5.10 Terrestrial Ecology

5.10.1 Introduction

Much of the terrestrial plant and animal life occurring in the vicinity of TVA reservoirs has adjusted to the established dynamic conditions associated with management of the many reservoirs and stream reaches. Changes in reservoir operations would change the seasonal timing and duration of water levels. The following discussion describes potential impacts of such changes on the upland and lowland plant communities, including those that are globally imperiled, and the associated wildlife communities described in Section 4.10.

Changes in the seasonal timing and duration of water levels could affect the species composition of plant and animal communities in the study area by changes to the structure of riparian habitats and the resulting gain or loss of specific community types. Factors such as increased shoreline erosion, residential development, and the spread of invasive species could substantially affect the distribution and quality of terrestrial habitats throughout the water control system.

5.10.2 Impact Assessment Methods

Data on the terrestrial ecology of the study area were gathered from field interviews with subject matter experts, published reports, TVA land use plans, environmental impact studies, and biological data collection centers. These data were used to identify plant and animal communities that could be affected by changes in reservoir operations.

Impacts on the terrestrial ecology of the study area were analyzed by summarizing effects described in various sections within this EIS. Results of analyses for wetlands and aquatic plants were used to identify potential effects on terrestrial resources. Analyses for other resource areas, such as invasive species, shoreline erosion, and land use were also used to identify potential effects on terrestrial plant and animal communities. The effects identified in these chapters were summarized for each alternative. This analysis used a qualitative approach to analyze the effects of each alternative on the terrestrial plant and animal resources in the study area.

Using the Base Case as a reference benchmark, the alternatives were grouped according to their similarities of impact on terrestrial ecology. Although the effects from potential changes in reservoir operations would vary widely, this analysis attempted to capture effects of the greatest magnitude on the resource.

The analysis of impacts in this section pertains only to mainstem storage and tributary storage reservoirs. Run-of-river reservoirs were initially investigated for elevation changes associated with each policy alternative. Because pool elevations for these reservoirs would not change under any of the alternatives, terrestrial ecology would not be affected around these reservoirs.

5.10.3 Base Case

Lowland Plant Communities

Most lowland terrestrial plant communities have adjusted to current operating conditions. Some communities, such as stands of water tupelo (*Nyssa aquatica*) on Guntersville and Wheeler Reservoirs and buttonbush (*Cephalanthus occidentalis*) on Kentucky Reservoir, are notable exceptions. Several stands of these species show signs of stress from prolonged periods of inundation under existing water regimes.

The Base Case would continue to provide lower winter pool elevations than any of the policy alternatives and thus would allow more opportunity for seed germination and establishment of vegetation in scrub/shrub and flats. As described in the SMI EIS, a long-term reduction in native shoreline plant communities would occur.

In areas where currents are sufficiently strong, headwater erosion of islands and toe accretion of deposits would continue under the Base Case, with consequent potential minor losses of bottomland hardwood or upland forest communities and some globally rare wetland communities. Slight increases in flats and scrub/shrub communities are expected under the Base Case.

Upland Plant Communities

Under the Base Case, continued rates of erosion would lead to additional loss of upland habitat adjacent to mainstem and tributary reservoirs (see Section 5.16, Shoreline Erosion). Existing successional patterns in upland communities would continue except where disrupted by shoreline development.

Wildlife Communities

Under the Base Case, most TVA reservoirs would continue to be operated at levels that are favorable to gulls, shorebirds, waterfowl, and other reservoir-dependent wildlife. Species associated with upland and lowland habitats would continue to derive benefits from the river system, and no adverse impacts on terrestrial wildlife are expected. The continuation of existing operations would result in limited effects on waterfowl and other migratory birds, as they have adapted to present conditions.

5.10.4 Commercial Navigation Alternative

The effects of the Commercial Navigation Alternative on lowland and upland terrestrial communities are expected to be similar to those described for the Base Case. Most plant communities would persist with little change. Impacts on vegetation under the Commercial Navigation Alternative would be minor.

Under the Commercial Navigation Alternative, higher winter pools would affect lowland wildlife species primarily through the net reduction of flats and changes in shallow-water habitats. Overall, available flats would be reduced as they are flooded by higher reservoir levels, resulting in a decrease in foraging areas for waterfowl (primarily geese) and roosting areas for gulls and other species. Areas inundated during winter would increase, shifting shallow-water foraging habitat for waterfowl and wading birds to higher elevations.

5.10.5 Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Tailwater Recreation Alternative, and Tailwater Habitat Alternative

Lowland Plant Communities

Under Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, and the Tailwater Habitat Alternative, summer pool levels would be extended to or later than Labor Day, and winter pool levels would be raised by 2 feet. The prolonged periods of inundation under these alternatives would stress species in the bottomland hardwood, scrub/shrub, and flats communities. Over time, large acreages of scrub/shrub community would likely convert to aquatic beds or marshes dominated by wetland emergent species. Species least tolerant to prolonged flooding would be adversely affected within a few years, particularly those in presently stressed bottomland hardwoods and scrub/shrub communities (Hall and Smith 1955).

Annual plant species that make up the flora of flats communities require sufficient exposure to air in order to germinate and grow to reproductive condition (Webb 1988, Gunn 2003). Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, and the Tailwater Habitat Alternative would considerably decrease the areas occupied by annually vegetated flats communities, especially on Kentucky, Barkley, Pickwick, and Douglas Reservoirs.

The composition of globally imperiled communities would change to favor species that are more tolerant of prolonged flooding. The magnitude of the impact cannot be evaluated because the regional extent of various imperiled communities is unknown. Overall, impacts on lowland plant communities are expected to be detrimental in localized areas under Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, and the Tailwater Habitat Alternative.

Upland Plant Communities

Extending summer pool levels and raising winter pool levels would maintain existing groundwater levels adjacent to waterbodies, with minimal short-term and long-term effects on the terrestrial ecology of the region over the next 30 years. Saturation of surface soils would result in a minor loss of upland plant species and replacement by species more tolerant to flooding. Overall, impacts on upland terrestrial communities are expected to be minimal under Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, and the Tailwater Habitat Alternative.

Wildlife Communities

A variety of changes to wetland habitats are possible under Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, and the Tailwater Habitat Alternative (see Sections 5.8.4 and 5.8.5 in Wetlands). Effects on wildlife communities resulting from higher winter pools would be the same as those described for the Commercial Navigation Alternative. Extended summer pools would affect wildlife primarily by extending the period that summer flats and pools, aquatic beds, and wetlands are inundated. Extended pool levels under these alternatives would delay exposure of flats habitats, resulting in adverse impacts on shorebirds and teal as they migrate through the area (see Table 5.10-01). Eventually flats would develop later in fall but might not have adequate exposure time to allow vegetation to become established. This could result in adverse impacts to waterfowl (primarily geese) that forage on these areas in early winter months.

Table 5.10-01 Dates That Shorebird Habitat (Flats) Would Be Exposed during Summer Drawdown by Policy Alternative

Alternative	Reservoir (elevation [feet])				
	Kentucky (356.6)	Pickwick (411.5)	Wheeler (554)	Chickamauga (679)	Douglas (987)
Base Case	08/25	09/10	09/01	10/20	08/10
Reservoir Recreation A	10/07	11/01	10/07	11/05	09/05
Reservoir Recreation B	11/15	11/05	10/20	11/05	09/25
Summer Hydropower	07/25	07/25	07/25	07/25	07/25
Equalized Summer/Winter Flood Risk	09/15	10/15	10/15	10/15	NA
Commercial Navigation	08/25	09/10	09/01	10/20	08/10
Tailwater Recreation	11/25	11/05	10/20	11/05	09/25
Tailwater Habitat	10/05	11/01	10/05	11/05	11/01
Preferred	08/25	10/15	10/05	10/20	08/20

Notes: Dates were derived from the Weekly Scheduling Model for each alternative.

NA = Not applicable; summer pool levels are not projected to reach this elevation during years with normal levels of rainfall.

Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, and the Tailwater Habitat Alternative could result in increases in aquatic vegetation, a food base for some waterfowl and aquatic turtles, on the tributary reservoirs. The increased vegetative biomass is likely to result in an increase in aerial aquatic insects that provide food for wildlife foraging on and adjacent to the river system.

Under Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, and the Tailwater Habitat Alternative, upland and some lowland species of wildlife would continue to derive benefits from the river system. Changes in operations under these alternatives would result in limited effects on semi-aquatic mammals and non-game wildlife, as they would adapt to changing conditions. Due to the anticipated decrease in flats habitats, shorebirds and early fall migrant waterfowl would be adversely affected during fall migration periods under these alternatives.

5.10.6 Summer Hydropower Alternative

Lowland Plant Communities

The Summer Hydropower Alternative has the potential to greatly expand or shrink the extent of the flats community, depending on how reservoirs are managed. Prolonged exposure and resultant drying of flats would reduce their extent, while slow drawdown at the appropriate time would allow extensive germination of seeds and establishment of associated plant communities. The Summer Hydropower Alternative could greatly reduce the extent of the scrub/shrub community (because of the severely reduced period of summer pool levels) and could initiate widespread changes in the composition of species found in bottomland hardwood forests.

Under the Summer Hydropower Alternative, delaying summer pool levels and shortening the duration of summer pool levels would allow upland species to displace existing bottomland hardwoods—resulting in adverse impacts on this community type. Impacts on scrub/shrub communities would be similar, although the shortened duration of summer pool levels might allow expansion of this community into new locations over the long term. The shortened duration of summer pool levels would result in loss of water from some globally imperiled plant communities listed in Table 4.10-01 (those with species more tolerant to flooding), triggering consequent changes in species composition and loss of community character.

Upland Plant Communities

The short duration of summer pool levels under the Summer Hydropower Alternative would not promote development of adjacent wetlands. Therefore, impacts on upland terrestrial communities are expected to be minimal under this alternative.

Wildlife Communities

Effects on terrestrial ecology resulting from higher winter pool levels under the Summer Hydropower Alternative are the same as those described for the Commercial Navigation

Alternative. Effects on wildlife under the Summer Hydropower Alternative would vary by reservoir. Shorter summer pool levels would affect wildlife primarily through changes in the availability of flats, aquatic beds, and wetlands. Early migrant shorebirds could benefit from the increase in the amount of exposed flats; however, flats may dry before shorebirds arrive, allowing vegetation to become established on these areas. While this could be detrimental to shorebirds, wintering waterfowl could benefit as these vegetated flats become flooded in winter. Decreases in aquatic beds may result in a reduction of food available to waterfowl and other species that feed in or adjacent to the river system. Overall, the Summer Hydropower Alternative would result in a negative change in wetland community types due to the loss of habitat for the variety of lowland, non-game animals that rely on these communities—including numerous Neotropical songbirds and semi-aquatic mammals.

Because of the instability of reservoir levels and the projected negative changes in wetland communities, the Summer Hydropower Alternative would also result in localized adverse impacts on wildlife that depend on lowland communities.

5.10.7 Equalized Summer/Winter Flood Risk Alternative

Lowland Plant Communities

Under the Equalized Summer/Winter Flood Risk Alternative, higher winter pool levels and lower summer pool levels may stress bottomland hardwood species (which are least tolerant of flooding from winter water levels). Some new species may move into bottomland hardwood forests under the Equalized Summer/Winter Flood Risk Alternative. The same rationale applies to imperiled communities. The management regime would likely eliminate some existing scrub/shrub communities but might allow for its reestablishment in different places. Development of nonpersistent vegetation on flats is likely to be severely restricted or eliminated as lower summer pool levels and higher winter pool levels would narrow the drawdown zone where this vegetation currently exists. Overall, selection of the Equalized Summer/Winter Flood Risk Alternative would result in adverse impacts on lowland plant communities, especially flats communities on tributary reservoirs.

Upland Plant Communities

The Equalized Summer/Winter Flood Risk Alternative is not expected to result in impacts on upland plant communities, because this alternative would not promote development of adjacent wetlands.

Wildlife Communities

Under the Equalized Summer/Winter Flood Risk Alternative, terrestrial ecology effects resulting from higher winter pool levels would be similar to those described for the Commercial Navigation Alternative. Lower summer pool levels would affect wildlife primarily through changes in wetlands and the ability to flood crops in dewatering units. Adequate water may not be available in the emergent and scrub/shrub wetland habitats to provide foraging and cover for

waterfowl, such as wood ducks. Resident geese are very adaptable and would probably eventually start nesting in the drawdown zone. The persistence of aquatic beds would benefit the species that depend on these habitats. Raising summer pool levels later could alleviate spring crop flooding on mainstem waterfowl impoundments (see Section 4.14 [Managed Areas and Ecologically Significant Sites]).

Under the Equalized Summer/Winter Flood Risk Alternative, upland and lowland species of wildlife would continue to derive benefits from the river system. Changes in operations would result in limited effects on waterfowl, semi-aquatic mammals, and non-game wildlife, as they would adapt to changing conditions. The projected negative effects on flats habitat could adversely affect shorebirds during fall migration periods.

5.10.8 Preferred Alternative

Lowland Plant Communities

Under the Preferred Alternative, summer pool levels could be extended to Labor Day on 10 tributary and five mainstem reservoirs. The impacts on the lowland plant communities would be similar to those described for Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, and the Tailwater Habitat Alternatives—but to a lesser degree (see Table 5.10-01). Impacts on the lowland communities on Kentucky and Barkley Reservoirs would be similar to those under the Base Case; operations on these reservoirs would not be modified under the Preferred Alternative.

Upland Plant Communities

Impacts on the upland plant communities are expected to be similar to those described for Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, and the Tailwater Habitat Alternative. Impacts on these resources are expected to be minimal under the Preferred Alternative.

Wildlife Communities

Raising winter pool levels on Wheeler and tributary reservoirs would result in effects similar to those described for the Commercial Navigation Alternative; however, impacts are expected to be of lesser magnitude. Extending summer pool levels on selected mainstem and tributary reservoirs under the Preferred Alternative would result in effects on terrestrial wildlife similar to those described for Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, and the Tailwater Habitat Alternative. The delayed exposure of flats on Wheeler, Pickwick and, to a lesser extent, Douglas during late summer would adversely affect waterfowl and shorebirds (see Table 5.10-01). Under the Preferred Alternative, these resources would not be affected on Kentucky and Barkley Reservoirs because these reservoirs would continue to be operated as they are under the Base Case. System-wide adverse changes to bottomland hardwood forests, scrub/shrub wetlands, and flats communities

(see Section 5.8, Wetlands) would result in changes in the distribution, abundance, and diversity of wildlife species that use these areas.

5.10.9 Summary of Impacts

The Base Case would result in fewer impacts on plant and wildlife resources than any of the action alternatives. Each policy alternative is expected to result in shifts in community types that will benefit some plant and animal species and adversely affect others. Table 5.10-02 identifies the impacts expected under each policy alternative on the issues of concern related to terrestrial ecology. Alternatives that would result in loss or change in species composition of wetland habitat types or communities would also result in the greatest potential impacts.

Except for the Summer Hydropower Alternative, changes in operations under all remaining policy alternatives would result in limited effects on semi-aquatic mammals and many non-game wildlife species, as they would adapt to changing conditions. Under several of the policy alternatives, shorebirds and waterfowl potentially would be adversely affected during fall migration periods, due to the decrease in the availability of flats along the reservoirs. Likewise, these same alternatives are expected to result in a loss of bottomland hardwood, flats, and scrub/shrub communities and changes in the composition of species in imperiled plant communities. Such changes in wetland communities are likely to result in shifts in species and numbers of local waterfowl.

Compared to the other policy alternatives, the Preferred Alternative and the Commercial Navigation Alternative are expected to result in a lower level of impacts on plant and animal populations; however, these impacts would be greater than those under the Base Case. Due to the instability of reservoir levels and the projected negative changes in wetland communities, the Summer Hydropower Alternative would result in the greatest impacts on the terrestrial ecology of the region.

Table 5.10-02 Summary of Impacts on Terrestrial Ecology by Policy Alternative

Alternative	Description of Impacts
Base Case	No change – Wildlife population trends would continue to mirror national trends; some bottomland hardwood communities would continue to be stressed.
Reservoir Recreation A	Adverse – Aquatic beds would persist longer, benefiting a wide variety of wildlife. Reduction of flats during late summer would affect migrating shorebirds and waterfowl. Some bottomland hardwood and scrub/shrub communities would be lost; and the composition of species in imperiled plant communities would change.
Reservoir Recreation B	Adverse – Aquatic beds would persist longer, benefiting a wide variety of wildlife. Reduction of flats during late summer would affect migrating shorebirds and some waterfowl. Some bottomland hardwood and scrub/shrub communities would be lost; and the composition of species in imperiled plant communities would change.
Summer Hydropower	Substantially adverse – Wetland habitats would be more adversely affected than under other alternatives. Reduction of flats and aquatic beds would adversely affect many dependent species of wildlife. Distribution and extent of scrub/shrub, bottomland hardwood, and imperiled plant communities potentially could be altered.
Equalized Summer/Winter Flood Risk	Adverse – Aquatic beds would persist longer, benefiting a wide variety of wildlife. Reduction of flats during late summer would affect migrating shorebirds and some waterfowl. Loss of scrub/shrub communities and changes in bottomland hardwood and imperiled plant communities would result.
Commercial Navigation	Slightly adverse – Minor benefits to some wetland types and associated wildlife. Decrease in flats on mainstem reservoirs would affect migrating shorebirds and some waterfowl; some bottomland hardwood communities would continue to be stressed.
Tailwater Recreation	Adverse – Aquatic beds would persist longer, benefiting a wide variety of wildlife. Reduction of flats during late summer would affect migrating shorebirds and some waterfowl. Loss of bottomland hardwood and scrub/shrub communities and species shifts in imperiled plant communities would occur.
Tailwater Habitat	Adverse – Aquatic beds would persist longer, benefiting a wide variety of wildlife. Reduction of flats during late summer would affect migrating shorebirds and some waterfowl. Loss of some bottomland hardwood and scrub/shrub communities and species shifts in imperiled plant communities would result.
Preferred	Slightly adverse – Aquatic beds would persist longer, benefiting a wide variety of wildlife. Reduction of flats during late summer would adversely affect migrating shorebirds and some waterfowl on select mainstem and tributary reservoirs. Loss of some bottomland hardwood and scrub/shrub communities and species shifts in imperiled plant communities would result.

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