Appendix A: Bottomland Restoration

Corridor "bottomlands" consist of creek and river riparian zones, wetlands, and floodplains—unique areas which form transitional zones between land and water. They have historically featured dense hardwood forests and deep alluvial soils, home for plants and animals of both terrestrial and aquatic ecosystems. From the perspective of watershed function, riparian areas are the most important part since they are the buffer between the uplands and the stream channel. In proper functioning condition, these areas provide the following irreplaceable ecosystem services:

- **Hydrological services**: water storage in the riparian "sponge" of plant roots and soil; water quality improvement as water is filtered through the riparian soils and vegetation; flood attenuation as the riparian area slows, filters, and absorbs flood waters; flow stabilization as the riparian area releases water to maintain baseflow of the river or absorbs water when the river flows are high; and groundwater recharge and discharge as the riparian area contributes to the alluvial aquifer along the Colorado River.
- **Biological services**: breeding habitat for Texas aquatic and terrestrial organisms; shading over the river and streams to reduce water temperature and provide enhanced habitat for aquatic life like fish and amphibians; wildlife corridors for linking Texas bioregions; and critical migratory habitat for North American birds and butterflies.
- **Geological services**: erosion control along the river channel as riparian vegetation "armors" the river banks against erosion, protecting both the river and our coastal bays and estuaries against sediment.

Most bottomlands have been extensively modified and their dense tree canopy largely removed compared with their original, historic condition. A soils map of the Corridorhelps to delineate the potential extent of the riparian forest that once covered the bottomlands. The soils of the alluvial plain trace the boundaries of the lost riparian forest. Today, along most of the river, only a thin strip of riparian vegetation remains, as shown in the NRCS Soils Unit and Tree Canopy map. The direct and visually obvious correlation in the physical location of alluvial deposits, wetlands, springs, waterfowl habitat, creek erosion hazard areas, and so forth in the 100-year floodplain indicates a need to manage, preserve and protect the land from over development in these areas.

Restoration opportunities for these bottomlands are many and would serve numerous positive community benefits, including recreation and tourism, increased property values, and significant improvement in the diminished ecological services listed above. Floodplain reclamation and modification standards need to be considered [proposed?] for the Corridor that retain and restore the integrity of in stream channel stability, protect riparian areas, and minimize long-term modification of the physical and biological characteristics of such areas.

The majority of restoration work will logically be on the mining properties once mining activity is completed. These landscapes are substantially altered from their original condition, with changes to topography (lakes and pits), soils (original topsoils removed), and vegetation (usually no vegetation remaining). Restoration would require that all three of these factors be addressed. The City of Austin's Pollutant Attenuation Plan (PAP) rules in its Environmental Criteria Manual (ECM section 1.3.4) provide this type of guidance. Additional measures could also be considered. Key considerations include:

- **Backfill Material Type**. TCEQ requires that all backfill placed in pits be inert (30 TAC 330.2 (61)) and essentially insoluble (30 TAC 335.521 (d)) to avoid contamination of the underlying groundwater. Hazardous materials must not be permitted as they are not only toxic but pose special risks due to bottomland properties being located near or below the water table.

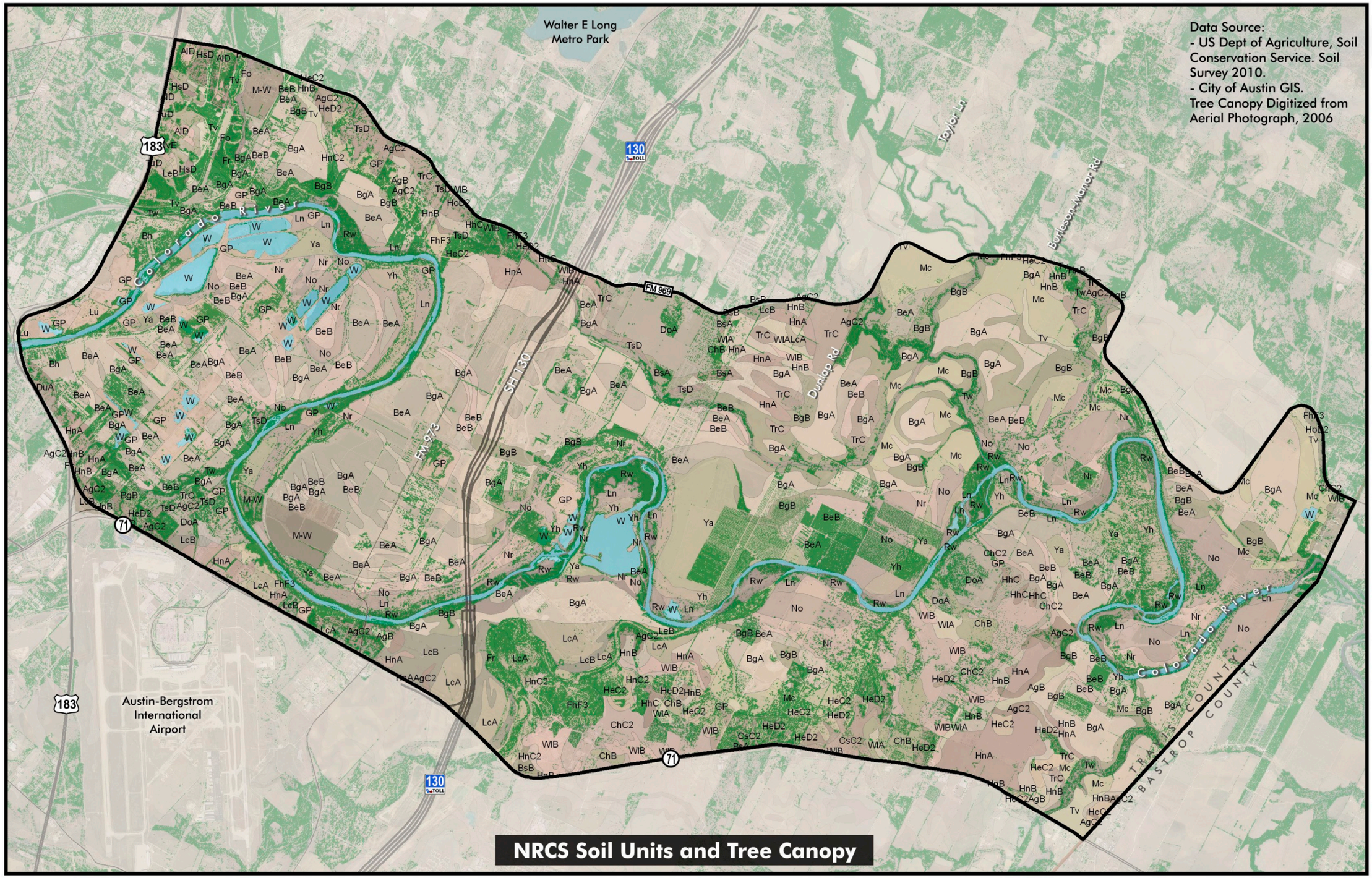
- **Backfill Material Compaction.** Mining pits must be backfilled in a suitable manner that will not lead to future problems with differential settlement and preservation or development of soils for vegetative restoration. Backfill must be compacted from the bottom of the pit to within 5 feet of the final grade. The plan must state the method of compaction.

- **Backfill Slopes.** Backfill slopes must be restored to no more than a 3-to-1 (horizontal-to-vertical) slope to prevent sloughing and to provide a safe walking surface for humans, livestock, etc.

- **Soils.** Providing healthy soils for revegetation after years of mining is both a challenge and essential to the success of future restored vegetation. Topsoil is removed at the outset of mining and is frequently sold and transported offsite. The material below is typically inert, orange clayey sand; although this is sometimes sold as "soil," it does not have the organic composition or microbial community to support vegetation unless mixed with more organic material. The City of Austin's PAP allows for the development of soil. (Some area mining operations have experimented with mixing in vegetation clippings, for example.) The PAP calls for soils with similar in pH, organic carbon content, aggregation, cation exchange capacity, nutrients and microbial community to native, undisturbed soils within the county.

- **Revegetation.** The City of Austin PAP requires that fiscal surety be posted to ensure that revegetation occurs. As noted above, soil quality and suitable topography (grading) are also key to the success of revegetation. The U.S. Department of Agriculture has voluntary guidelines that encourage restoration of native grasses and address soil requirements. The U.S. Army Corps of Engineers also issued a regulatory guidance letter for constructing wetlands and migratory fowl habitat (both are referenced in ECM 1.3.4).

- **Future Considerations.** Future restoration rules should consider a requirement to have a licensed, professional engineer establish performance standards for reclamation and to verify that those performance standards are met. Additional requirements should also be developed to describe the methods used to determine if compaction for the backfill material has been achieved. These methods must follow current best engineering practices.


Data Source:
- US Dept of Agriculture, Soil Conservation Service. Soil Survey 2010.
- City of Austin GIS.
Tree Canopy Digitized from Aerial Photograph, 2006
Walter E Long Metro Park
Taylor Ln
Burleson-Manor Rd
Dunlap Rd
FM 969
SH 130
FM 973
Colorado River
Austin-Bergstrom International Airport
TRAVIS COUNTY
BASTROP COUNTY
183
71
130
NRCS Soil Units and Tree Canopy