured in August–September 2000, following an environmental assessment (DOI BLM 2000) and is expected to be fully decommissioned by 2002.

### Lower Little South Fork Elk River Watershed

This steep watershed includes 1,200 acres of harvested lands tributary to the Little South Fork Elk River from its confluence with the South Fork upstream to the northern edge of the main Headwaters Forest grove (1.6 miles). The mainstem channel has a steep gradient, limiting anadromy to the lower quarter mile as noted. This area has nearly 10 miles of logging roads that have 20 stream crossings and an estimated eight landslides. The main road accessing the harvested lands from the Elk River corridor is used as a trail, but it is poorly routed for continued use, requiring high maintenance. Forest cover has begun to dominate much of the area: 77% of its second-growth forest has already reached or exceeded early-mature forest stage. Fine sediment is abundant in the stream channel.

### Salmon Creek Watershed

The 3,000-acre Salmon Creek drainage encompasses the entire south end of the Reserve. The Reserve contains all of the headwaters of the stream. The main stem flows for nearly two miles through unharvested old-growth forest, where it is isolated from harvested areas in southern portions of the watershed by a streamside corridor of old-growth forest. Although the Salmon Creek watershed contains up to one-third of the old-growth forest in the Reserve, 65% of the watershed acreage has been heavily roaded and logged. Nearly 15 miles of abandoned logging roads with 50 stream crossings are present. As a result, numerous roads and landings are in inner gorge locations, perched above the streams and episodically contribute massive amounts of sediment to the Salmon Creek system. Twenty-two road-related landslides are present. As previously noted, channel-bottom sediment is extensive. Industrial forest lands downstream of the Reserve, where salmon and steelhead are found, have recently initiated road decommissioning. Roads directly adjacent to Salmon Creek within the Reserve are in the process of being removed (late summers of 2000 and 2001).

#### Upper South Fork Elk River Watershed (Elkhead Springs Area)

Reserve lands comprise approximately 1,100 acres of the 1,300-acre headwaters of the South Fork Elk River (85%). Only 400 acres, or 31%, of this watershed has unharvested old-growth forest. Harvested areas (69% of the watershed) contain many roads (an estimated 9.6 miles of roads with 48 stream crossings and eight landslides). These areas are recently harvested and contribute significant sediment to the river and its tributaries, which are occupied anadromous fish habitat. This watershed had highest densities of roads and upslope diversions of runoff within the Reserve. Fine sediment is abundant in the river channel.

#### South Fork Elk River Corridors

These two South Fork Elk River corridors (from the Elk River trailhead to slightly downstream of the confluence with the Little South Fork, and from the confluence upstream to the Elkhead Springs area) comprise narrow parcels of public land along the South Fork Elk River. The width of the downstream corridor averages nearly 0.2 mile (700–1,200 feet); width of the upper corridor averages less than 0.1 miles (300–500 feet). Much of the corridor land supports mountain riparian forest. Conifer forests within the corridors were harvested for timber, and second- and third-growth stands have replaced them. Lands in the tributary watersheds, except for the Reserve's Elkhead Springs area previously described, have been and continue to be managed for timber production under an approved HCP. Management of the Reserve's upland watersheds will therefore have only a limited effect on the extensive fine sediment and existing anadromy in the corridor reach of the river. Appropriate watershed restoration within the corridor would be limited to controlling erosion and stability of the Elk River Road, a former logging haul route that now serves as the primary trail into the northern portion of the Reserve. This road presently requires a high level of maintenance due to erosive substrate and location adjacent to river.

## Forest Vegetation

The natural vegetation of the Reserve is coniferous forest, dominated by coastal redwood. Douglas-fir (on northerly slopes) and tanoak (on southerly slopes) naturally occur in association with redwood over large areas of the Reserve (tables 3-1 and 3-2). Other forest trees include grand fir, Sitka spruce, western red cedar, western hemlock, and in riparian zones, red alder. Natural understory species include salal and evergreen huckleberry. (Jimerson and Jones 2000.)

As previously described, 60% of the Reserve has been harvested, beginning in the late 1800s and continuing through most of the 1990s. The remaining 40% has remained relatively undisturbed. The timber harvesting significantly altered the natural vegetation, suppressing certain species and favoring others. This has created a mosaic of forest stands that are more accurately characterized by postharvest age than by potential vegetation. For purposes of Reserve management, therefore, it is important to consider the Reserve's vegetation in terms of seral stage, rather than simply natural plant associations. With the present cessation of timber harvesting, vegetation at the Reserve will tend to evolve back to a natural condition (which may differ somewhat from the preharvest condition) as characterized in tables 3-1 and 3-2. Proposed forest restoration actions (chapter 4) can assist in creating structure and species composition approaching preharvest conditions.

**Table 3-1.** Extent of Potential Natural Vegetation Types in the Headwaters Forest Reserve

| Plant Association | Acres | Percent of Reserve |
|---|---|---|
| Redwood–Douglas-fir subseries | | |
| Redwood–Douglas-fir/salal–evergreen huckleberry | 3,369 | 45 |
| Redwood–Douglas-fir/swordfern | 712 | 10 |
| Redwood-tanoak subseries | | |
| Redwood-tanoak/evergreen huckleberry–salal | 2,825 | 38 |
| Redwood-tanoak/swordfern | 38 | <1 |
| Redwood–western red cedar subseries | | |
| Redwood–western hemlock/evergreen huckleberry–salal | 123 | 2 |
| Redwood–western hemlock/salmonberry/swordfern | 22 | <1 |
| Redwood–grand fir subseries | | |
| Redwood–grand fir/salal/swordfern | 125 | 2 |
| Redwood–red alder subseries | | |
| Redwood–red alder/salmonberry | 169 | 2 |
| Redwood–Sitka spruce subseries | | |
| Redwood–Sitka spruce/thimbleberry | 89 | 1 |
| Redwood–western red cedar subseries | | |
| Redwood–western red cedar/swordfern | 2 | <1 |
| Total | 7,472 | 100 |

Source: Jimerson and Jones 2000

**Table 3-2.** Environmental Characteristics of Vegetation Types in the Headwaters Forest Reserve

| Plant Association | Elevation (feet) | Aspect | Slope | Slope Position |
|---|---|---|---|---|
| Redwood–Douglas-fir/salal–evergreen huckleberry | 1,120–1,760 | NE | 5–45% | Middle-upper 1/3 |
| Redwood-tanoak/swordfern | 1,700–1,910 | S, W | 45–85% | Middle-lower 1/3 |
| Redwood-tanoak/evergreen huckleberry–salal | 920–2,140 | SW, SE | 15–65% | Upper-middle 1/3 |
| Redwood–Douglas-fir/swordfern | 330–1,700 | NW, NE | 5–80% | Upper-lower 1/3 |
| Redwood–western hemlock/evergreen huckleberry–salal | 1,150–1,640 | NW, SW | 10–80% | Middle-lower 1/3 |
| Redwood–western hemlock/ salmonberry/swordfern | 600–700 | W | 2–5% | Streamside |
| Redwood–grand fir/salal/swordfern | 1,060–1,690 | NW, NE | 15–55% | Upper-lower 1/3 |
| Redwood–red alder/salmonberry | 50–800 | NW | 2–5% | Streamside |
| Redwood/Sitka spruce/thimbleberry | 40–120 | N, W | 1–5% | Lower 1/3 |
| Redwood–western red cedar/swordfern | 380–620 | N | 40–65% | Lower-middle 1/3 |

Source: Jimerson and Jones 2000

## Forest Seral Stages

The following is a description of the various forest seral stages that have been mapped at the Reserve (figure 3-4) (Jimerson and Jones 2000). Seral-stage delineations are a useful basis for special-status plant management, wildlife-species management, forest restoration action, and management of recreation access over the next few to several decades.

The primary subdivisions of seral-stage forest types are unharvested and harvested, applying to 42% and 58% of the Reserve, respectively (table 3-3).

**Table 3-3.** Seral Stages of the Headwaters Forest

| Seral Stage | Acreage | Percent of Reserve |
|---|---|---|
| **Unharvested Forest** | | |
| Old-growth | 1,947 | 26 |
| Late-mature | 434 | 6 |
| Midmature with pre-dominant trees | 519 | 7 |
| Midmature | 188 | 3 |
| Early mature with pre-dominant trees | 23 | <1 |
| Shrub/forb natural | 5 | <1 |
| **Harvested Forest** | | |
| Seed-tree harvested | 433 | 6 |
| Late-mature harvested | 9 | <1 |
| Midmature harvested | 838 | 11 |
| Early-mature harvested with pre-dominant trees | 153 | 2 |
| Early-mature harvested | 598 | 8 |
| Pole harvested | 1,677 | 22 |
| Shrub-sapling harvested | 647 | 9 |
| Total | 7,472 | 100 |

Note: "Pre-dominant trees" indicates that larger individuals are beginning to dominate the stand.
Source: Jimerson and Jones 2000

### Unharvested Forest

Unharvested portions of the Reserve are generally not considered for active management in this plan, with the exception of the development of some trail access into them under certain alternatives. The seral stages found in the Reserve are described below.

- **Old-growth.** Old-growth forest, covering 1947 acres (26% of the Reserve), typically has 30–40 trees per acre, primarily redwood and Douglas-fir. They usually occur as widely spaced individuals, generally with diameters at breast height (dbh) greater than 60 inches and ages greater than 200–500 years. A variety of age classes of conifer species are represented with a high degree of both vertical and horizontal structural complexity. Understory vegetation is well developed and there is a significant component of large woody debris (LWD) on the forest floor.

- **Mature.** Because of natural substrate and topographic conditions, as well as wind and fire history, a substantial portion of the unharvested forest is not strictly considered "old-growth" but comprises somewhat younger groves considered "mature." Occupying 1,164 acres (16% of the Reserve), these stands differ as a matter of degree rather than kind from the old-growth groves; in fact they tend to grade into one another. They tend to have fewer old-growth attributes, but are capable of attaining them. Average tree ages and diameters tend to be less, and stocking densities tend to be higher, with a larger Douglas-fir component. Understory vegetation is also well-developed with a significant LWD component.

#### Harvested Forest

Harvested portions of the Reserve are considered for active management in this plan, with the goal of accelerating successional change to natural mature and old-growth conditions (chapter 4). Forest seral stages and riparian zones at the Reserve are described below.

- **Seed-tree harvested.** Approximately 6% of the Reserve (433 acres) was harvested by seed-tree silvicultural prescriptions in which scattered single trees or small groups of mature or old-growth trees were retained across the harvest area, usually with random spacing. (This seral stage is referred to as *old-growth harvested* by Jimerson and Jones 2000) These stands generally have two distinct strata of conifers and a less-well-developed understory and LWD component. The overstory is composed of the residual trees, and the understory is usually a uniform pole or shrub-sapling stand with characteristics similar to pole or shrub-sapling stands described below.
- **Mature harvested.** These stands, covering 1,598 acres (21% of the Reserve), are generally more than 30 years old, representing regeneration in the earliest harvest units of the Reserve. They are highly variable in species compositions and structures. Average stem diameters are greater than 16 inches, and maximum stand height is greater than 100 feet. In general, redwood dominates the stands (44% to 71%), with Douglas-fir as the other principal species. Minor constituents, but often locally dense, include tanoak, western hemlock, and grand fir. Understory layers are better developed than in the pole/sapling stands because stand densities are less due to managed thinning and natural thinning processes. Principal understory species are salal, evergreen huckleberry, red huckleberry, salmonberry, and thimbleberry. Variability of stand structure depends on the history of management and/or natural processes. Some stands show characteristics similar to the pole stands (i.e., emerging dominance differentiation and little structural diversity), while older stands show strong variability in individual tree form and have highly variable structures, both vertically and horizontally.
- **Pole harvested.** These stands, covering 1,677 acres (22% of the Reserve), are composed of extremely dense stands of young conifer trees generally 15–35 years of age. Typically, 500–2,500 trees are present per acre. A sample regeneration survey showed Douglas-fir dominance (78%), with redwood and grand fir percentages of 21% and 1%, respectively. Tanoak is present in these stands but is a very minor component once these stands are well established. Structurally, the stands typically have a single overstory layer, with some understory composed of salal and evergreen huckleberry. The trees have diameters ranging from 6–14 inches dbh, and sometimes as large as 20 inches. Stand heights range from 40 to 75 feet.

  Because of the density of these stands, live crown ratios are low and crown-base height is relatively high. These stands are extremely dense where they have developed on skid trails and layouts (i.e., beds prepared for the purpose of reducing breakage during the felling of large trees). Eventual overstory trees have begun to establish dominance over slower-

growing trees that are at less of an advantage because of their siting, the availability of sunlight, etc. This overstory selection will accelerate through the pole stage.

- **Shrub-sapling harvested.** This type, covering 647 acres (9% of the Reserve), has developed on ground that was clearcut 10–15 years ago. The dominant vegetation is broad-leafed shrubs with hardwood and conifer saplings, seedlings, and sprouts. The young conifers are primarily seeded Douglas-fir and redwood stump sprouts, variably stocked from 500 to 3,000 per acre. Pacific madrone and tanoak are generally present in minor percentages, but in some instances tanoak is a major component and displaces conifer stocking. Relative species compositions and canopy percentages have not yet been inventoried. Redwood stump sprouts are scattered throughout the areas, but Douglas-fir seedlings are clumped, with extreme densities on old skid trails and layouts.
- **Riparian zones.** Vegetation along watercourses and seep areas in unharvested forests is dominated by redwoods and huckleberry. In harvested forests, it is dominated by hardwoods such as red alder and big leaf maple and by conifers such as western red cedar, Douglas-fir, Sitka spruce, and grand fir. Crown canopy closures are usually 90–100%, with well-developed vertical structure. The LWD component is also usually well developed.

## Special-Status Plants, Fungi, Lichens, and Bryophytes

This section describes special-status vascular plants, fungi, lichens, and bryophytes (mosses, liverworts, and hornworts) that occur or may occur in the Reserve. Fungi, lichens, and bryophytes are collectively referred to as cryptogams.

### Vascular Plants

Special-status plants are plants that are legally protected under ESA, CESA, or other regulations and species that are considered sufficiently rare by the scientific community to qualify for such listing. Special-status plants are species in any of the following categories:

- plants listed or proposed for listing as threatened or endangered under ESA (50 CFR 17.12 [listed plants] and various notices in the Federal Register [proposed species]);
- plants that are candidates for possible future listing as threatened or endangered under ESA (61 FR 40: 7596-7613, February 28, 1996);
- plants listed or proposed for listing by the state as threatened or endangered under CESA (14 CCR 670.5);
- plants listed as rare or endangered under the California Native Plant Protection Act (California Fish and Game Code, Section 1900 et seq.);
- plants that meet the definitions of rare or endangered under CEQA (State CEQA Guidelines, Section 15380);
- plants considered by the California Native Plant Society (CNPS) to be “rare, threatened, or endangered in California” (lists 1B and 2 described in Skinner and Pavlik 1994);
- plants listed by CNPS as species about which more information is needed to determine their status;

- plants of limited distribution (lists 3 and 4 described in Skinner and Pavlik 1994), which may be included as special-status species on the basis of local significance or recent biological information; and
- plants listed as sensitive, special-interest, or "Survey-and-Manage" by U.S. Forest Service (USFS) Region 5 (Forest Service Manual 2670), California BLM, or the 2001 record of decision for amendments to the Northwest Forest Plan (U.S. Forest Service and U.S. Department of Interior Bureau of Land Management 2001).

General field surveys for special-status plants have been conducted in the Reserve in conjunction with cryptogam surveys and forest stand examinations. Because of the types of habitats present in the Reserve, few special-status vascular plant species or populations are expected to occur. During other survey work in the Reserve, scattered populations of heart-leaved twayblade, a CNPS list 4 species, were observed (Wheeler pers. comm. and Scanlan pers. comm.). A list of special-status plants with potential to occur in the Reserve was developed through a search of the latest versions of the California Natural Diversity Data Base (CNDDB), CNPS Electronic Inventory, and descriptions of the vegetation types of the project area (Jimerson and Jones 2000, Wheeler pers. comm.). Special-status plants that may occur in the Reserve, their listing status, and known geographic distribution and ecological information are summarized in table 3-4.

#### Fungi, Lichens, and Bryophytes (Cryptogams)

No fungi, lichens, or bryophytes, collectively known as cryptogams, are currently listed or are candidates for listing under ESA or CESA. However, the CNPS has developed a list of lichens and bryophytes that are considered rare. In addition, the Northwest Forest Plan contains a list of Survey-and-Manage species that includes fungi, lichens, and bryophytes (U.S. Forest Service and U.S. Department of Interior Bureau of Land Management 2001).

McFarland and Largent (2000) are conducting protocol-level surveys to identify cryptogams in representative plots in the Reserve. Complete surveys for cryptogams require at least five years of studies, and only two years have been completed to date. Fifty-six permanent monitoring plots at least 0.10 hectare in size were established throughout the forest and distributed among sites that capture the range of vegetation communities, seral stages, slope exposures, and slope positions in the Reserve. The plots were revisited multiple times on a weekly or biweekly basis during mushroom season and after storm events from 1999 through spring 2001, and all species of cryptogams were recorded. Survey-and-Manage species, the number of plots in which they were identified, and their microhabitat requirements are summarized in table 3-5.

A total of 458 species of fungi, lichens, and bryophytes have been recorded to date in the Reserve. The Reserve supports a relatively rich composition of fungal species, with 340 species identified to date. The most species-rich sites for fungi include north-to-east facing midslopes with a redwood/Douglas-fir overstory and a tanoak/huckleberry understory. Young, early-successional, even-aged and monotypic forest stands that were previously logged supported the fewest number of cryptogam species. Exceptions occurred where some late-mature trees had been retained in the harvested stands (i.e., seed-tree harvested stands), which provided source populations of cryptogams to repopulate the site (McFarland and Largent 2000).

A total of 24 Survey-and-Manage fungi species have been identified in the Reserve. Three fungal Survey-and-Manage species have been found only once in the Reserve and have not been identified on other BLM lands in California. These relatively rare species include *Clitocybe subditopoda, Dermocybe humboldtensis,* and *Gyromitra infula*.

Relatively few lichen and bryophyte species have been identified in the Reserve compared to other public lands in the region. The lichen and bryophyte list is still being compiled; the expected completion date is summer 2001. To date, three Survey-and-Manage lichens have been identified in the forest, one of which, *Usnea longissima*, is also considered rare by the CNPS. Two bryophyte genera, *Tetraphis* and *Buxbaumia*, were identified during the cryptogam surveys. Both of these genera have species that are Survey-and-Manage species, but characteristics for species-level identification were lacking.

### Invasive Nonnative Plant Species

Several nonnative plant species occur in the Reserve, some of which are considered noxious weeds. Surveys and mapping of noxious weed populations will be conducted during 2001. Weed species identified to date have been recorded as part of other survey work in the forest.

In general, most nonnative plants are restricted to areas of past disturbances to the soil and forest cover. Old-growth forests and stands with high-crown closure do not provide suitable habitats for most weed species. The most widespread noxious weed in the project area is pampas grass (*Cortaderia jubata*), which occurs throughout the project area on roadcuts and other disturbed sites lacking forest cover. Other weed species include Himalaya berry (*Rubus discolor*) and English ivy (*Hedera helix*), which occur along the South Fork Elk River (Wheeler pers. comm.). The northwest portion of the Reserve near the Elk River Trailhead and the historical town of Falk contain the greatest number of nonnative species, generally associated with historical landscaping. Most of these species are not considered invasive and are unlikely to spread to other parts of the Reserve.

## Aquatic Species and Habitat Needs

### Common Species

As described under "General Aquatic Habitat Conditions" above, the Reserve includes the headwaters of Salmon Creek, South Fork Elk River, and Little South Fork Elk River, which contain populations of anadromous and freshwater resident fish species. Common native fish species that may be found in these waterways include sculpin (*Cottus* spp.), threespine stickleback (*Gasterosteus aculeatus*), and nonanadromous (i.e., resident) rainbow steelhead and cutthroat trout (*Oncorhynchus clarki clarki*).

### Special-Status Species

As previously discussed, four species of anadromous salmonids occur in or near the Reserve: chinook salmon, coastal cutthroat trout, coho salmon, and steelhead (table 3-6). Three evolutionarily significant units (ESUs) are listed as threatened under ESA, and one species, coho salmon, is a state-candidate endangered species. The three federally listed ESUs are the California coastal chinook salmon ESU, the southern Oregon/northern California coasts coho salmon ESU, and the northern California steelhead ESU. In addition, critical habitat, which includes the riparian zones of the Reserve, has been designated under ESA for the southern Oregon/northern California coasts coho salmon and California coastal chinook salmon ESUs. Critical habitat is defined as specific areas, both occupied or unoccupied, that are essential to the conservation of a listed species and that may require special management considerations or

protection. NMFS conducted a status review of the southern Oregon/California coasts coastal cutthroat trout ESU and determined that this ESU was not presently in danger of extinction, nor was it likely to become so in the foreseeable future. However, coastal cutthroat trout are a DFG state species of special concern.

Pacific salmon and trout are indicators of a properly functioning aquatic ecosystem because they require cool, clean water, complex channel structures and substrates, and low levels of silt. Excessive water temperatures, high turbidity, sedimentation of habitats, loss of cover and habitat complexity, sport and commercial harvest, pollution, poor hatchery practices, and migration barriers are some of the factors that have contributed to the decline in population abundance of wild stocks for all four species. The establishment of conditions, constraints, and practices that maintain watershed integrity and restoration of problem areas that continue to degrade aquatic habitats are primary objectives needed to restore anadromous salmonid populations.

The information presented below on the life history of coho and chinook salmon, steelhead, and coastal cutthroat trout is based on Shapovolov and Traft (1954), Moyle (1976), and Moyle et al. (1995).

#### Coho Salmon

Adult coho salmon leave the ocean and migrate up coastal rivers and streams in the fall and early winter. Most spawning occurs in November–January. Females excavate redds (nests) in clean gravel with their tails. Eggs are deposited in the redds where they incubate for 2–3 months, depending on water temperature. Incubation times are inversely related to water temperature; higher water temperatures result in shorter incubation times. After hatching, the young emerge from the gravel and take up residence in the streams. Optimal habitat for young appears to be deep pools containing rootwads and boulders in heavily shaded stream sections. Juvenile coho salmon rear in freshwater for approximately one year before emigrating to the ocean as smolts. As previously noted, coho salmon occur in the South Fork Elk River within the Reserve boundaries and in Salmon Creek downstream of the Reserve (figure 3-5).

#### Chinook Salmon

Adult chinook salmon leave the ocean and migrate up coastal rivers and streams in the fall to spawn. Most spawning occurs in October–December. Spawning behavior and egg incubation is similar to that described for coho salmon. After hatching, young chinook salmon rear in their natal streams for a relatively short time before emigrating to the ocean in spring, although a few juveniles may oversummer in freshwater before emigrating. As previously noted, chinook salmon occur in the South Fork Elk River within the Reserve boundaries (figure 3-5).

#### Steelhead

Adult steelhead leave the ocean and migrate up coastal rivers and streams in late fall and winter. Spawning can occur from December through April and probably peaks in January–March. Spawning behavior and egg incubation are similar to that described for coho salmon. After hatching, young steelhead rear in freshwater for 1–3 years before emigrating to the ocean as smolts. Smolt emigration typically occurs during spring (March–June). As previously noted, steelhead occur in the South Fork Elk River up to the headwaters, the lower 0.25 mile of the Little South Fork Elk River, and Salmon Creek below the Reserve boundary (figure 3-5).

### Coastal Cutthroat Trout

In Northern California, coastal cutthroat trout begin to leave the ocean and migrate up spawning streams after the first fall rains. Spawning typically occurs in January or February. Cutthroat typically spawn and rear farther upstream than do steelhead or coho salmon, which are competitively dominant over cutthroat trout. Spawning behavior and egg incubation are similar to that as described for coho salmon. After hatching, young coastal cutthroat trout rear in freshwater for up to five years, although some spend their entire lives in freshwater. After migrating to sea, juvenile cutthroat trout remain close inshore and most remain in the estuary. Adult coastal cutthroat trout spend one to several years in saltwater but may migrate upstream each year to spawn. As previously noted, anadromous coastal cutthroat trout occur in the Reserve's South Fork Elk River up to the headwaters and in Salmon Creek downstream of the Reserve. A non-anadromous population exists in Salmon Creek within the Reserve (figure 3-5).

## Factors Affecting Abundance of Anadromous Salmonids at the Reserve

The Elk River and Salmon Creek watersheds once supported abundant runs of native anadromous salmonids. Habitat loss and degradation is the human-caused factor that has had the greatest effect on the abundance of anadromous salmonids. Other factors that have contributed to low abundance relative to historical conditions include commercial and sportfishing harvest, changes in ocean temperature and prey availability, entrainment in diversions, continued habitat degradation, contaminants, species interactions (e.g., presence of or predation by nonnative species), and artificially propagated stocks.

Relative to historical conditions, the Elk River and Salmon Creek watersheds have been highly modified. Timber harvesting has occurred in the upland areas for more than a century, while the lowland areas bordering Humboldt Bay have been leveed and drained and converted for agricultural purposes (e.g., pasture). The Humboldt Bay estuary and surrounding wetlands receive contaminated runoff from agricultural lands and roadway surfaces and discharges from industries and municipalities. As a consequence of a century of watershed disturbances, large quantities of sediment have been introduced into the rivers and streams within these watersheds. As previously described, excessive sediment input into streams has degraded spawning and rearing habitat for fish by filling in pool habitats and causing stream gravels to have a higher-than-normal percentage of fine sediments (PALCO 1999). In Salmon Creek, the combination of accumulated sediments and woody material has formed numerous debris jams that have created partial and sometimes complete barriers to migrating fish (California Department of Fish and Game 1984). Farther downstream, the large volume of sediment introduced into the bay and estuary has contributed to sedimentation of habitats, causing aquatic organisms to be displaced or completely buried. Levees that have been constructed along the lower watercourses have separated the river and stream channels from their floodplain. Floodplain habitats are important nursery areas and refugia for many aquatic organisms, including anadromous salmonids.

## Current Monitoring and Restoration Programs

In response to the continual decline in abundance of anadromous salmonids, various agencies and resource conservation groups have initiated monitoring programs to assess the current status of fish populations and habitat conditions in the region, including streams within the Elk River and Salmon Creek watersheds. For example, a multiyear, regional abundance survey of juvenile coho salmon in the Mad River-Redwood Creek Hydrologic Unit was initiated in 1999 to monitor abundance in, among others, the Humboldt Bay tributaries. Similarly, in response to a heightened

interest in the potential effects of altered stream temperatures on salmonids and other aquatic organisms, a regional stream temperature assessment was initiated to identify thermally sensitive streams and to characterize temperature regimes of the various watersheds across the region. Both of these programs are part of the Humboldt State University Foundation, Forest Science Project. In addition to these monitoring programs, other monitoring efforts include water quality monitoring on Salmon Creek in the Humboldt Bay National Wildlife Refuge by the USFWS and summer water temperature monitoring on Reserve streams by BLM.

Restoration projects within the Elk River and Salmon Creek watersheds below the Reserve include decommissioning of inner gorge roads along Salmon Creek and vegetation planting, channel realignment, and tidal gate modification along Salmon Creek within the wildlife refuge. Within the Reserve, BLM initiated an interim watershed restoration and emergency sediment reduction program in 2000 to reduce the threat of immediate erosion and to prevent further deterioration of streams. In addition to road repair and emergency sediment reduction, BLM is performing trail maintenance along South Fork Elk River to reduce sedimentation to the South Fork and Little South Fork Elk River.

# Wildlife Species and Habitat Needs

## Common Species

North coast coniferous forest habitats provide food, cover, and unique habitat elements for many wildlife species (Mayer and Laudenslayer 1988, Schoenherr 1992). More than half of the forest land on the Reserve has been disturbed, at some level, by timber harvesting practices. As a result of this disturbance, a variety of habitat types currently occur in the Reserve. The following is a discussion of five distinct habitat types (shrub-sapling harvested, pole harvested, mature harvested and unharvested, old-growth, and riparian forest) and examples of common wildlife species associated with these habitats.

### Shrub-Sapling Harvested Habitat

Shrub-sapling harvested habitat consists of recently clearcut forests that are now dominated by broad-leafed shrubs (salal and blue blossom) with coniferous seedlings and saplings. Common wildlife species that are able to tolerate drier, warmer temperatures include ensatina (*Ensatina eschscholtzii*), gopher snake (*Pituophis melanoleucus*), western fence lizard (*Sceloporus graciosus*), Bewick's wren (*Thryomanes bewickii*), California ground squirrel (*Otospermophilus beecheyi*), black-tail deer (*Odocoileus hemionus*), and striped skunk (*Mephitis mephitis*).

### Pole Harvested Habitat

Pole harvested habitat consists of dense stands of young conifers, especially Douglas-fir. Common wildlife species found in this habitat include pacific tree frog (*Hyla regilla*), western skink (*Eumeces skiltonianus*), western terrestrial garter snake (*Thamnophis elegans*), dark-eyed junco (*Junco hyemalis*), Trowbridge shrew (*Sorex trowbridgei*), and bobcat (*Lynx rufus*).

### Mature Harvested and Unharvested Habitat

A wide variety of wildlife species inhabit the mature forest stands (both harvested and unharvested), which include early , mid-, and late-mature seral stages. Mid- and late-mature forests provide habitat for amphibians such as clouded salamander (*Aneides ferreus*) and Pacific giant salamander (*Diacamptodon ensatus*). Reptiles such as northern alligator lizard (*Gerrhonotus coeruleus*) and sharp tailed snake (*Contia tenuis*) are commonly found in a variety of forest habitats. Bird species found in forests dominated by Douglas-fir include Steller's jays (*Cyanocitta stelleri*), northern flicker (*Colaptes auratus*), and Pacific slope flycatcher (*Empidonax difficilis*). Common mammals found in mature stands are Allen's chipmunk (*Tamias senex*), long-eared myotis (*Myotis evotis*), mountain beaver (*Aplodontia rufa*), gray fox (*Urocyon cinereoargenteus*), and black bear (*Ursus americanus*).

### Old-Growth Habitat

Old-growth habitat provides a cool, moist environment for a variety of wildlife species, several of which can only find their nesting or foraging grounds within this habitat type. Moisture-loving animals, such as insects, amphibians, and mollusks, tend to thrive in old-growth forests (Schoenherr 1992). Banana slugs (*Ariolimax* ssp.) and other detritus feeders are an important and conspicuous component of this habitat because they process organic material throughout the forest floor. Amphibian species commonly found include Pacific giant salamander, clouded salamander, California slender salamander (*Batrachoseps attenuatus*), and northwestern salamander (*Ambystoma gracile*). Common bird species include pileated woodpecker (*Dryocopus pileatus*), Vaux's swift (*Chaetura vauxi*), Swainson's thrush (*Catharus ustulatus*), varied thrush (*Ixoreus naevius*), and brown creeper (*Certhia americana*). Mammal species that depend on old-growth habitat include California red-backed vole (*Clethrionomys occidentalis*), red tree vole (*Arborimus pomo*), silver-haired bat (*Lasionycteris noctivagans*), and northern flying squirrel (*Glaucomys sabrinus*).

### Riparian Forest Habitat

Riparian forest habitat provides food, water, and migration and dispersal corridors, as well as escape, nesting, and thermal cover for many wildlife species (Mayer and Laudenslayer 1988). Wildlife species associated with riparian forest habitat include black salamander (*Aneides lugubris*), tailed frog (*Ascaphus truei*), rubber boa (*Charina bottae*), and Anna's hummingbird (*Calypte anna*). Common mammals that could occupy this habitat include raccoon (*Procyon lotor*), spotted skunk (*Spilogale putorius*), and Virginia opossum (*Didelphis marsupialis*).

## Migratory Birds

Of the approximately 900 migratory birds occurring in the United States, 122 were selected as species of management concern at a national level (chapter 2). Migratory bird species on this list that occur within the Reserve's coastal redwood forest habitat include hermit warbler, Vaux's swift, northern spotted owl, Allen's hummingbird, olive-sided flycatcher, and Pacific-slope flycatcher.

## Special-Status Wildlife Species

Various information was gathered and reviewed to develop a list of threatened, endangered, candidate, and other special-status wildlife species that exist or could exist in the Reserve. Several data sources were reviewed to develop this list, including database records from the DFG's California Natural Diversity Database (CNDDB) (2001), Survey-and-Manage species lists (U.S. Forest Service and U.S. Department of Interior Bureau of Land Management 2001), USFWS species lists (April 2001), PALCO's HCP (1999), published and unpublished literature, and results of protocol-level field surveys. Table 3-6 lists special-status fish and wildlife species with potential to occur in the project area and describes the federal and state status for the species identified. The table includes comments about the geographic distribution, habitat requirements, and range of the species. Two special-status, terrestrial species known to occur on the Reserve are listed as threatened or endangered: the marbled murrelet and the northern spotted owl. The following is a brief discussion of special-status species with the potential to occur in or near the Reserve.

### Birds

#### Marbled Murrelet

Marbled murrelet populations in California have declined significantly (U.S. Fish and Wildlife Service 1997). At present, no concentrated marbled murrelet nesting populations occur along the California coast south of the Reserve until San Mateo County, south of San Francisco (U.S. Fish and Wildlife Service 1997). Scattered nesting occurs at Humboldt Redwoods State Park, on PALCO lands, at Alder Creek, near Fort Bragg, and in other locations. Approximately 25% of the marbled murrelet reproductive activity in the southern Humboldt region may occur in the Reserve (Ralph et al. 1997).

In its recovery plan for the marbled murrelet, USFWS recommends the maintenance and development of suitable habitat in relatively large continuous blocks, specifically including the Reserve, which is designated critical habitat for the species (U.S. Fish and Wildlife Service 1997). The Reserve currently contains suitable marbled murrelet nesting habitat in most of the intact old-growth and late mature stands present (2,115 acres) and in seed-tree and mature harvested forests (270 acres), together representing 32% of the Reserve. Under the critical-habitat designation, actions in the Reserve should not adversely affect marbled murrelet habitat. Suitable nesting habitat for the marbled murrelet is low elevation, mature to over-mature coniferous stands. Younger stands are also suitable for nesting if they contain large trees with nest platforms. Nest platforms include large branches, deformities, or debris platforms created by mistletoe infestations. The current range of the marbled murrelet in California is considered to be up to 45 miles inland from the coast (U.S. Fish and Wildlife Service 1997).

Disturbance near nests may interrupt normal breeding behavior and result in a failed nesting attempt. Such outcomes are especially onerous for species with a low rate of reproduction, such as the marbled murrelet. Protection of nesting marbled murrelets generally focuses on protecting suitable habitat and minimizing the potential for noise and visual disturbance that may adversely affect breeding birds. According to Long and Ralph (1998), however, anecdotal data supports the theory that nesting marbled murrelets are relatively tolerant of loud noises. They conclude that marbled murrelets are not easily disrupted from nesting attempts by human disturbance, except in situations where humans have confronted murrelets at or very near the nest. Hamer and Nelson (1998) preliminarily investigated the effects of several disturbance types on nesting activity. They found that human presence near a nest tree caused adults to abort feeding or flush from the nest limb. According to this research, visual human disturbance caused disruption in nesting

activity, while noise disturbance from human presence did not result in a reaction by adult nesting marbled murrelets.

A potential indirect effect that is perhaps more significant than disturbance is the risk of predation on marbled murrelet eggs and chicks. The only defense mechanism a nesting marbled murrelet has from predators is to remain hidden at the nest and to travel to and from the nest without being detected. Forests with trails and roads will alter bird community composition by enhancing forest-edge habitat used by generalist species and known nest predators, such as Steller's jays (Hickman 1990, Miller et al. 1998, Marzluff and Balda 1992, Nelson and Hamer 1995). Predation on marbled murrelets by corvids (birds in the family Corvidae, such as jays and ravens) has been documented by Singer et al. (1991). Furthermore, corvids are attracted to human garbage. An informal BLM survey of corvid abundance in the Reserve in 1999 indicated that Steller's jays were abundant and widespread in open areas and that four pairs of common ravens were detected (Hawks pers. comm.). Many rural residences and the towns of Fortuna (which has a waste disposal facility), Rohnerville, Fernbridge, Loleta, and Field's Landing are located near the Reserve, and general recreation and timber management activities take place in the area; therefore, the potential for corvid intrusion into the Reserve is significant.

Marbled murrelet nesting behavior has been identified at 47 of 72 survey stations in the Reserve (figure 3-6). Behaviors that indicate nesting activity include circling above and below canopy, flying through at or below canopy and stationary calling. Detections that do not indicate nesting activity include flying over canopy or nonstationary auditory detections. Nesting activity within the Reserve occurs primarily within the old-growth unharvested portions of the Reserve, but visual detections are often recorded in cleared areas and along roads because surveyor visibility is greater in these areas. Generally, the birds are travelling into the old-growth forests using drainages as corridors (Hawks pers. comm.).

USFWS estimates that activities within 0.25 miles of a marbled murrelet nest site may adversely affect nesting behavior (U.S. Fish and Wildlife Service 2000). Approximately 60% of the Salmon Creek watershed is within this distance of a marbled murrelet nesting site (approximately 900 acres), and 65% of the Upper South Fork Elk River (Elkhead Springs) watershed is similarly situated (approximately 290 acres). One such zone extends into the South Fork Elk River corridor. Another zone extends into the Lower Little South Fork Elk River watershed at its southernmost boundary. Thus, several of these disturbance-sensitive zones extend into the previously harvested portions of the Reserve (figure 3-6). Protocol-level surveys for marbled murrelet have not been conducted in the Lower Little South Fork Elk River watershed and the South Fork Elk Corridor; however, radar surveys on portions of the Reserve will be conducted in 2001.

#### Northern Spotted Owl

This species inhabits old-growth and late-successional forests in the Pacific Northwest and northern California. The survival of the owl depends on maintaining adequate well-distributed nesting, roosting, and foraging (NRF) habitat throughout the species' range. The components of NRF habitat include a multilayered, multispecies canopy with large overstory trees, large trees with various deformities, accumulations of fallen trees, and open space below the canopy for owls to fly (Thomas et al. 1990). Suitable dispersal habitat is also an important component of the owl's recovery because it provides a critical link to blocks of NRF habitat. Dispersal habitat consists of forest stands with adequate tree size and canopy closure.

The Reserve is within the California Coastal biogeographic subprovince in the range of the northern spotted owl and contains suitable NRF and dispersal habitat, as well as known nest sites and activity centers for the species. Protocol-level surveys from the last several years indicate

that five northern spotted owl sites occur in the Reserve. Five owl sites surveyed in 2001 revealed two that fledged young, one that was occupied by a single adult, and two with no detections. Approximately 4,666 acres of the Reserve (62%) is considered to be suitable nesting habitat (table 3-7). Fifty-one known owl nesting sites are located on land in Humboldt, Mendocino, and Trinity Counties managed by BLM's Arcata Field Office.

**Table 3-7.** Existing Suitable Nesting Habitat for Northern Spotted Owl and Marbled Murrelet in the Headwaters Forest Reserve*

| Seral Stage | Northern Spotted Owl (acres) | Marbled Murrelet (acres) |
|---|---|---|
| **Unharvested Forest** | | |
| Old-growth | 1,948 | 1,928 |
| Late-mature | 434 | 187 |
| Midmature | 188 | - |
| Midmature with predominant trees | 230 | - |
| **Harvested Forest** | - | - |
| Seed-tree harvested | 443 | 249 |
| Midmature harvested | 794 | 21 |
| Early-mature harvested | 62 | - |
| Early-mature harvested with predominant trees | 92 | - |
| Pole harvested | 186 | - |
| Total | 4,666 | 2,385 |

* Criteria for habitat suitability are as follows:

Northern spotted owl: $21" DBH, $40% canopy closure.
Marbled murrelet: $36" DBH, $60% canopy closure.

A search of the CNDDB and survey results from the BLM indicate that the known nest sites are within both unharvested old-growth areas and some mature harvested stands. Nest sites are within 0.25 mile of harvested areas in the Lower Little South Fork, South Fork Elk Corridor, and Upper South Fork Elk River (Elkhead Springs) watersheds (figure 3-7).

The current threat to spotted owl populations within the Reserve is the presence of at least three pairs of barred owls observed in or near the Reserve, which are able to outcompete spotted owls for habitat and available prey.

### Bald Eagle

Nesting habitat for this species includes conifer forests (Zeiner et al. 1990) associated with a lake, river, or other large body of water. Nest trees are typically dominant or co-dominant trees in a mature or old-growth stand (Lehman 1979). Winter habitat for this species is generally large trees with open crowns near large creeks, rivers, or lakes that have an available supply of fish (Lehman et al. 1980). PALCO has conducted bald eagle surveys on the Reserve and adjacent lands. No bald eagles were observed, and no nesting activity is known or suspected to be occurring on or near the Reserve (PALCO 1999, U.S. Fish and Wildlife Service and California Department of Forestry and Fire Protection 1999).

#### American Peregrine Falcon

This species nests on cliff ledges. They have been known to nest on small outcrops in other portions of their range (Zeiner et al. 1990). In 1999, PALCO conducted peregrine falcon surveys in the vicinity of the Reserve. As required by their HCP, surveys were conducted within 0.5 mile of timber harvest plans in suitable habitat. No peregrine falcons were observed at that time, and no nesting activity is known or suspected to be occurring on or near the Reserve. The species could occur irregularly during migration.

#### Osprey

The osprey population has substantially increased over the last 30 years. This species is always associated with large water bodies (e.g., lakes, reservoirs, large rivers) where the species preys on fish. Nests are usually within 1,000 feet of water but are occasionally as far away as one mile (Airola and Shubert 1981). Nest sites consist of a large stick nest typically constructed on the top of tall, broken-top trees or snags. Nest sites are usually in open forest habitats for easy accessibility (Zeiner et al. 1990). One known osprey nest occurs in the Reserve.

#### Little Willow Flycatcher

This species nests in wet meadows with abundant willows. Occurrences of the little willow flycatcher in the north coast are limited to the Six Rivers National Forest and along the Eel River (Sterling pers. comm.). It is suspected that these birds were not nesting but over-summering in the north coast area. Except for shrub-sapling harvested areas, the upland forested areas of the Reserve do not contain suitable nesting habitat for little willow flycatchers, but the riparian habitat in the Elk River Corridor of the Reserve does contain suitable habitat for migrating birds.

### Amphibians and Reptiles

#### Southern Torrent Salamander

Southern torrent salamanders occur in seeps, springs, and high-gradient reaches of streams in coniferous forest habitats (Corkran and Thoms 1996). Southern torrent salamanders have been detected in the Reserve and on adjacent PALCO lands.

#### Northern Red-Legged Frog

This species inhabits permanent pools, marshes, and slow-moving streams with dense streamside vegetation (Stebbins 1972). This species is rarely observed away from streamside habitats and finds escape cover in water at least three feet deep. Permanent or nearly permanent pools are required for larval development. Northern red-legged frogs have been detected in the Reserve and on adjacent PALCO lands.

#### Foothill Yellow-Legged Frog

This species inhabits streams and rivers in woodlands, chaparral, and forests (Stebbins 1985). The species requires shallow, flowing water in small to moderate streams with at least some cobble-sized substrate (Hayes and Jennings 1988). The frogs have been found in streams without cobble (Fitch 1936, Zweifel 1955), but it is not known if foothill yellow-legged frogs live in such habitats regularly (Hayes and Jennings 1988). Suitable habitat for the foothill yellow-legged frog exists within the riparian portions of the Reserve, but this species has not been detected within the Reserve. The foothill yellow-legged frog has been detected regionally in the Eel and Van Duzen Rivers.

#### Tailed Frog

This species lives in fast, small, permanent forest streams with clear cold water. Darkly shaded shallow water with cobble or boulder substrates are important habitat components for survival and reproduction of the tailed frog. Adults can be found away from streams during winter rains

and occasionally on warm, humid cloudy days (Corkran and Thoms 1996). Presence of this species within the Reserve is well-documented (Fuller pers. comm.).

#### Northwestern Pond Turtle

The northwestern pond turtle is thoroughly aquatic, preferring the quiet waters of ponds, reservoirs, and sluggish streams (Stebbins 1985). This species leaves the water to bask on rocks or logs and to deposit eggs along the streambank or in adjacent uplands. Northwestern pond turtles may overwinter in upland sites, which may enable them to occupy creeks or waterways that dry out for several months each year. This species has been detected in or near major watercourses in Yager and Eel watersheds but not in the Reserve or on adjacent PALCO lands.

### Mammals

#### Pacific Fisher

The Pacific fisher species inhabits intermediate- to large-tree seral stages of coniferous forests and deciduous riparian habitats with a high percent canopy closure. Hollow logs, trees, and snags are an important habitat component because fishers den in protected cavities (Zeiner et al. 1990). The BLM conducted Pacific fisher surveys in the Reserve using four bait/photo stations in 1999 and 2000. The Pacific fisher was not detected during these surveys (Hawks pers. comm.). Regionally, the Pacific fisher occurs throughout the Humboldt Bay region.

### Survey-and-Manage Wildlife Species

The Reserve lies within the Northwest Forest Plan area requiring surveys for Survey-and-Manage mollusks (U.S. Forest Service and U.S. Department of Interior Bureau of Land Management 2001). These species are: Oregon shoulderband snail, Church's sideband snail, Shasta chaparral snail, and Tehama chaparral snail. Surveys were conducted where ground-disturbing activities are to occur for all Survey-and-Manage mollusks, at which time only one Survey-and-Manage mollusk species was found, the Papillose tail-dropper slug (*Prophysaon dubium*). As of January 2001, this species is no longer considered a Survey-and-Manage mollusk (U.S. Forest Service and U.S. Department of Interior Bureau of Land Management 2001).

Surveys were also conducted for the Del Norte salamander, which is listed as a Survey-and-Manage Category "D" species. Suitable habitat for the Del Norte salamander includes talus slopes, rock outcrops, and rocky areas along riverbanks, road cuts, and road fill areas (Corkran and Thoms 1996). In addition, suitable habitat requires protection from sunlight by an overstory canopy that maintains cool, moist conditions on the ground. All road segments decommissioned on the Reserve to date were surveyed to protocol for this species prior to ground-disturbing activity, but none were detected.

## Interim Management of Biological Resources

### Species Preservation Management

Interim management for species preservation has several elements embodied in various program areas addressed by this plan:

- **Watershed restoration**—logging road and landing decommissioning, sediment reduction actions (installing water bars, road drainage improvements, elimination of water diversions),

and trail repair to reduced sediment yield, to protect and enhance stream habitats within and downstream of the Reserve.

- **Forest restoration—**limited to removal of invasive nonnative pampas grass along the southern access road and along the two open trails.
- **Recreation management—**sponsoring guided interpretive walks, addressing local school classes, hosting school field trips to engender concern and care of the Reserve's resources, controlling visitation to prevent disturbance to nesting marbled murrelets and spotted owls, watershed degradation, and other activities that threaten preservation of ecosystem integrity.
- **Research and monitoring management—**regulating scientific studies to minimize impacts of human intrusion into old-growth forests through a set of guidelines for researchers' behavior and by limiting their access seasonally and hourly to protect listed nesting species.

The watershed restoration work currently being conducted in the Reserve through fiscal year 2002 was approved under an existing environmental assessment (DOI BLM 2000) and biological opinions (U.S. Fish and Wildlife Service 2000, National Marine Fisheries Service 2000). Under the resulting biological opinion of July 12, 2000, issued by USFWS, incidental take was authorized on 792 acres of marbled murrelet nesting habitat between August 6 and September and on 445 acres of nesting habitat between September 1 and September 15, for one breeding season between 2000 and 2002.

At present no forest restoration density-management actions have been planned, approved, or carried out.

## Watershed Restoration

Watershed restoration planning began shortly after the Reserve came into public ownership, resulting in a series of restoration planning documents (PWA 2000a, 2000b, 2001). Road and landing removal actions according to these plans commenced in summer 2000 and are continuing in summer 2001. These actions involve removal of the road into the primary old-growth grove and of six road segments adjacent to streams in the watersheds of both Salmon Creek and the Little South Fork Elk River. Full recontouring of these roads to near-original grade is the target level of restoration. In addition, sediment reduction actions are being undertaken on the Salmon Creek Road, which now serves as the Salmon Creek Trail, and extensive trail repairs are being conducted on the Elk River Trail, which was also formerly a logging road.

## Research and Monitoring

The following elements are currently monitored:

- various ecological parameters as specified in PALCO's HCP (conducted by PALCO representatives), including radar and conventional surveys for marbled murrelets within the Reserve and on adjacent PALCO lands;
- high-risk sediment sources and watershed restoration site recovery;
- recreation activity, including magnitude and pattern of visitation and adherence to established rules regarding off-trail prohibition and discarding of food wastes;

- possible occurrences of Survey-and-Manage species before any watershed restoration activities; and
- northern spotted owl activity centers.

A corvid monitoring plan has also been developed to establish a baseline sample of corvid abundance within the Reserve. Surveys will be conducted before this management plan is implemented. The study will involve corvid surveys at point-count stations in the Elk River Corridor, Elkhead Springs area, Alicia Pass area, and Salmon Pass area and stations located in the interior of old-growth stands. Once a baseline has been determined, BLM will be able to use this population estimate for comparison to future monitoring results.

BLM is also providing funding for a study in Redwood National Park on the effects of human disturbance on nesting marbled murrelets. This study will not be conducted within the Reserve.

# Fire Regime and Hazard

## Natural Fire Regime

Fire in the cool, humid climatic environment in which the forest stands of the Reserve are located is not considered to be a major risk (Viers1981 and 1982). Significant fire events in this regime apparently have a low frequency of occurrence. Wildfire occurred with an average frequency of 80 to more than 400 years in the forests of coastal Oregon prior to widespread European settlement (Morris1934, Juday 1976, Morrison and Swanson 1990, Agee 1991 and 1993). Viers (1981) indicates that fires in natural stands here may have average return intervals greater than 500 years. Although lightning is considered to be an important potential source of ignition, the typically high humidity during storm events retards the ignition and spread rate of fire. However, because some management alternatives considered in this report would increase opportunities for fire ignition (public access) or fuel loading (forest restoration), it is important to further assess current fire risk.

## Fire Risk

Two aspects of an assessment of current risk of stand-replacing fire (RSRF) are important for the Reserve: sources of ignition and conditions affecting spread of fire. In the Reserve, ignition can come primarily from two sources, lightning strikes and human presence. Postignition fire behavior is determined by a number of factors, including topography, wind speed and direction, and fuel condition, which includes fuel moisture, fuel loading, and fuel structure. A risk assessment for planning purposes can focus on human sources of ignition and topographic and fuel-load conditions affecting fire spread.

### Ignition

Ignition can come from four sources: lightning strikes, off-Reserve burning, within-Reserve management activities using fire, and activities related to human use of the Reserve. As noted, most lightning strikes occur on ridge tops, and spread of lightning fire is only a risk during a relatively infrequent combination of extreme wind and dry fuel conditions during lightning

storms. At present and in the foreseeable future, management of the Reserve does not involve use of prescribed fire (except for pile burning in stand density management areas; see chapter 4).

Fire spreading into the Reserve as a result of off-site ignition is possible. The lands of the Reserve are not isolated topographically from potential off-site ignition sources; they are both upslope and upcanyon from non-Reserve lands. Such fires could result from four ignition sources off of the Reserve: lightning strikes, trash burning in rural residences, recreation activity, and forest management activity. These sources are difficult to affect through management of the Reserve.

Human-caused ignition by those approaching or using the Reserve is an important potential source of wildfire, and degree of public access is a key factor of risk. Ignition of wildfire along access roads is probably not a major threat, however. Only one road provides access to the southern perimeter of the Reserve from the normally locked Newburg gate. From the gate, 75% of the road up to the Salmon Pass trailhead is in a topographic position where it is separated from the Reserve by a ridge; therefore, fire burning through lower timberlands and reaching the Reserve boundary would tend to stall at the ridge top without having the upslope preheating effect and would tend to be controllable (although adverse wind conditions could negate this tendency). The remaining 25% of the road, the portion between the Salmon Pass trailhead and Alicia Pass, stays on the ridge top, with the Reserve lands to the north. Again, fires ignited on the ridge top would tend not to easily descend into the Reserve. Except for the Salmon Pass Trailhead, the portion of the road on the ridge top is not open to the public. This road actually continues on through the southern portion of the Reserve, where it is used only for private commercial log-haul purposes.

The existing Elk River Corridor Trailhead and trail constitute another zone where consideration of human-caused fires is important. This corridor is characterized by riparian vegetation along a river, and the adjacent conifer forest has been reduced in volume by past logging. It is situated in a topographic position that has elevated atmospheric humidity and fuel moisture. If ignition were to occur, spread rates would be relatively low. The existing wide trail provides good accessibility for fire suppression.

At present, no facilities for camping or cooking fires are provided in the Reserve, and fires are prohibited. Thus, the most significant threat of wildlife from ignitions within the Reserve is associated primarily with trail day use beyond the Elk River Corridor.

## Spread of Fire

Slope position and condition of vegetation are the key factors affecting fire spread. Quantitative data about fuel loading and structure are not available for the Reserve, and standardized fuels models have not been developed. However, two key elements of fire spread that can be evaluated are the relative topographic position of various seral stages and general fuel condition based on seral stage.

### Topographic Position

In general, fire ignited in vegetation in the lower third slope position starts relatively slowly, but because of generally elevated fuel moisture conditions it can burn uphill with increasing rates of spread and intensity. Fire ignited in the midslope position tends to have a greater rate of ignition success and immediate spread but less uphill slope distance is available for fire to gain momentum. Fire ignited on the ridge has the greatest initial success because of generally lower

fuel moisture and higher wind exposure, but rate of spread and intensity are usually low. For the existing trail system, approximately 5.43 miles, 84% of the total trail distances are in positions on the lower third of the slopes and 16% are on midslope and upper third positions (table 3-8).

**Table 3-8.** Topographic Position of Existing Trails

| | Trail Distances Relative to Slope Position (miles) | | | |
|---|---|---|---|---|
| Trail | Lower 1/3 | | Upper 2/3 | |
| Elk River Corridor | 2.94 | | 0 | |
| Little South Fork Elk River | 0.40 | | 0.86 | |
| Salmon Creek | 1.23 | | 0 | |
| Total Distance | 4.57 | | 0.86 | |
| Percent of Total Distance | 4.57 | 84% | 0.86 | 16% |

### Vegetation Condition

Typical stand conditions of three seral stages are considered to contribute to elevated RSRF. These stages are the shrub-sapling harvested, pole harvested, and seed-tree harvested. These stands have combinations of fuel-size-class distributions, fuel load densities, and structures (both vertical and horizontal) that promote fire. They have low canopy-base heights and high canopy-bulk densities that promote vertical fire development into crown fires. A total of 29% of the existing trail distance is in these stands. The remaining 71% is in stands having lower risk associated with stand fuel condition (mature harvested).

The mature harvested seral stage has widely varying characteristics, and the associated RSRF depends on the evolutionary stage of the stand. Generally, these mature seral stages include stands 30–80 years old. Natural processes of mortality, thinning, dominant tree emergence, and mosaic development are occurring to various degrees, and associated fire risk varies greatly as a function of shading, humidity, understory development, and vertical connectivity. In the early periods of development, these mature stands exhibit similar conditions and RSRF to the sapling/pole stands, and in the later periods they exhibit conditions more like old-growth stands, which generally have low RSRF.

The unharvested old-growth stands generally have high levels of shading, elevated fuel moisture, considerable rates of decomposition on the forest floor, and relatively low understory volume. They also lack vertical connectivity and are dominated by large fire-resistant trees.

### Integration of Fire Risk

Table 3-9 presents for each seral stage

- a subjective fuels condition risk factor (1–5 rating, with five the highest),
- the distribution by two relative slope positions, and
- a resulting RSRF rating.

**Table 3-9.** Risk of Stand-Replacing Fire of Various Seral Stages and Topographic Positions

| Seral Stage | Fuels Condition Risk Factor (1–5) | Total Acres | Lower 1/3 Acres | Risk of Stand-Replacing Fire | Percentage of Total Area | Upper 2/3 Acres | Risk of Stand-Replacing Fire | Percentage of Total Area |
|---|---|---|---|---|---|---|---|---|
| Shrub-sapling harvested | 4 | 652 | 207 | Moderate | 3 | 445 | High | 6 |
| Pole harvested | 5 | 1,677 | 314 | High | 4 | 1,363 | Extreme | 18 |
| Mature harvested | 3 | 2,762 | 823 | Low to moderate | 11 | 1,939 | Moderate to high | 26 |
| Seed-tree harvested | 3 | 433 | 236 | Low to moderate | 3 | 197 | Moderate | 3 |
| Unharvested old-growth | 1 | 1,947 | 635 | Low | 8 | 1,312 | Low | 18 |

Table 3-10 summarizes the acreages of the Reserve having the various levels of fire risk. As shown, approximately 40% of the Reserve is characterized by low and low-moderate RSRF (primarily the unharvested old-growth stands) but almost 30% has high and extreme RSRF (principally the sapling/pole and shrub stands). The combination of the relatively high proportion of stands with elevated fuel-condition risk and the topographic position of these areas poses a significant threat of wildland fire.

**Table 3-10.** Summary of Existing RSRF at the Reserve

| Risk of Stand-Replacing Fire | Area (acres) | Percent of Total Area |
|---|---|---|
| Low | 1,947 | 26 |
| Low to moderate | 1,059 | 14 |
| Moderate | 404 | 6 |
| Moderate to High | 1,939 | 26 |
| High | 759 | 10 |
| Extreme | 1,363 | 18 |

The highest proportion of high and extreme RSRF are in the Salmon Creek watershed, where pole harvested stands are widespread. The Upper South Fork Elk River watershed has the next highest proportions because of the presence of both pole harvested and shrub-sapling harvested stands. The Lower Little South Fork Elk River has the least proportion of high and extreme RSRF, because of the widespread presence of the older mature harvested stands.

A major concern is the risk of spread of fire into the unharvested old-growth stands from adjacent high-risk stands (the pole and shrub-sapling seral stage stands and pole- and shrub-dominated openings in seed-tree harvested stands). Such stands could introduce fire from below into the old-growth at relatively high rate of spread and intensity. In the Upper South Fork Elk River watershed of the Reserve, however, the old-growth stands are fairly well protected because they generally occupy lower slope positions and the high-risk stands are either in small isolated patches or are located upslope of the old-growth. No trails enter this area of the Reserve. A permanent timber-haul road does cross this area, but it is not open to public use.

The central old-growth grove of the Reserve is significantly threatened on both the north and south by the presence of pole and shrub-sapling stands downslope. Trails enter both of these areas. Most of these stands are located on relatively –more –humid, northern-facing slopes. In the Little South Fork Elk River watershed, pole, shrub-sapling, and early mature stands border the old-growth downslope. In the Salmon Creek watershed, a large expanse of pole harvested stands and smaller areas of shrub-sapling stands and seed-tree harvested stands border the old growth. These stands are generally on northeast-facing slopes above the old growth that remains in the inner gorge of the creek and extends up the southwest-facing slope. In one central location, however, an unthinned pole stand approximately 100 acres in size extends across the inner gorge and up the south-facing slope for nearly ½ mile, presenting a high risk of fire intrusion into the adjacent old growth.

# Visual Resources

The aesthetic or visual qualities of the Headwaters Forest are some of its most outstanding attributes. Natural landscapes of magnificent towering trees, clear streams, and rolling coastal mountains define the character of the core old-growth redwood forest. However, in some of the previously harvested areas, the landscape has reduced visual qualities. Sharp contrasts are created by road corridors, exposed soil, blocks of different height trees, etc., and reduce the visual qualities, particularly on the 1,550 acres that comprise the most recently harvested areas.

# Cultural Resources

## Known Resources

Eight archaeological sites have been located and formally recorded within the Reserve (Humboldt State University Academic Foundation 2001). Seven are historic period archaeological sites, and one is a prehistoric site; of the historic sites, one also has a reported but unconfirmed prehistoric component.

Two of the historic sites are very complex, with multiple features spatially associated in various loci. These include the *townsite of Falk and the Elk River Mill and Lumber Company*, with 14 major recorded loci, and *Maggie's Camp*, with three loci, both within the Elk River Corridor. The historic townsite of Scribner, founded before Falk, may have been a prehistoric campsite for indigenous people. Also within the Elk River Corridor is one of two linear historic sites, the complex *Bucksport and Elk River Railroad Company* system, a logging railroad.

A second linear historic site is a well-preserved segment of the *Old Military Trail*, built in the 1850s by U.S. troops stationed at Fort Humboldt. From Falk, it traverses the central old-growth grove of the Reserve along the ridgetop between Salmon Creek and Little South Fork Elk River and is suspected to exit the Reserve's southeastern boundary. It coincides with a recent jeep road and was most likely the route of a prehistoric Indian trail. The single prehistoric site recorded at the Reserve is located on the ridgetop adjacent to the trail and indicated prehistoric habitation.

Consultation with representatives of the Table Bluff Reservation Band of Wiyot Indians, the Bear River Band of Rohnerville Rancheria, and Blue Lake Rancheria has not revealed any sacred or traditional cultural places within the Reserve.

## Resource Condition

All the historic sites within the Reserve have been disturbed by either natural erosion or human activity. Logging affected the Old Military Trail in the southeast portion of the Reserve, but in the old-growth grove, the trail is well-preserved and retains its integrity of place. Other disturbances include digging for old bottles and structure demolition by fire authorities. However, historic structures remain standing and retain historical integrity. The prehistoric site remains undisturbed.

## Interim Management

Interim management of cultural resources at the Reserve has consisted of three elements:

- conducting the cultural resources survey noted above;
- developing interpretive information regarding the townsite of Falk and disseminating it to the public via trailhead interpretive signs, interpretive walks, and presentations in local schools; and
- patrolling historic structures and other sites to prevent vandalism.

# Recreation Activities

## Access to the Reserve

As noted at the beginning of this chapter, the Reserve is accessible year round by Elk River Road from the city of Eureka (6 miles) or seasonally for BLM tours by the Newburg Road connecting to the Felt Springs Road from the town of Fortuna (4 miles), both of which are situated on U.S. 101 in the Humboldt Bay area. The Elk River Road is a paved two-lane minor collector road, while the Newburg Road is a paved two-lane rural residential road with homes closely bordering the roadway. The Felt Springs Road is a private natural-surface, two-lane arterial log haul road. BLM has a public easement over this timber company road, which must be accessed through a locked gate. Graveled turnouts have been installed by BLM. Only motor vehicles are allowed on the road, and stopping is prohibited.

The Elk River Road, providing access to the northern portion of the Reserve, terminates at the Reserve Boundary where an improved parking area and trailhead (Elk River Trailhead) are located on Reserve property. The improvements include a graveled surface parking area, suitable for cars but not trailers, fencing to prohibit vehicles from entering the Reserve, an information kiosk, and temporary restrooms. A gate prevents public motor access beyond the trailhead.

Where the Felt Springs Road first reaches the ridge along the southern boundary of the Reserve at Salmon Pass, another trailhead—the Salmon Pass Trailhead—is located. Improvements are similar to those at the Elk River Trailhead. Public travel on the Felt Springs Road beyond this point is currently restricted, although the road continues to Alicia Pass along the same ridge, where additional public access is considered in this plan. The Felt Springs Road continues on into the southeastern portion of the Reserve, where it is used for timber management activities on adjoining private timberlands under an existing right-of-way.

## Existing Trail Network

The former logging road into the northern portion of the Reserve now serves as the Elk River Corridor Trail. This trail extends up the South Fork Elk River with a gentle gradient for 2.9 miles through a narrow riparian corridor of the Reserve. The old road surface is paved for the lower half mile, after which it has a natural surface. Adjoining lands are private timberlands. Near the confluence of the South Fork and Little South Fork, the trail becomes the Little South Fork Elk River trail, which climbs steeply for 2.7 miles through harvested timberlands along a former logging road to near the edge of the main old-growth grove on the divide between Salmon Creek and Elk River. Off-trail hiking and access into the old-growth grove at this point are discouraged. Users must return as they came for a round-trip hike of 11.2 miles.

The Salmon Creek trail, formerly a logging road from the Felt Springs Road at Salmon Pass, provides access to the southern portion of the Reserve. The trail begins with a gentle slope but eventually descends steeply to the inner gorge of Salmon Creek, 1.3 miles from the trailhead. At this point the trail turns east and heads up the inner gorge of Salmon Creek for 0.6 mile, allowing continuous viewing of the southern edge of the main old-growth grove in the canyon bottom and on the opposite slope. Entry into the grove is also discouraged here, and users must return by the same route—a round trip of nearly four miles.

## Interim Access and Use Limitations within the Reserve

In March 1999, interim management guidelines for the Reserve were published that allow for day-use pedestrian access only. They do not allow use of vehicles, (whether motorized and nonmotorized), possession of firearms, overnight camping, and equestrian use in the Reserve (*Federal Register* 1999). Trail use was made subject to seasonal closure during wet weather to minimize sediment yield and trail damage. The Elk River Trailhead is open to the public year-round, only during daylight hours, although use of the Elk River Corridor Trail may not be allowed during wet conditions. The Felt Springs Road and Salmon Creek Trailhead are open only to guided hikes. Activities along the Elk River Corridor and Little South Fork Elk River Trails are monitored daily by BLM back-country rangers, who are available to provide information and assist visitors. The interim guidelines also subject collecting of vegetation to a special use permit process.

## Visitation and Visitor Preferences

### Visitation and Use

A study of visitation to the Reserve was developed from information cards completed by 2,305 visitors who registered at the Elk River Trailhead between June 1999 and March 2000 (DOI BLM 2000). The survey revealed that 75% of all Reserve visitors were from Humboldt County. Approximately 12% and 10% were from the San Francisco Bay Area and Sacramento Area, respectively. Seventy-four percent of the visitors said it was their first trip to the Reserve, and 96% said they would return. Most of the visitor use occurred in June and July (monthly average was 356 hikers). Use declined during August–October (monthly average was 278 hikers), and the least use occurred November through March (monthly average = 151 hikers), which is the rainy season. This level of visitation is relatively light compared to visitation at state and national parks in the region; an average of only 12 persons per day used the primary access to the Reserve during the peak use season.

The majority of visitors to the Reserve only hike the Elk River Corridor Trail. Only 13% of visitors reported that they also hiked the Little South Fork Elk River Trail to the terminus near the main old-growth grove in the Reserve. The amount of hiking that visitors completed varied during the survey period, however; after October a higher percentage of people hiked shorter distances (0–3 miles). Visitors' primary reasons for visiting the Reserve included hiking, exploring, seeing old-growth forest, seeing the result of all of the attention and controversy of the Headwaters forest acquisition, showing it to friends and relatives, exercising, birdwatching, relaxing, and walking dogs (Humboldt State University 2000).

### Visitor Preferences

A survey of the preferences of visitors to the Reserve was conducted from July to September, 1999 (Humboldt State University 2000). Reserve visitors were contacted on a stratified random sampling basis for onsite interviews and submittal of a mail-back questionnaire. Of the 580 persons contacted, 411 returned completed surveys (71%).

Only 8% of the respondents indicated they saw too many other hikers, indicating that lack of solitude was not an issue. Twenty-five percent of visitors said they noticed resource impacts caused by other recreationists, primarily litter and dog excrement. Twelve percent of visitors complained that the behavior of others interfered with their enjoyment; the most common problems cited were off-leash dogs and bicycles (bicycle use is in violation of the interim management policy for the Reserve).

When asked what problems they experience with the Reserve, 35% of visitors considered both the lack of information about the area's history and culture and the lack of additional trails to be major or moderate problems. Other problems considered to be major or moderate were the lack of information about trails (30%), litter (25%), trail erosion (21%), pets off-leash (19%) and human waste (17%).

When asked about the importance of services and facilities provided by the BLM, visitors rated the following as important or very important: trailhead signs having necessary information (85%), and opportunity for personal freedom (77%).

Visitors were asked about their support or opposition toward a list of possible management options and permitted activities. More than 90% of respondents support hiking, nature study, and wildlife viewing activities. A majority of visitors opposed hunting (88%), pets off-leash (64%), mountain biking (58%), and horseback riding (58%). A majority of visitors supported providing more trailhead parking (62%) and charging a small user fee (58%).

# Suitability for Special-Area Designations

Some of the Reserve's lands and resources may qualify for special designation under certain federal and state laws or administrative regulations, including Area of Critical Environmental Concern/Research Natural Area (ACEC/RNA), Special Recreation Management Area, National Register of Historic Places, Wilderness Study Area, National Wild and Scenic River, and State of California Ecological Reserve. Each special-area designation has certain qualifying criteria. The characteristics of the Reserve germane to these criteria are discussed in *Designation and Management of Special Areas* in chapter 4. Evaluations of eligibility and suitability for

designation of Wilderness study areas and Wild and Scenic Rivers are presented in appendices G and H.

# Socioeconomic Environment

## Locally Affected Communities

### Humboldt County

Humboldt County's economy developed around agriculture, logging and lumber milling, and ocean fishing. Its population has steadily increased, and the unemployment rate has decreased, over the past 20 years. Humboldt County has a current estimated population of 127,000, with a median age of 33. Retail trade now dominates local commerce, followed by health care, manufacturing, and accommodations and food service. The county's median per capita income is relatively low ($20,500) compared to $39,595 for California and $33,300 nationally. Humboldt had a high unemployment rate of 6.3% in 1999 (compared with 5.2% in California and 4.2% nationally) (U.S. Census Bureau 2001), and the lowest labor wage rate ($7.25/hour for a skilled employee) in 26 U.S. labor markets. Housing costs in Humboldt County are low for California but typical of the nation, with a median home price of $142,000 (CICG 2001), (compared with a statewide median price of $240,000 and a national median price of $135,000) (McAllister 2000). The county government maintains an extensive road system throughout the county, which includes the two roads that provide access to the Reserve.

### Eureka

Eureka, bordered on one side by Humboldt Bay and on the other by mountains, had its roots since the 1850s in the timber and commercial fishing industries. The city has 28,600 residents within 17 square miles. It is the county seat of Humboldt County. Colleges in Humboldt Bay area (but outside of the city) include College of the Redwoods south of the city and Humboldt State University in Arcata, a town of 16,000 residents eight miles to the north (Eurekawebs.com 2000).

### City of Fortuna

The City of Fortuna covers approximately five square miles and is located 16 miles south of Eureka on U.S. 101. Fortuna is the largest city in Humboldt County south of Eureka and has a population of approximately 10,200. The area within the city limits is mostly residential, with the surrounding area predominately rural. Much of the employment in the Fortuna area is related to timber and agriculture. However, within the city the largest percentage of employment is in retail trade and manufacturing. Recreation and tourism also contribute significantly to the city's economy. Because of its location, the city has served as commercial center for the residents of southern Humboldt County, enabling the city to maintain a relatively stable economy and employment rate during seasonal fluctuations in the timber and tourism industries. (City of Fortuna, 1993)

## Regional Recreation Opportunities

Humboldt County provides diverse recreation opportunities for its residents and visitors. Public recreation sites include beaches, rivers, and old-growth redwood forests (figure 3-8). Numerous parks offering a wide range of recreation opportunities are located within a 60-mile radius of the Reserve. The closest parks with stands of old-growth redwood are Grizzly Creek Redwoods State Park (15 miles east), Humboldt Redwoods State Park (30 miles south), and Prairie Creek Redwoods State Park and Redwood National Park (50 miles north). These parks provide a full array of recreation opportunities and facilities, including a combined total of 170 miles of trails. Much of the trail mileage traverses old-growth redwoods, allowing visitors to directly access some of the world's tallest and most impressive forests. In addition, all three parks offer camping and picnicking. Humboldt Redwoods and Prairie Creek offer backpacker/mountain bicyclist backcountry camps, and Humboldt Redwoods offers an equestrian camp. These parks have very high use compared to the Reserve, with a combined total of more than 1.2 million visitors annually.

During the scoping process for development of this plan, in addition to hikers, mountain bicyclists and equestrians expressed the desire for use of the Reserve. Off-highway vehicle users did not express a desire for use of the Reserve. Currently, 19 public recreation sites in Humboldt County permit equestrian recreation and 12 sites allow mountain bike use in the county. The extent, quality, and challenge of trails for these uses vary among these sites. Recreation use on private lands is generally prohibited without special permission. PALCO and Simpson Lumber Company, large landholders in the area, do not provide public access to their properties for any recreation uses without prior approval.

Information below is based on a telephone survey of managers of eight of these recreation sites to evaluate the quality of recreation experiences available to equestrians and bikers (table 3-11). Managers of the following sites were contacted in November and December of 2000: Clam Beach, Mad River Beach, Humboldt Redwoods State Park, Trinidad State Beach, King Range National Conservation Area, Sinkyone Wilderness State Park, Redwoods National and Prairie Creeks Redwoods State Parks, and Arcata City Forest.

### Equestrian Opportunities

When asked to rate the availability of equestrian opportunities, managers from five of the seven sites indicated that their sites are underutilized by equestrians. Some of the sites are forest environments. Six of the sites are considered to have good or high quality riding trails and adequate parking for horse trailers. Five of the sites have direct trail access from offsite locations. The extent of trails on individual sites ranged from three miles to 50 miles, with a combined total of more than 178 miles between the seven recreation sites. Three sites have adequate watering sources, and three sites have plans to increase capacity, including the BLM King Range National Conservation Area and adjacent lands such as the Redwoods-to-the-Sea Corridor linking to Humboldt Redwoods State Park.

### Mountain Biking

Managers of five sites also addressed the availability of mountain biking opportunities. All indicated adequate biking access from urban/suburban areas. Only one manager indicated his site was nearing capacity; the other four managers believed their sites are underutilized by mountain

bikers. Some of the sites are forest environments. The extent of trails on individual sites ranged from seven miles to 46 miles, with a combined total of approximately 146 miles. The quality of trails ranges from moderate to high, and the level of challenge ranges from easy to difficult. Four sites have plans to increase capacity, including the BLM King Range National Conservation Area.

### Multiple-Use Trails and Recreation Conflicts

Interim management of the Reserve has limited recreation use to hiking, but mountain biking and equestrian uses are being considered in this plan. Multiple-use trails, while common, pose the potential for conflict among users. The most frequently mentioned conflict among the surveyed park managers in the region was between mountain biking and other users. Equestrian park visitors complain that the fast-moving bikes frighten horses and disrupt their recreation experience. Pedestrians complain of being surprised and feeling physically endangered by unexpected encounters with cyclists. These observations are not unique to Humboldt County, as they have been described in other areas.

# Management Revenues

## Existing Funding for Reserve Management

Fees are not currently charged for access to the Reserve, either for recreation access or research access. Funding from Reserve management is derived exclusively from Congressional appropriations to the Secretary of Interior for BLM. In the original budget for Reserve management submitted in 1997, the State of California was expected to contribute one third of the annual operation costs, but no state funds have been allocated to management of the Reserve yet. BLM has been providing $1.2–1.3 million per year from federal appropriations for Reserve management since the Reserve's inception.

## Federal/State Experiences with Recreation User Fees

### Federal Fee Demonstration Program

In 1993, Congress enacted deficit reduction by passage of Public Law 103-66, the Omnibus Budget Reconciliation Act of 1993, which amended the Land and Water Conservation Fund Act of 1965. This fee legislation directed a number of changes in the BLM recreation fee program. In the 1996 Interior appropriations bill, Congress provided BLM the authority to establish a demonstration program to test the collection, retention, and reinvestment of new admission and users fees. This new Recreational Fee Demonstration Program allows BLM to use all of the fee income for meeting costs of operating the site where they are collected. As noted in chapter 2, the federal legislation that created the Reserve requires that the assessment of fees for recreation and research be considered in this management plan.

Fees charged to date under the demonstration program range from $3 to $5 for daily use/parking permits and typically are $40 for seasonal passes. Visitation to BLM's 95 sites in the program in 1999 was relatively unchanged from visitation in years before the program began. All of the federal participating agencies report high public acceptance of the fee program. Approximately

90% of visitor respondents to agency surveys said the level of fees is "about right" or "too low." However, some recreation user groups, such as the International Mountain Bicycling Association and the Backcountry Horsemen of Washington, oppose user fees. They argue that public lands should be funded by taxes, that charging fees discriminates against low-income families and that, because of the program, recreation interests that generate the most income (OHV use, power boating) will take precedence over lower impact activities.

At some sites, BLM provides no-fee days for select groups, such as economically disadvantaged persons, educational institutions, and volunteers.

## California State Park Fee Waiver Program

In 2000, California state parks reduced user fees by approximately 50% in an attempt to induce more visitation by low-income persons. It was estimated that fee reduction will increase attendance by 30% in urban areas and 10% in rural areas. Day-use fees were reduced from $5 to $2 in Humboldt-area state parks in July 2000. This reduction increased attendance at some facilities, such as Patrick's Point State Park, which experienced a 40% increase in attendance, comprised primarily of surfers. Attendance at most other facilities—those with more general recreation activity—were relatively unaffected by the policy change (Wilbur pers. comm.).