Appendix B, Chapter 23
Red-eyed Vireo

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23.0 Red-eyed Vireo (*Vireo olivaceus*)

23.1 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 red-eyed vireo (*Vireo olivaceus*) is strongly associated with riparian and wet, deciduous habitats throughout its North American range. It is positively associated with forested habitats in riparian areas, making it a good species index of this habitat (Altman 2001; Sauer *et al*. 2003).

23.2 Life History & Habitat Requirements

23.2.1 Life History

23.2.1.1 Diet

Vireos are primarily insectivorous, with 85% of their diet composed of insects and only 15% of vegetable material. During fall migration, generally August to October, they eat mostly fruits and berries, eating fruit exclusively on wintering grounds. A third of its total food is composed of caterpillars and moths, mainly the former. Beetles, hymenoptera bugs and flies rank next to Lepidopteron in importance as food items for the Red-eyed Vireo (Bent 1965; 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).

23.2.1.2 Reproduction

The red-eyed vireo has been one of the most abundant neotropical birds in North America. The red-eyed vireos breeding range extends from British Columbia to Nova Scotia, north through parts of the Northwest Territories, and throughout most of the lower United States. Its numbers seem to have declined recently, possibly as a result of the destruction of wintering habitat, loss and fragmentation of northern breeding grounds, and loss of critical habitat along migratory routes. Its principal habitat, broad-leaved forests, often supports one breeding pair per acre.

23.2.1.3 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). Red-eyed vireos 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).

Courtship begins in May, with the peak of egg laying in the first half of June. The nest is a thin-walled pendant cup of bark strips and plant fibers, decorated with lichen and attached to a forked twig, usually containing 3 or 4 white eggs, sparsely marked with dark brown. The incubation period is 12-14 days. Usually the nest is built from 5-35 feet above the ground, although nests as low as 2 feet and as high as 60 are reported (Bent 1965; Ehrlich et al. 1988). The sexes share in incubation and both develop brood patches (Pyle 1997; Sibley 2001). Occasionally a pair may raise two broods in a season, but this unusual (Pyle 1997; Bent 1965).

The red-eyed vireo typically lays 3 to 4 eggs, but is often parasitized by the Brown-headed Cowbird. red-eyed vireos haven't developed effective responses to nest parasitism by the Brown-headed Cowbird. They are considered an "acceptor species" as they rarely recognize the cowbird egg as an intruder (Pyle 1997, Sibley 2001). The host bird incubates and cares for the young interlopers, commonly to the detriment of its own young. Often the young cowbird will push the young of the host out of the nest causing failure of the host's nesting. This parasitism may compromise productivity, especially in areas where habitat modification creates openings close to the riparian zone (Sibley 2001).

23.2.1.4 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, powered migrants 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).

The red-eyed vireo is known in Central America as a transient, journeying between its breeding range in North America and its winter home in South America. September is the month when these vireos pass southward through the Isthmus of Panama in the greatest numbers, but stragglers have been recorded in Costa Rica as late as October 28, and November 10 (Bent 1965; Pyle 1997; Sibley 2001), and are regularly documented into late November, along the Caribbean Coast of Costa Rica (Renan 1995; Ralph et al.1999). The northward migratory passage to breeding grounds begins in late March and peaks in April. An occasional straggler or small flock may be seen in early May passing through Central America (Bent 1965).

23.2.2 Habitat Requirements

The habitat requirements of neotropical bird 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. 1993). Initial findings define the Washington breeding population of red-eyed vireos preferred habitat as: “tall, some what extensive, closed canopy forests of cottonwood, maple, or alder; deciduous trees (cottonwood, alder, maple, and ash; optimum cottonwood gallery forest) >15 m., high mean canopy closure (>60%), deciduous shrubby or young trees in understory (>10% cover). red-eyed vireo forages in understory more than Warbling Vireo; forest stand sizes should be larger than 50 acres (20 hectares) in size, and riparian corridor widths should be >50 m. (164 feet) in width, as they are more common in stand interiors, yet will tolerate some tree removal and canopy opening (Bushman and Therres 1988).

The Washington red-eyed vireo populations are likely dependant on riparian areas for necessary food requirements, but use the cottonwood stands or other broadleaf trees for nesting and singing. A tall tree perch allows a singing male to take advantage of the height, enabling their vocalizations to carry further in hopes of attracting a mate. They also sing to claim and define territories from other breeding males in the area (Sibley 2001).

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: mean canopy tree height >50 ft (15 m), mean canopy closure >60%, young (recruitment) sapling trees >10% cover in the understory, riparian woodland >164 ft (50 m) wide (Altman 2001). Red-eyed vireos are closely associated with riparian woodlands and black cottonwood (*Populus trichocarpa*) stands and may use mixed deciduous stands (Altman 2001).

23.3 Population & Distribution

23.3.1 Population

The North American breeding range of the Red-eyed vireo extends from British Columbia to Nova Scotia, north through parts of the Northwest Territories, and throughout most of the lower United States (Bent 1965). This species is one of the most abundant in the northeastern United States, but is much less common in Washington due to habitat limitations. In Washington they are strongly associated with the tall, somewhat extensive, closed canopy forests of cottonwood, maple, or alder in the Puget Lowlands (C. Chappell pers. comm. 1998).

23.3.2 Distribution

Little is known about the size of the breeding population in Washington. Their patchy distribution correlates with the distribution of large black cottonwood groves, which are usually limited to riparian areas. Their associated habitat is most abundant in northeastern river valleys, especially the Sanpoil, Kettle, Columbia, Colville, and Pend Oreille Rivers (Sauer et al. 2003). Areas of relatively high red-eyed vireo density in Washington are the Skagit River (Whatnot/Skagit Counties), the Fort Lewis area (Pierce County), and major river valleys of the northeastern part of the state.

In Washington they are locally common in riparian growth with cottonwood stands (especially along the Nooksack and Skagit Rivers and at Fort Lewis); along the Columbia River in Clark, Skamania and Klickitat Counties; and in eastern Washington along major rivers. They are more widespread in northeastern Washington and southeastern Washington than elsewhere in the state (Sauer et al. 2003). See Figure 23-1 for Washington breeding distribution of red-eyed vireo from 1987-1995.

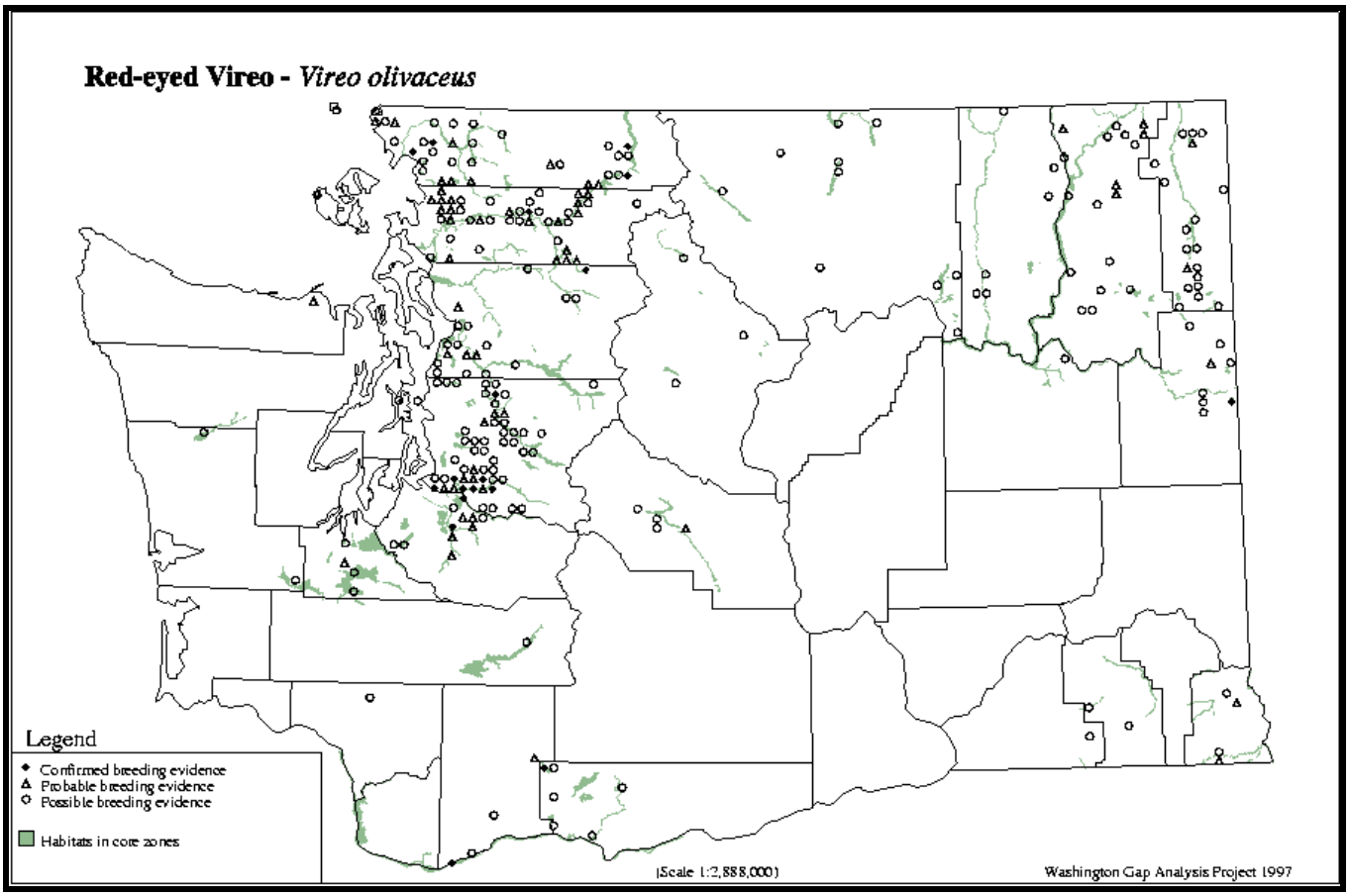

Figure 23-1. Breeding bird atlas data (1987–95) and species distribution for red-eyed vireo.

23.4 Status & Abundance Trends

23.4.1 Status

Red-eyed vireo populations were once considered stable, but have seen localized declines across North America in the last 10 years (Saurer et al. 2003). Red-eyed vireo 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.

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.

23.4.2 Trends

In Washington, Breeding Bird Survey (BBS) data show a long-term decline, this represents an annual population decline in Washington of 2.6%, although the change is not statistically significant, largely because of scanty data (Sauer et al. 2003). Because BBS dates back only about 30 years, population declines in Washington resulting from habitat lost before the surveys began would not be accounted for. The overall abundance trend in North America for this species is both declining and increasing, appearing to be localized and likely tied into habitat changes at breeding areas. Figure 23-2 shows red-eyed vireo North American breeding trends from 1966-2002.

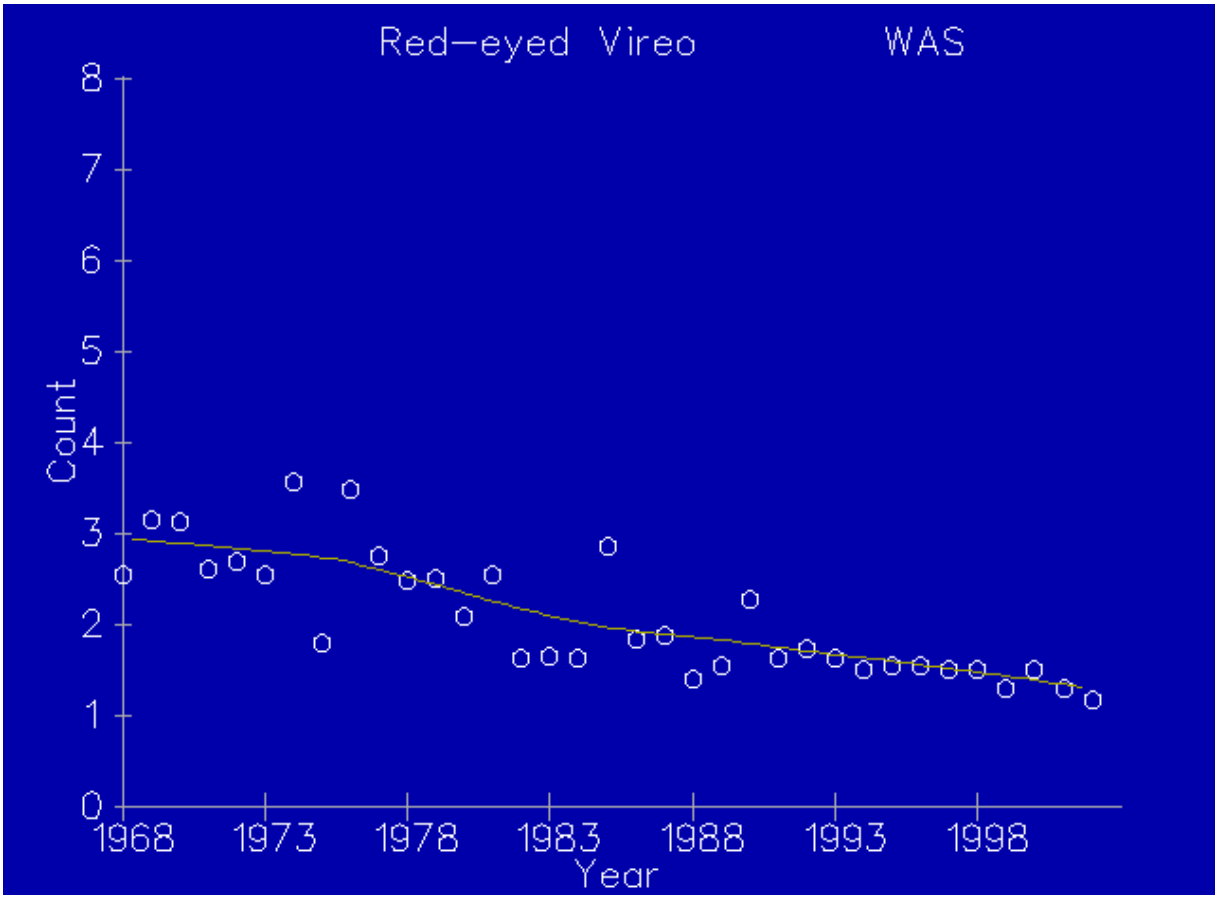

Figure 23-2. Red-eyed vireo North American Breeding Bird Survey trend results (Sauer *et al.* 2003).

23.4.3 Productivity

The red-eyed vireo typically lays 3 to 4 eggs, but it is often parasitized by the brown-headed cowbird. The host bird incubates and cares for the young interlopers, commonly to the detriment of its own young. Often the young cowbird will push the young of the host out of the nest causing failure of the host's nesting. This parasitism may compromise productivity, especially in areas where habitat modification creates openings close to the riparian zone.

Although little data is available on annual survival rate of populations in Washington, the average adult annual survival is 55%-75%, with a mean longevity of 2-4 years from hatching (Sauer et *al*.2003).

23.5 Environmental Conditions

23.5.1 Habitat Distribution

The red-eyed vireo is one of the most abundant species in northeastern United States, but is much less common in Washington due to limited habitat. The patchy distribution in Washington for the red-eyed vireo species correlates with the distribution of large black cottonwood groves, which are usually limited to riparian areas. The species is locally common in riparian growth with cottonwood stands in western Washington (especially along the Nooksack and Skagit Rivers and at Fort Lewis), along the Columbia River in Clark, Skamania, and Klickitat Counties, and in eastern Washington along major rivers. It is more widespread in northeastern Washington and southeastern Washington than elsewhere in the state. Habitat is most abundant in northeastern river valleys, especially the Sanpoil, Kettle, Columbia, Colville, and Pend Oreille Rivers.

23.5.2 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 23-3 and Figure 23-4 on following pages. It is difficult to determine if these are accurate representations. The numbers available from the Northwest Habitat Institute (2003) 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 23-3 and Figure 23-4, respectively 1850 and 1999 are as follows:

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

In interpreting this data, it should be noted that west-side riparian habitats are represented on a large, ecological landscape 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 acreage, 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.

23.6 Factors Affecting Population Status

23.6.1 Key Factors Inhibiting Populations & Ecological Processes

23.6.1.1 Habitat Loss and Degradation

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 red-eyed vireos. 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.

23.6.1.2 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).

23.6.1.3 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 red-eyed vireos (Marzluff 2001).

23.6.1.4 Pesticides/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).

14.6.1.3 Nest Depredation and Brood Parasitism

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). The Brown-headed Cowbird is an obligate nest brood parasite that does not build a nest, but instead lays eggs in the nests of other species. Often the young cowbird will push the young of the host out of the nest, causing failure of the host's nesting (Sibley 2001; Ehrlich et al.1988). Cowbirds have been shown to affect red-eyed vireo productivity at localized breeding areas (Ehrlich et al. 1988), 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).

23.7 Inventory & Assessment of Existing Management and Conservation 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: mean canopy tree height >50 ft (15 m), mean canopy closure >60%, young (recruitment) sapling trees >10% cover in the under story, riparian woodland >164 ft (50 m) wide (Altman 2001). Red-eyed vireos are closely associated with riparian woodlands and black cottonwood (*Populus trichocarpa*) stands and may use mixed deciduous stands. It is very detailed and would go a long way towards preserving and enhancing the critical habitats needed for the protection of the red-eyed vireo in Washington. Currently, no active restoration is taking place towards conserving neotropical migrants in the Lower Columbia River.

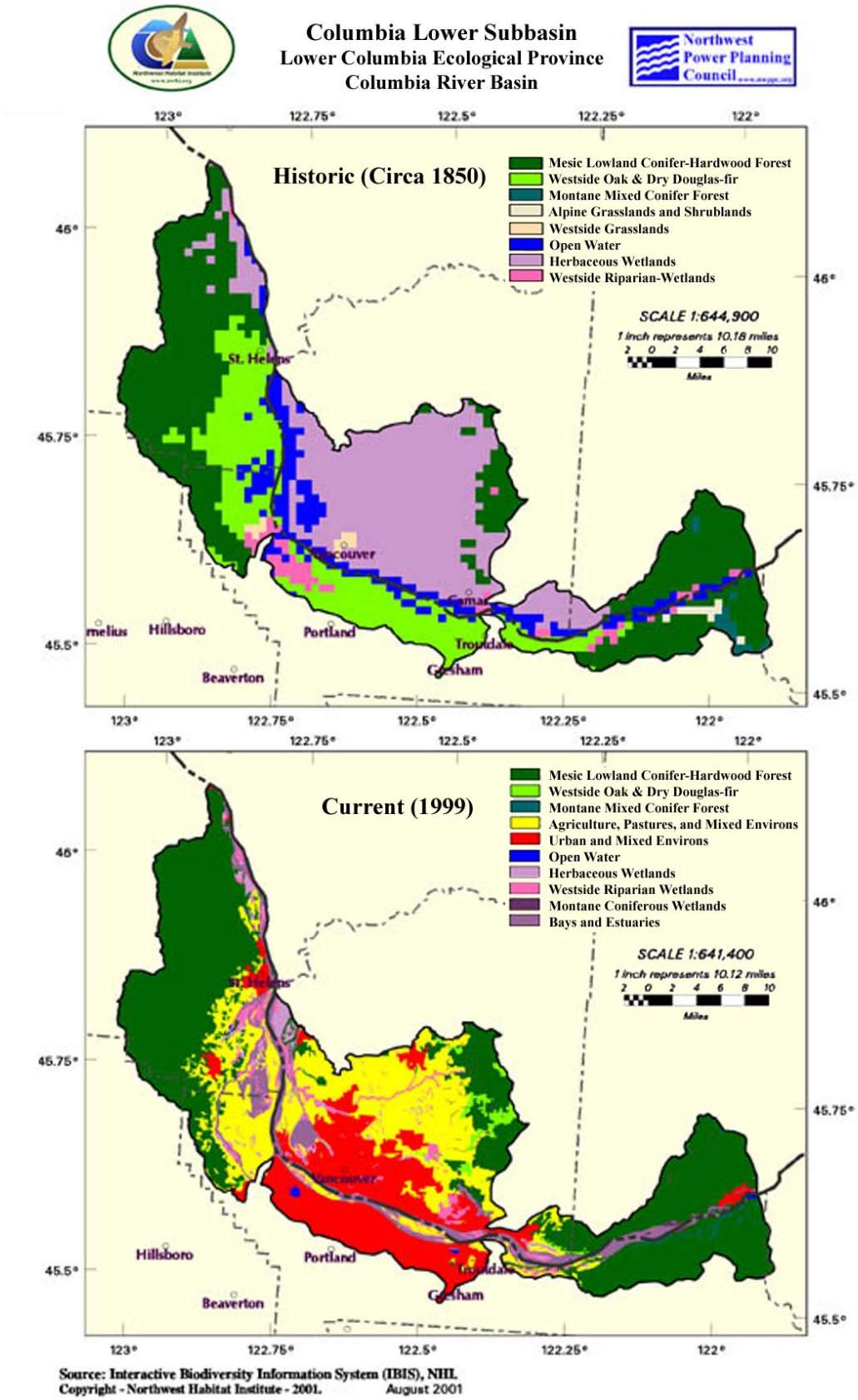

Figure 23-3. Historical (circa 1850) and current (1999) wildlife habitat types in the Columbia Lower Subbasin (IBIS 2003).

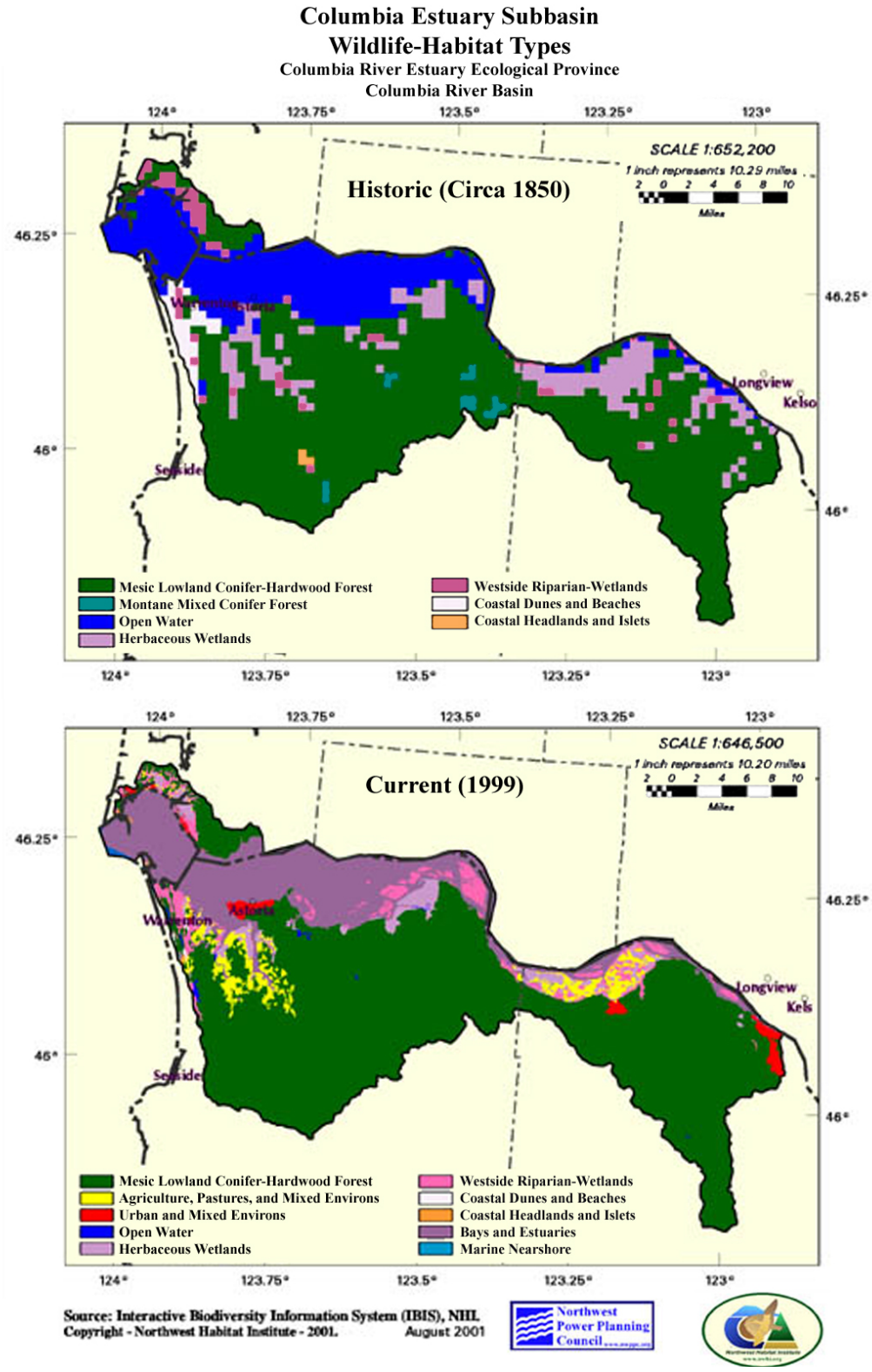

Figure 23-4. Historical (circa 1850) and current (1999) wildlife habitat types in the Columbia Estuary Subbasin (IBIS 2003).

23.8 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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