Appendix B, Chapter 22
Yellow Warbler

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22.0 Yellow Warbler (*Dendroica petechia*)

22.1 Introduction

Over the past several years, songbirds and the reasons for declines in their populations have been a focal point of interest. Many species of neotropical songbirds birds have experienced population declines due to losses and fragmentation of breeding, wintering, and migratory habitats. These long-distance migrants tend to be more vulnerable to habitat loss and fragmentation than resident birds or those that migrate only short distances within North America.

At least 49 neotropical bird species are highly associated with riparian forest and shrub habitats. Many are generalists that also occur as breeders in other habitat types. Other riparian-associated bird species are tied to unique features, but most are insectivores and likely dependant upon the high insect productivity that riparian areas produce (Sibley 2001; Yong et al. 1998). It is sometimes useful to choose an index species to represent a habitat used by many other species.

The yellow warbler (*Dendroica petechi*a) is strongly associated with riparian and wet, deciduous habitats throughout its North American range. It is positively associated with sub-canopy/shrub habitats in riparian areas, making it a good species index of this habitat (Altman 2001; Sauer *et al*. 2003).

22.2 Life History and Habitat Requirements

22.2.1 Life History

22.2.1.1 Diet

Yellow warblers capture and consume a variety of insect species. Yellow warblers consume insects and occasionally wild berries, especially when migrating. Food is generally obtained by gleaning from sub-canopy vegetation, although the species also sallies and hovers to a much lesser extent (Loather *et al*. 1999; Sibley 2001).

They are primarily insectivores on their breeding grounds, and this enables them to take advantage of the high insect productivity that occurs in riparian areas. Generally, there is a positive relationship in, the greater the structural layering and complexity of the habitat, the greater the insect productivity, and the greater the diversity of bird species. Many studies have

reported higher species richness, abundance, or diversity in riparian zones than adjacent habitats, particularly at lower elevations (Stauffer and Best 1980; Sibley 2001).

22.2.1.2 Reproduction

The yellow warbler is a common species associated riparian habitat throughout its breeding range. Locally common, it can be found along rivers and creeks in the Columbia Basin, but is declining in some areas (Sauer et *al*. 2001). Little is known about yellow warbler breeding behavior in Washington, although substantial information is available from other parts of its range.

Yellow warblers have developed effective responses to nest parasitism by the brown-headed cowbird (*Molothrus ater*). The brown-headed cowbird is an obligate nest brood parasite that does not build a nest and instead lays eggs in the nests of other species. When cowbird eggs are recognized in the nest the yellow warbler female will often build a new nest directly on top of the original. In some cases, particularly early in the incubation phase, the female yellow warbler will bury the cowbird egg within the nest. Some nests are completely abandoned after a cowbird egg is laid (Lowther *et al.* 1999). Up to 40% of yellow warbler nests in some studies have been parasitized (Lowther *et al.* 1999).

Nesting

Pair formation and nest construction may begin within a few days of arrival at the breeding site (Loather et al. 1999). Egg dates have been reported from British Columbia, and range between 10 May and 16 August; the peak period of activity there was between 7 and 23 June (Campbell et al. in press). The incubation period is about 11 days and young fledge 8-10 days after hatching. The young often associate with their parents for up to 3 weeks following fledging (Loather et al. 1999). Yellow warblers typically lay only one clutch with 4 or 5 eggs. Re-nesting may occur, however, following nest failure or nest parasitism by Brown-headed Cowbirds (Sibley 2001; Loather et al. 1999).

Migration

Songbirds are nocturnal, or powered migrants, and tend to migrate in a couple of different patterns. It is thought that powered migrants are much less affected by topography because of their night travel, and therefore show little concentration at particular landforms. (Corral 1989). Unlike the larger, diurnal migrants that depend upon updrafts for “soaring” migration, powered migrants must generate all the energy themselves for the long- distance water crossings thus, adding to the importance of stopover habitat during migration (Kerlinger 1995). For the most part, they rely on food supply and prevailing winds to determine their specific migration pattern for the season, thus spring migration does not always follow the fall migration pattern. In general, however, North American powered migrants are pushed east in fall by prevailing winds and do concentrate on the Atlantic Coast as they move to wintering areas (Corral 1989).

Western populations overwinter primarily in Mexico and northern Central America.

Spring migrants begin to arrive in the Columbia River Basin in April; dates of 2 April and 10 April have been reported from Oregon and British Columbia, respectively (Gilligan et al. 1994, Campbell et al. in press). Average arrival dates are somewhat later, the average for south-central British Columbia being 11 May (Campbell et al. in press). The peak of spring migration in Washington and the Columbia Basin is in late May (Gilligan et al. 1994). Southward

migration begins in late July, and peaks in late August to early September; very few migrants remain in the region in October (Lowther et al. 1999).

Mortality

Little has been published on annual survival rates. Roberts (1971) estimated annual survival rates of adults at 0.526 ±0.077 SE, although Lowther *et al.* (1999) felt this value underestimated survival because it did not account for dispersal. The oldest yellow warbler on record lived to be nearly 9 years old (Klimkiewicz *et al.* 1983).

22.2.2 Habitat Requirements

The habitat requirements of neotropical migrants are extremely diverse. Within a single species, the habitat and food preferences on breeding grounds, is often different than wintering areas (Petit et al. 1995). The yellow warbler is a common breeder in riparian habitats with hardwood trees throughout the state, generally found at lower elevations. Associated with riparian habitats, they prefer the presence of nearby water. Their habitat suitability index strongly associates them with a dense deciduous shrub layer 1.5-4 m. (5-13.3 feet), with edge, and small patch size (heterogeneity). Other suitability index associations include % of deciduous shrub canopy comprised of hydrophytic shrubs (wetlands dominated by shrubs had the highest average of breeding densities of 2males/ha) and deciduous tree basal area (abundance is positively associated). Negative associations are closed canopy and cottonwood proximity. Some nests have been found in cottonwood, but more often in shrubs with an average nest height of 0.9-2.4 m., maximum being 9-12 m. (Schroeder 1982).

Partners in Flight have established biological objectives for this species in the lowlands of western Oregon and western Washington. These include providing habitats that meet the following definition: >70% cover in shrub layer (<3 m) and subcanopy layer (>3 m and below the canopy foliage) with subcanopy layer contributing >40% of the total; shrub layer cover 30-60% (includes shrubs and small saplings); and a shrub layer height >2 m. At the landscape level, the biological objectives for habitat included high degree of deciduous riparian heterogeneity within or among wetland, shrub, and woodland patches; and a low percentage of agricultural land use (Altman 2001).

22.3 Population and Distribution

22.3.1 Population

Washington breeders represent the western subspecies *D. p. morcomi* (AOU 1998). Little is known about population size, although it is locally common where habitat exists.

22.3.2 Distribution

In the Wood-Warbler Family, Parulidae, the yellow warbler is a common species which breeds across much of the North American continent, from Alaska to Newfoundland, south to western South Carolina and northern Georgia, and west through parts of the southwest to the Pacific coast (AOU 1998). Their wintering range extends from western Mexico south to the Amazon lowlands in Brazil Brazil (AOU 1998). Neither breeding, nor winter ranges appear to have changed (Loather et al. 1999). It is one of two widespread species in the Wood-warbler family exhibiting vast geographic variation, each species containing 10 or more sub-species occurring north of Mexico. Browning (1994) recognized 43 subspecies of the yellow warbler; two of these are known to occur in Washington. One of them, Dendroica petechia brewsteri, is found in western Washington (Sibley 2000).

Little is known about the size of the breeding population in Washington State. Yellow warblers are most abundant in riparian areas in the lowlands of eastern Washington, but also occur in west side riparian zones and the lowlands of the western Olympic Peninsula. Where high rainfall limits hardwood riparian habitat, they are less common (Sharpe 1993). Locally common where riparian and wet, deciduous habitat exists, the yellow warbler can be found in the riparian areas along the Columbia River, and most riverine systems.

Core zones of distribution in Washington are the forested zones below the sub alpine fir and mountain hemlock zones, plus steppe zones other than the central arid steppe and canyon grassland zones, which are peripheral. There are no Breeding Bird Atlas records at the probable or confirmed level from sub alpine habitats in the Cascades, but Sharpe (1993) reports them nesting at 4000 feet in the Olympics. Numbers decline in the center of the Columbia Basin, but this species can be found commonly along most rivers and creeks at the margins of the Basin. A local breeding population exists in the Potholes area (Sauer et al. 2003). See Figure 22-1 for Washington breeding distribution of yellow warbler from 1987-1995.

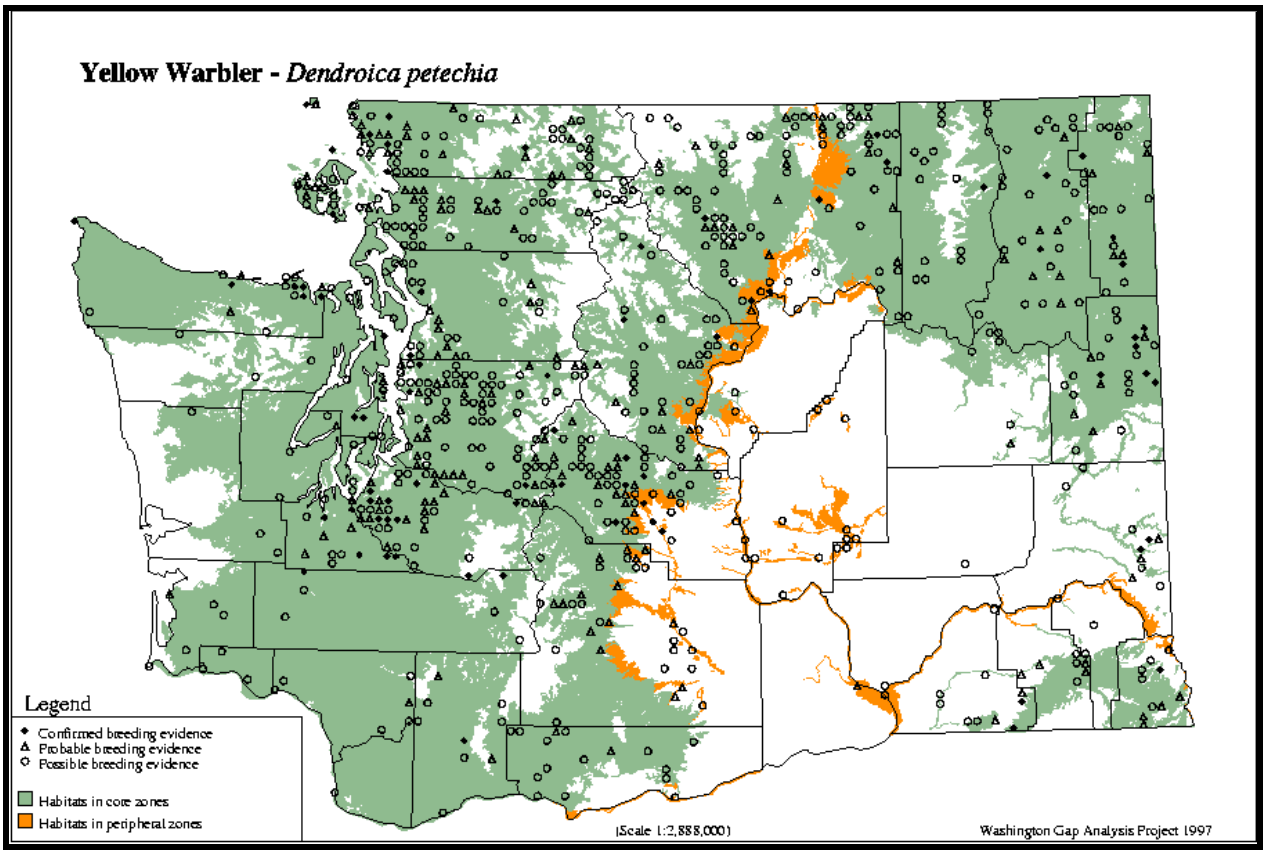

Figure 22-1. Breeding bird atlas data (1987–95) and species distribution for yellow warbler.

22.4 Status and Abundance Trends

22.4.1 Status

The yellow warbler is one of the more common warblers in North America (Loather et al. 1999). Yellow warbler populations are protected throughout their breeding range by the: Migratory Bird Treaty Act (1918) in the US, the Migratory Bird Convention Act (1916) in Canada, and the Convention for the Protection of Migratory Birds and Game Mammals (1936) in Mexico.

Information from Breeding Bird Surveys indicates that the overall populations are declining (Petit et al. 1993; Saurer et al. 2003). Some subspecies, particularly in southwestern North America, have been heavily impacted by degradation or destruction of riparian habitats (Loather et al. 1999). Unanswered questions regarding habitat requirements and population constraints need to be addressed in order to provide adequate management recommendations and appropriate conservation measures, aimed at stabilizing and reversing population declines.

22.4.2 Trends

Washington populations appear relatively stable from 1980 up to present, but show a significant decline of 6.9% in the population from 1968 to 1979 (Saurer et al. 2003). Because the Breeding Bird Survey dates back only about 30 years, population declines in Washington resulting from habitat loss dating prior to the survey would not be accounted for by that effort. Data results of Washinton population trends presented below in Figure 22-2 are highly significant (p<0.1).

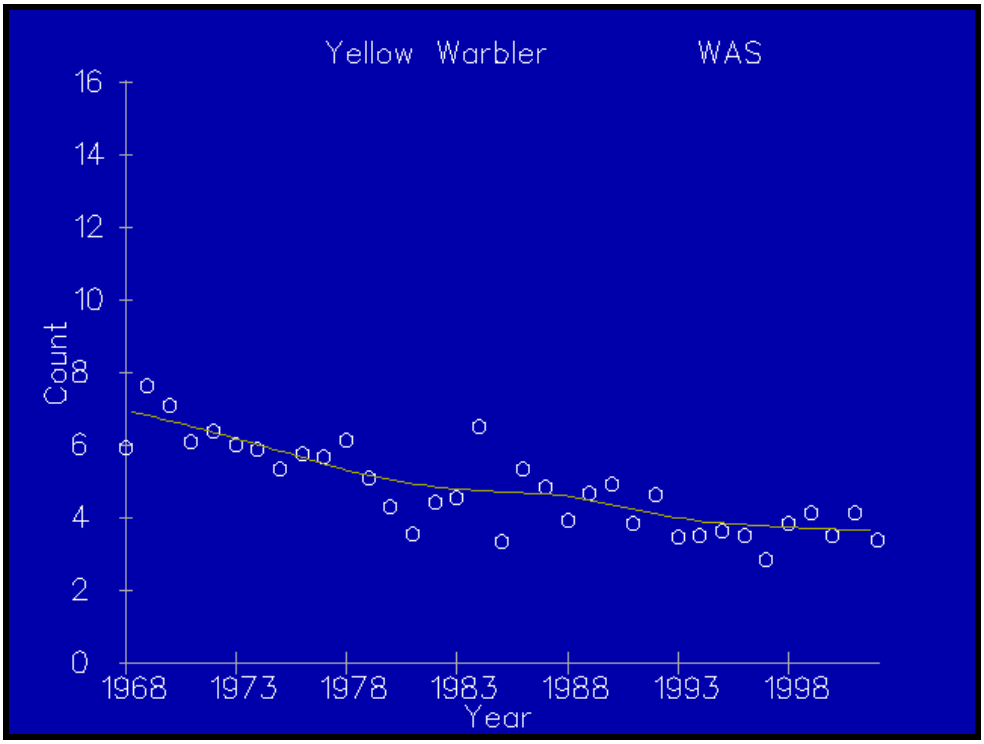

Figure 22-2. Breeding Bird Survey data for Washington State show a significant population decline of 2.9% per year (p < .1) from 1966–91 (Peterjohn 1995).

22.4.2.1 Productivity

Little has been published on annual survival rates. Roberts (1971) estimated annual survival rates of adults at 0.526 ±0.077 SE, although Lowther et al. (1999) felt this value underestimated survival because it did not account for dispersal. Results of research on breeding activities indicate variable rates of hatching and fledging. Two studies cited by Lowther et al. (1999) had hatching rates of 56% and 67%. Of the eggs that hatched, 62% and 81% fledged; this represented 35% and 54%, respectively, of all eggs laid. Two other studies found that 42% and 72% of nests fledged at least one young (Lowther et al. 1999); the latter study was from British Columbia (Campbell et al. in press). This data shows that site variability is common, local conditions often affecting or contributing to productivity and survivorship. The oldest yellow warbler on record lived to be nearly 9 years old (Klimkiewicz et al. 1983).

22.5 Environmental Conditions

22.5.1 Habitat Distribution

The yellow warbler breeds across much of the North American continent, from Alaska to Newfoundland, south to western South Carolina and northern Georgia, and west through parts of the southwest to the Pacific coast (AOU 1998). Browning (1994) recognized 43 subspecies; two of these occur in Washington, and one of them, *D.p. brewsteri*, is found in western Washington. This species is a long-distance migrant and has a winter range extending from western Mexico south to the Amazon lowlands in Brazil (AOU 1998). Neither the breeding nor winter ranges appear to have changed (Lowther *et al.* 1999).

Breeding yellow warblers are closely associated with riparian hardwood trees, specifically willows, alders, or cottonwood. They are most abundant in riparian areas in the lowlands of eastern Washington, but also occur in west-side riparian zones, in the lowlands of the western Olympic Peninsula, where high rainfall limits hardwood riparian habitat. Yellow warblers are less common (Sharpe 1992). There are no BBA records at the probable or confirmed level from subalpine habitats in the Cascades, but Sharpe (1993) reports them nesting at 4000 feet in the Olympics. Numbers decline in the center of the Columbia Basin, but this species can be found commonly along most rivers and creeks at the margins of the Basin. A local breeding population exists in the Potholes area.

22.5.2 Habitat Status

The status of historic habitat conditions is largely unknown. However, the Northwest Habitat Institute (2001) mapped historic riparian/wetland habitat in the Lower Columbia subbasin and the current riparian/wetland habitat in the lower Columbia subbasin, see Figure 15-22-3 and Figure 22-4 on following pages. It is difficult to determine if these are accurate representations. The numbers available from the Northwest Habitat Institute (2001) indicate that no riparian habitat loss has occurred in the Columbia River subbasin since 1850. The number of acres of west-side riparian wetlands in the Columbia River subbasin and Columbia River Estuary represented in Figure 15-22-3 and Figure 22-4.

Columbia Estuary: 1850 (14,186 acres)	Lower Columbia River: 1850 (12,982 acres)
1999 (20,064 acres)	1999 (16,086 acres)

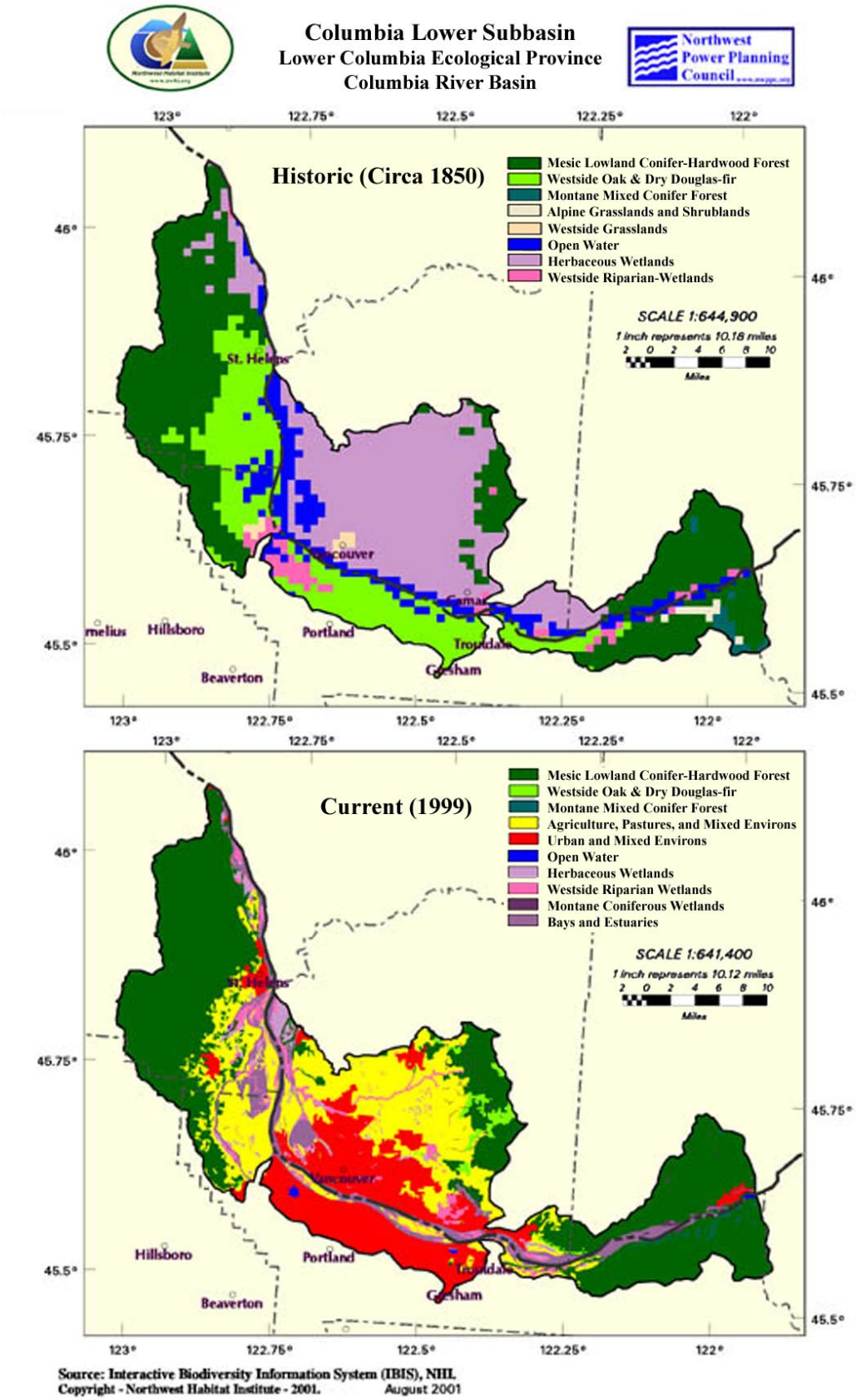

Figure 15-22-3. Historical (circa 1850) and current (1999) wildlife habitat types in the Columbia Lower Subbasin (IBIS 2003).

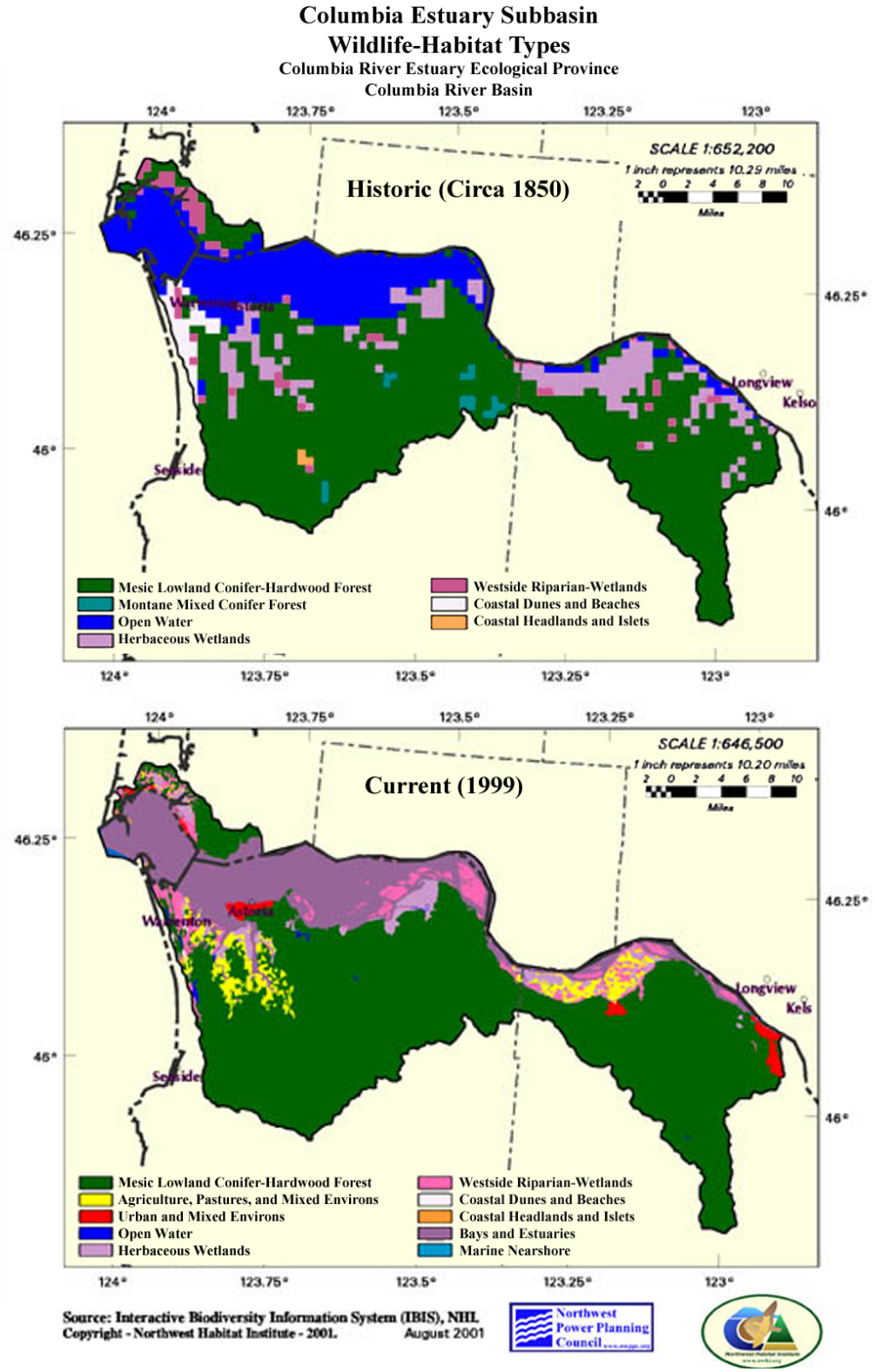

Figure 22-4. Historical (circa 1850) and current (1999) wildlife habitat types in the Columbia Estuary Subbasin (IBIS 2003).

In interpreting this data, it should be noted that west-side riparian habitats are represented on a large, ecological landacape level, but on a local level, the relevance of the plant communities making up these riparian areas cannot be ignored. Even if there is currently more west-side riparian acrerage, the historic riparian vegetation most likely contained much more native vegetation, and thus, were probably more functional on a local, and landscape level.

A study on neotropical songbird use of native and non-native riparian areas in the mid-Columbia River Basin during fall migration confirmed species richness and abundance was significantly greater in areas dominated by native shrub vegetation. The riparian sites consisted of similar vegetation features aside from the dominant shrub layer, which was either a native willow species (*Salix spp.),* or the non-native Russian Olive (*Elaegnus angustifolia*). In addition to greater neotropical songbird abundance and species richness, riparian areas with dominant native shrub (willow spp.) vegetation also had greater invertebrate abundance. Non-native, Russian Olive dominated riparian areas, had greater abundance of resident or "non-migratory" songbirds; no significant difference was found in species richness of invertebrates, although non-native sites primarily contained demapterans (earwigs), while native sites contained mostly homopterans (aphids and hoppers) (Hudson *et al*. 1999). These results demonstrate the importance of natively vegetated riparian areas, and how plant species on a local level, can change the functions, and thus species use of that habitat; indicating the importance of conserving riparian areas dominated by native vegetation, and the importance in restoring non-native dominant riparian areas.

22.6 Factors Affecting Population Status

22.6.1 Key Factors Inhibiting Populations and Ecological Processes

22.6.1.1 Habitat loss

Neotropical migrants tend to be more vulnerable to habitat loss and fragmentation than resident birds, or those that migrate only short distances within North America. Habitat loss due to hydrological diversions and control of natural flooding regimes (e.g., dams) has resulted in an overall reduction and /or conversion of riparian habitat for yellow warblers. Habitat losses are also caused by inundation from impoundments, cutting and spraying for ease of access to watercourses, gravel mining, forest management, etc. The status of historic habitat conditions is largely unknown.

22.6.1.2 Habitat degradation

Habitat degradation from loss of vertical stratification in riparian vegetation can be caused from: lack of recruitment of young cottonwoods, ash, willows, and other sub-canopy species; stream bank stabilization (e.g., riprap) which narrows stream channel, reduces the flood zone, and reduces extent of riparian vegetation; invasion of exotic species such as reed canary grass and blackberry; overgrazing which can reduce under story cover; and reductions in riparian corridor widths which may decrease suitability of the habitat and may increase encroachment of nest predators and nest parasites to the interior of the stand (Marzluff 2001; Hutto 1998; Sibley 2001).

Certain cycles/timing periods in a songbird life are more critical than others, and the habitat uses during that time, also rank in importance. Migratory habitat is critical in fulfilling the feeding and energy renewals of migrating birds. It is thought these brief stops for feeding and energy renewal are critical, can affect population trends, and are important in conservation

efforts (Hutto 1998). Amongst the age classes, immature birds seem to suffer the most from degradation or loss of migration habitats (stopover areas). This is because the juveniles migrate south after the adults, and have less experience at foraging for food, selecting habitat, competing against adults, and dealing with predators. These migration habitats are essential to birds for fat accumulation, in order to make flights of long distances without stopping (Yong et al. 1998). Without sufficient fat stores energy depletion and/or exhaustion can cause mortality during long flights or inhospitable habitats. The common observation of grounded birds far at sea reflects these phenomena and may become more common as humans further impinge on the habitats where migrants obtain these energy stores (Sibley 2001;Yong *et al*. 1998).

22.6.1.3 Human Disturbance

Hostile landscapes, particularly those close to agricultural and residential areas, may have high density of nest parasites, such as Brown-headed Cowbirds and domestic predators (cats), and can be subject to high levels of human disturbance. Recreational disturbances, particularly during nesting season and especially in high-use recreation areas, may have an impact on yellow warblers (Marzluff 2001).

22.6.1.4 Nest Depredation and and Brood Parasitsm

Nest parasitism from Brown-headed Cowbirds is increasingly becoming an issue in songbird populations. Fragmentation of habitats, resulting in reduced patch size and increased edge, is correlated with higher cowbird brood parasitism (Marzluff 2001). In temperate North America the yellow warbler is one of the principal victims of the cowbird. A cowbird lays only one egg per foster nest, but she may lay eggs in four or five nests in a short time, thus jeopardizing many broods. If the female yellow warbler discovers a cowbird egg in her nest, she usually covers the alien egg with a new foundation and lays another clutch. Occasionally a nest is found with up to six layers, each containing one cowbird egg. This parasitism may compromise productivity especially in areas where habitat modification (forest fragmentation) creates openings close to the riparian zone (Sibley 2001; Burton 1995; Marzluff 2001).

22.6.1.5 Pesticides and Herbicides

Increased use of pesticide and herbicides associated with agricultural and forestry practices may reduce insect food base. Washington State Forestry rules (Forest and Fish) allow spraying of herbicides during important timing periods, like fall migration, when abundant food sources are necessary to gather adequate fat stores (Sibley 2001; Alltman 2001).

22.7 Inventory and Assessment of Existing Management Plans

Westside Lowlands and Valleys Bird Conservation Plan (Partners in Flight 2001) is the only existing comprehensive plan for management of habitats for neotropical migrant birds in Washington and Oregon. It establishes biological objectives for the species in the lowlands of western Oregon and western Washington. These include providing habitats that meet the following definition: >70% cover in shrub layer (<3 m) and sub canopy layer (>3 m and below the canopy foliage) with sub canopy layer contributing >40% of the total; shrub layer cover 30-60% (includes shrubs and small saplings); and a shrub layer height >2 m. At the landscape level, the biological objectives for habitat included high degree of deciduous riparian heterogeneity within or among wetland, shrub, and woodland patches; and a low percentage of agricultural land use (Altman 2001). It is very detailed, and if followed, would go a long way towards preserving and enhancing the critical habitats needed for the protection of the yellow warbler in

Washington. Currently, no active restoration is taking place towards conserving neotropical migrants in the Lower Columbia River.

22.8 Conservation Implications

Conserving viable populations of migratory species and their associated habitats may seem impossible when we consider that only 7% to 8% of available lands in the United States have been set aside as nature preserves, wilderness, refuges, sanctuaries, and parks. It is apparent that the reversal of these declines will also depend on the management, conservation, or enhancement of the other 92-93% of the land in the United States. This land consists of privately owned, or is managed for multiple uses by states, counties, cities, or federal natural resource agencies such as U.S. Forest Service and Bureau of Land Management (Finch and Stangel 1993). Private, state, and federal land owners are realizing the necessity for multiple- land use management, and that, managing for single resources, such as wood products, livestock, minerals, or single species, such as game species, endangered species, and charismatic species, is costly, time-consuming, and potentially in conflict with sustaining other resources and species (Finch and Stangel 1993). Identifying critical habitat, inventorying habitat remaining, and monitoring habitat changes, both locally and at a landscape level, will become crucial to the future management and protection of fish and wildlife, including but not limited to ESA salmon, game birds/mammals, and non-game species, like neotropical songbirds.

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