# Appendix G
# Vegetation Communities and Habitat Types Mapped by PacifiCorp

This appendix provides information on vegetation communities and habitat types mapped by PacifiCorp and originally documented in:

> *Terrestrial Resources Final Technical Report. Klamath Hydroelectric Project (FERC Project No. 2082). PacifiCorp, Portland, Oregon. February, 2004.*

During fall and winter 2001-2002, PacifiCorp developed a vegetation classification system for creating a preliminary vegetation map with input from the Terrestrial Resources Work Group (TRWG). The classification system was based on the California Wildlife Habitat Relations System (CWHRS) and the National Wetland Inventory (NWI) classification schemes.

During fall 2001, PacifiCorp delineated polygons on aerial and infrared photos and U.S. Geological Survey (USGS) digital orthoquads and classified vegetation within each polygon using the floristic/structural vegetation classification scheme. Vegetation mapping was verified in the field, with a particular focus on riparian and wetland habitats. In addition, 295 of the 2,900 polygons were sampled in August and September of 2002. Data collected during vegetation sampling included aerial foliar cover by cover class for each species in each of the vegetation layers (i.e., tree, shrub, and herb layers); the areal cover and height of each vegetation layer in the plot; the aspect; and the slope. In addition, the number of living trees was tallied and the tree diameters at breast height (dbh) were recorded, and the amount of dead wood in the plot was assessed by collecting data on coarse woody debris (CWD), snags, and wood cover for pieces greater than 4 inches (10 centimeters [cm]) in diameter. General observations were made regarding erosion, livestock, and recreation, and their effects on the habitat.

In conjunction with the study described above, PacifiCorp conducted an extensive assessment of wetland and riparian areas in 2002 and 2003. Representative riparian/ wetlands transects were sampled at reservoirs and river reaches throughout the PacifiCorp study area. Transects were positioned perpendicular to the flow of the river or reservoir shoreline at a depth in the channel sufficient to capture the low elevation edge of submerged and emergent vegetation or unvegetated shoreline habitat and to span the full width of the riparian/wetland vegetation and up to the upland-riparian zone. Riparian and wetland sampling data were collected in 1,135 plots distributed among 113 sampling sites in the 11 Project sections of the study area.

The wetland and riparian assessment included the characterization and quantification of wetland and riparian vegetation for each reservoir and river reach within the study area; documentation of flow, hydrology, and benthic substrate, and characterization of wetland and riparian habitat quality.

Vegetation communities and habitat types documented in 2002 in the PacifiCorp Study are shown in Table G-1. Vegetation cover and sampling locations are shown in Figures G-1 through G-18.

**Table G-1. Vegetation Communities and Habitat Types Documented in 2002 in the PacifiCorp Study (2004).**

| Vegetation Cover Type | Description of Cover Type within Study Area | Location in Study Area |
|---|---|---|
| **Upland Tree Habitats** | More than 10 percent total cover by tree species | |
| Montane Hardwood Oak | Moderately open tree canopy, moderately dense shrub layer, moderately dense herbaceous layer. Yellow starthistle (*Centaurea solstitialis*) and medusahead (*Taeniatherum caput-medusae*) occur in about 25 percent of stands in the project vicinity. | Most abundant around Iron Gate Reservoir, Copco Reservoir, and along J.C. Boyle peaking reach. |
| Montane Hardwood Oak-Conifer | Dense tree cover, sparse shrub layer, moderately open herbaceous layer. | Most abundant along the J.C. Boyle peaking and bypass reaches, at Copco Reservoir, at Fall Creek, and along Copco 2 bypass reach. |
| Montane Hardwood Oak-Juniper | Open tree layer, sparse shrub layer, dense herbaceous layer. Yellow starthistle and medusahead occur in about 25 percent of stands, primarily around Iron Gate and Copco Reservoirs and along Copco 2 bypass reach. | Most abundant cover type in the project vicinity. |
| Juniper | Open canopy, shrub layer varies from sparse to dense, herbaceous layer ranges from sparse to dense. | Most abundant along Link River and along J.C. Boyle peaking reach. |
| Mixed Conifer | Dense tree cover is often two-layered, open shrub layer, moderately sparse herbaceous layer. | Approximately 70 percent of stands are along J.C. Boyle bypass reach. |
| Lodgepole Pine | Sparse tree layer, sparse shrub layer, dense herbaceous layer. | Lodgepole pine stands occur along J.C. Boyle bypass reach and at J.C. Boyle Reservoir as a result of replanting following timber harvest. |
| Ponderosa Pine | Moderate canopy cover, relatively sparse shrub cover, moderately open herbaceous layer. | Most abundant along Keno reach and at J.C. Boyle Reservoir. |
| **Upland Shrub Habitats** | More than 10 percent total cover by shrub species and less than 10 percent total cover by tree species. | |
| Mixed Chaparral | Requires occurrence of two or more shrub species, each covering 5 percent or more of the area. Very few trees, moderate shrub layer, herbaceous layer varies from sparse to dense. | Approximately 60 percent occurs along J.C. Boyle bypass reach and around Copco Reservoir. |
| Rabbitbrush | Gray rabbitbrush (*Ericameria nauseosa*) is the dominant shrub species in most areas and Sierra plum (*Prunus subcordata*) is the only other shrub species present. Applegate's milk-vetch (*Astragalus applegatei*), a federally endangered plant species, grows in a seasonally moist site with rabbitbrush and saltgrass (*Distichlis spicata*) along Keno Impoundment. | Occurs at Keno Impoundment and along Keno reach. |
| Sagebrush | Moderately dense shrub layer, sparse herbaceous layer. | This limited habitat type occurs near Keno Impoundment and J.C. Boyle Reservoirs. |

**Table G-1. Vegetation Communities and Habitat Types Documented in 2002 in the PacifiCorp Study (2004).**

| Vegetation Cover Type | Description of Cover Type within Study Area | Location in Study Area |
|---|---|---|
| **Upland Herb Habitats** | More than 2 percent total cover by herbaceous species and less than 10 percent total cover of tree and/or shrub species. | |
| Annual Grassland | Total shrub cover is less than 1 percent. Nine of the 11 most frequent herbaceous species are introduced species; two of them are the exotic/invasive species medusahead and yellow starthistle. Cheatgrass (*Bromus tectorum*) is relatively more abundant in annual grasslands along Keno Impoundment and along J.C. Boyle bypass reach. Medusahead, hairy brome (*Bromus ramosus*), and yellow starthistle dominate grasslands downriver of J.C. Boyle peaking reach. | More than 88 percent of the annual grasslands occur along J.C. Boyle peaking reach and around Copco and Iron Gate Reservoirs. |
| Perennial Grassland | Sparse shrub cover includes a wide variety of species. 31 graminoid species occur: 5 introduced annuals, 11 introduced perennials, 2 native annuals, 10 native perennials, 1 native rush, and 2 native sedges. | More than 87 percent occurs around J.C. Boyle Reservoir and in the J.C. Boyle peaking and bypass reaches. |
| **Wetland Habitats** | | |
| Palustrine Emergent | Dense herbaceous layer, often with a weedy zone immediately upslope of the bulrush (*Scirpus* spp.) zone. Short-podded thelypody (*Thelypodium brachycarpum*), a special status species, occurs in this habitat type at Keno Impoundment. | More than 88 percent occurs adjacent to Keno Impoundment, where wetlands associated with the Klamath Wildlife Area and the undiked wetlands southwest of the Klamath Wildlife Area are located. The largest single emergent wetland associated with the project covers more than 63 acres and is near Sportsman's Park at J.C. Boyle Reservoir. |
| Palustrine Scrub-Shrub | Open canopy with moderate shrub layer. Coyote willow (*Salix exigua*, also known as narrowleaf willow) and arroyo willow (*Salix lasiolepis*) are the primary hydrophilic shrubs. Arroyo willow is more abundant upriver and upslope. The only shrub layer species in the Link River wetland is arroyo willow; this species was most frequent at Keno Impoundment, J.C. Boyle Reservoir, and Fall Creek. Species dominating the Spencer Creek wetland include arroyo willow and coyote willow. Arroyo willow also occurred in the Fall Creek reach. Coyote willow is the dominant shrub layer species in 75 percent of the wetlands from J.C. Boyle Reservoir to Iron Gate Reservoir. | More than 80 percent occurs adjacent to J.C. Boyle, Copco, and Iron Gate Reservoirs. |

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| Vegetation Cover Type | Description of Cover Type within Study Area | Location in Study Area |
|---|---|---|
| Palustrine Forested | Dense tree cover includes the primarily hydrophilic tree species coyote willow and shining willow (*Salix lucida*); weeping willow (*Salix babylonica*) is the dominant tree layer species in one of the Keno Impoundment wetlands. The two Keno Impoundment wetlands have no shrub layer. Brown dogwood (*Cornus glabrata*) and arroyo willow are the only species in the open shrub layer of the two wetlands along Copco 2 bypass reach. Wetlands at Copco and Iron Gate Reservoirs have an open shrub layer with coyote willow. | More than 80 percent occurs adjacent to Copco and Iron Gate Reservoirs. |
| Palustrine Aquatic Bed | Dominant species are pondweeds (*Potamogeton* spp.) and coontail (*Ceratophyllum demersum*). | Occurs in all project reservoirs and slow moving sections of the Klamath River. |
| **Riparian Habitats** | | |
| Riparian Grassland | Dense herbaceous cover. | Reed canarygrass (*Phalaris arundinacea*) is relatively common along Link River, along Keno reach, and along J.C. Boyle peaking reach. |
| Riparian Shrub | Coyote willow, arroyo willow, and Oregon ash (*Fraxinus latifolia*) saplings are the primary hydrophilic shrubs. Dense herbaceous cover is dominated by reed canarygrass along Link River, Keno reach, J.C. Boyle bypass reach, and J.C. Boyle peaking reach. | J.C. Boyle peaking reach and Klamath River from Iron Gate development to Shasta River are the locations with the most riparian shrub habitat. |
| Riparian Deciduous | Moderate canopy cover includes coyote willow. Moderate shrub and herb layers. | Occurs primarily along J.C. Boyle peaking reach and along the Klamath River from Iron Gate development to Shasta River. |
| Riparian Mixed Deciduous-Coniferous | A total of 8 tree, 12 shrub, and 49 herbaceous plant species were documented in this habitat. Dense tree layer, moderate shrub layer, open herbaceous layer. A taller herb layer with reed canarygrass and devil's beggarstick (*Bidens frondosa*) is often present along the river. | 37.8 acres are mapped at Fall Creek, 12.0 acres along J.C. Boyle peaking reach, and 1.9 acres around Copco Reservoir. |
| **Aquatic Habitats** | The reservoirs represent 4,333 acres of lacustrine habitat in the PacifiCorp study area. Several reservoirs and river reaches have pockets of submerged aquatic vegetation that was not accounted for in this study. | |
| Riverine and Lacustrine Unconsolidated Bottom | Riverine unconsolidated bottom, which includes the semipermanently flooded flowing water of the Klamath River, totaled 726 acres. | |
| Riverine and Lacustrine Unconsolidated Shore | Riverine and lacustrine unconsolidated shoreline or gravel bar habitats cover 17.2 acres. | |

**Table G-1. Vegetation Communities and Habitat Types Documented in 2002 in the PacifiCorp Study (2004).**

| Vegetation Cover Type | Description of Cover Type within Study Area | Location in Study Area |
|---|---|---|
| **Barren Habitats** | Less than 2 percent total cover by herbaceous, desert, or nonwildland species; less than 10 percent cover by tree or shrub species. | |
| Rock Talus | Most rock talus habitats are barren with small patches of vegetation where the talus is thin or at the margins of the talus patch. 2 tree, 7 shrub, and 23 herbaceous plant species provided sparse cover in rock talus habitats. | Particularly abundant along J.C. Boyle peaking and bypass reaches. |
| Exposed Rock | A wide variety of species occurs in the sparse shrub and moderate herb layers. | Most abundant along J.C. Boyle peaking and bypass reaches and Copco 2 bypass reach; does not occur at Link River or Keno Impoundment. |
| **Agricultural/Developed** | More than 2 percent total vegetation cover is non-wildland vegetation. Includes three developed vegetation types: residential, recreational development, and industrial, where vegetation includes plants grown for landscaping. Also includes agricultural types such as pasture and irrigated hayfields, where vegetation includes plants grown for food and/or fiber. | Pastures and irrigated hayfields are distributed over 3,682 acres. More than 85 percent of the pasture/irrigated hayfield occurs around Keno Impoundment. J.C. Boyle peaking reach and the area along the Klamath River from Iron Gate development to Shasta River also have a substantial amount of pasture/irrigated hayfields. |

Source: PacifiCorp 2004.

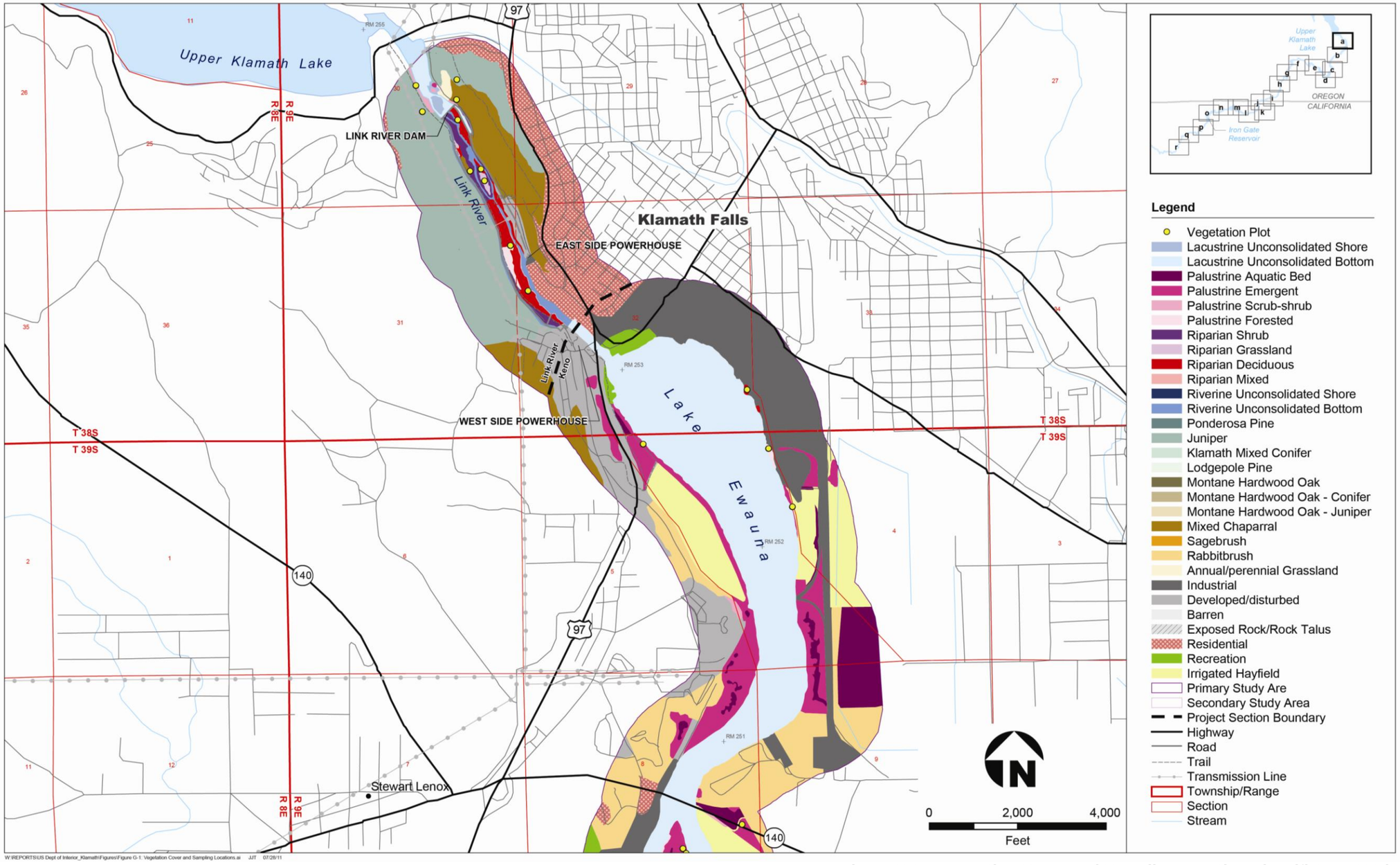



**Figure G-1. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**

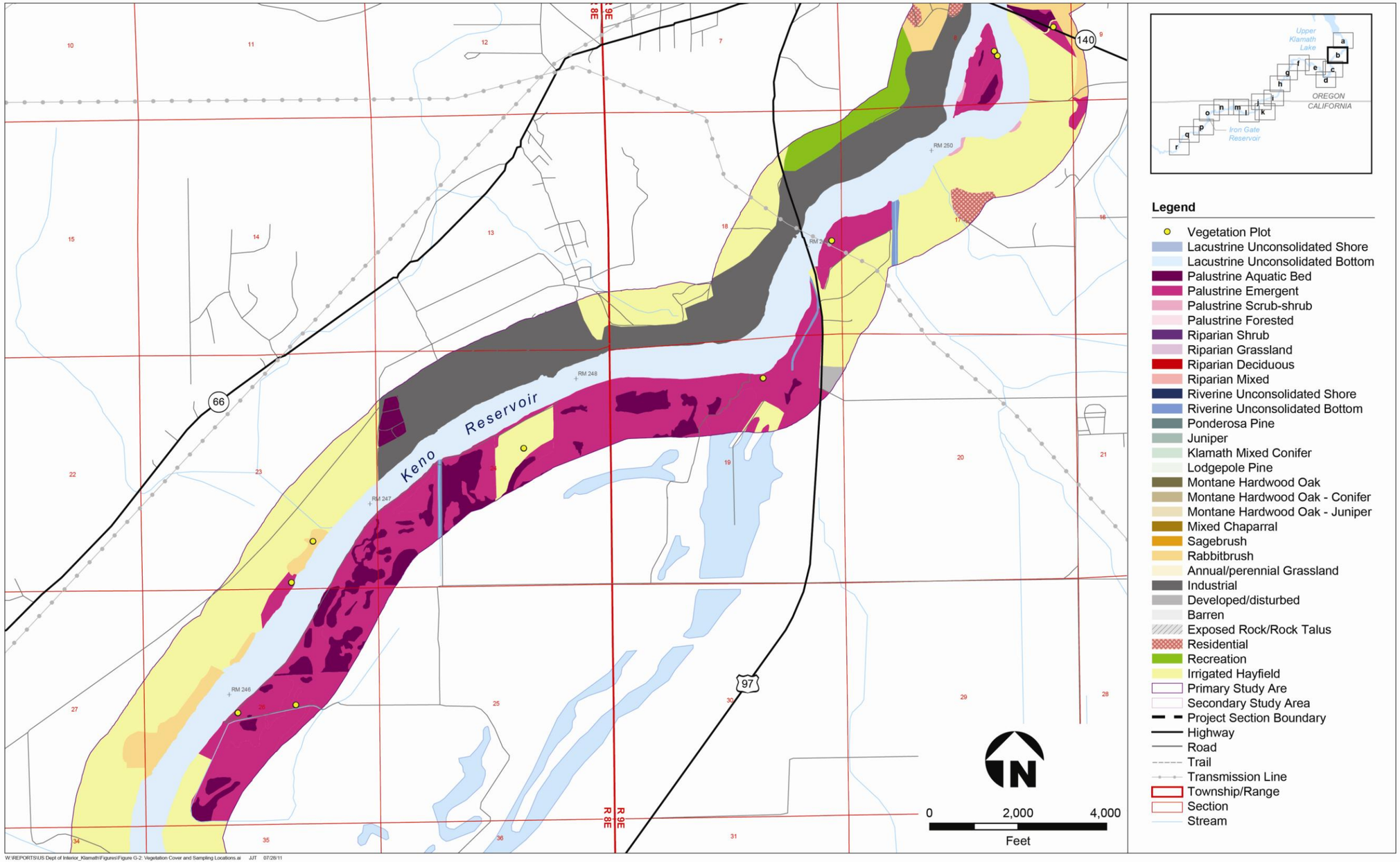
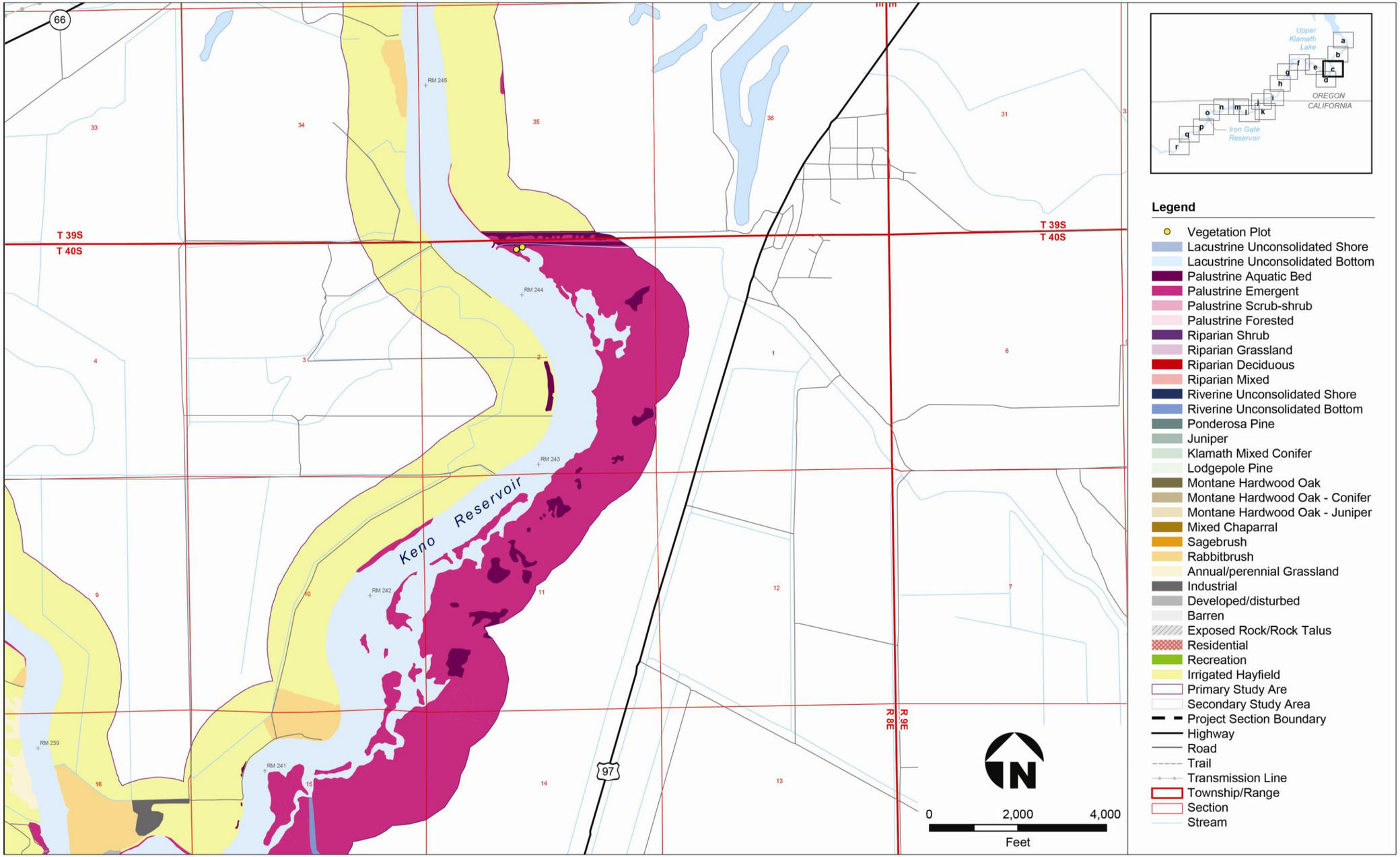



**Figure G-2. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**




W:\REPORTS\US Dept of Interior_Klamath\Figures\Figure G-3: Vegetation Cover and Sampling Locations.ai JJT 07/28/11

**Figure G-3. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**

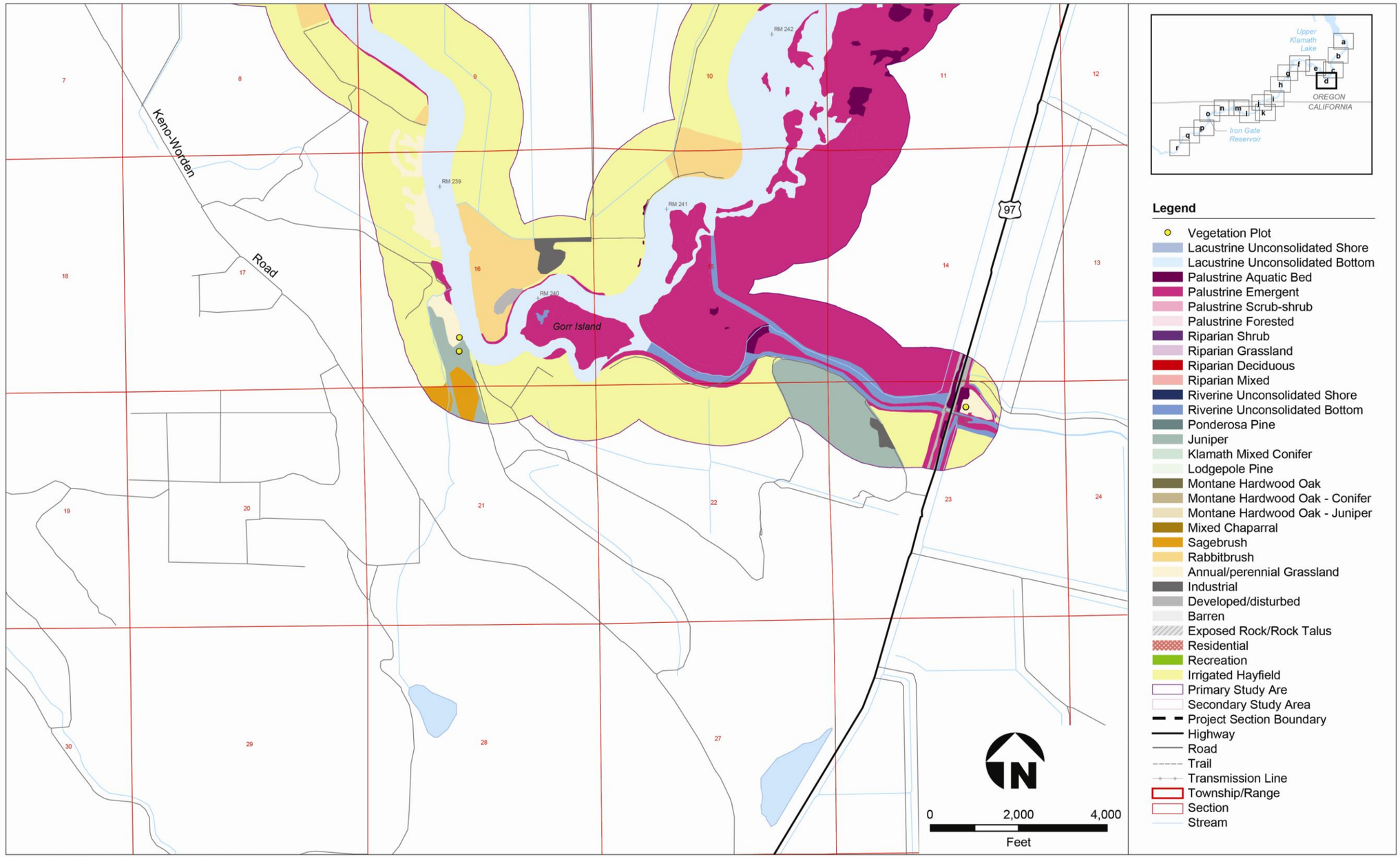



**Figure G-4. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**

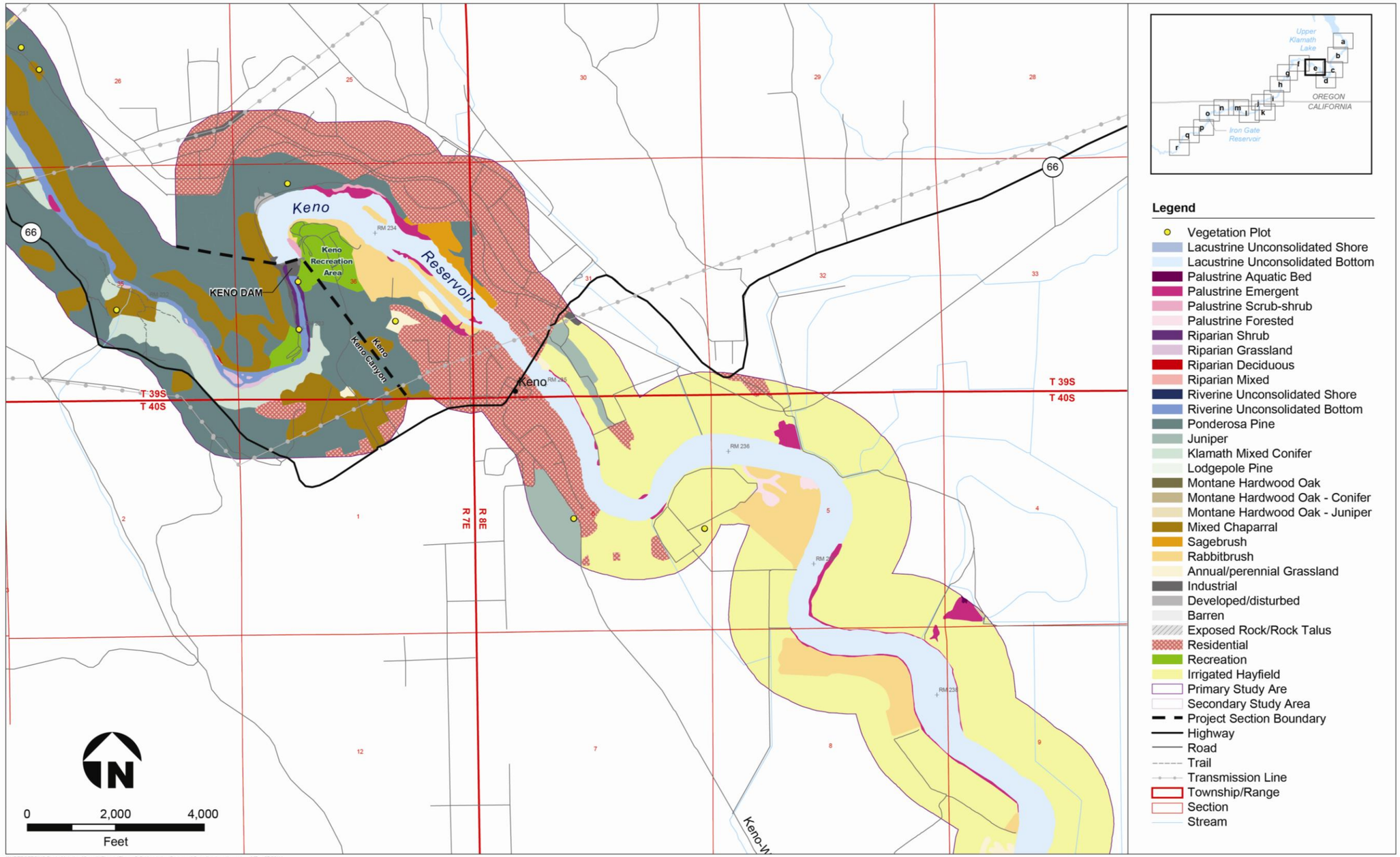



**Figure G-5. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**

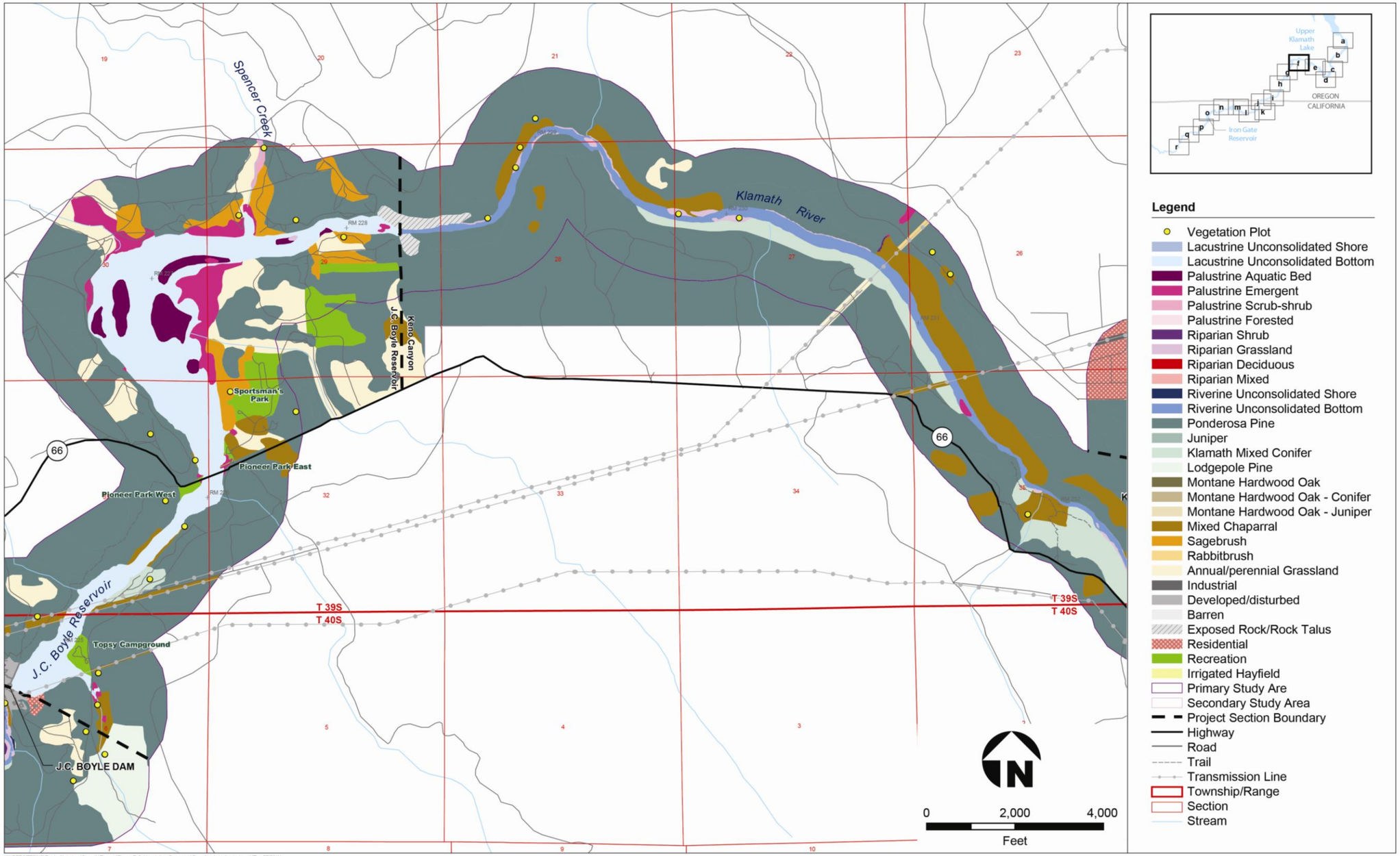



**Figure G-6. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**

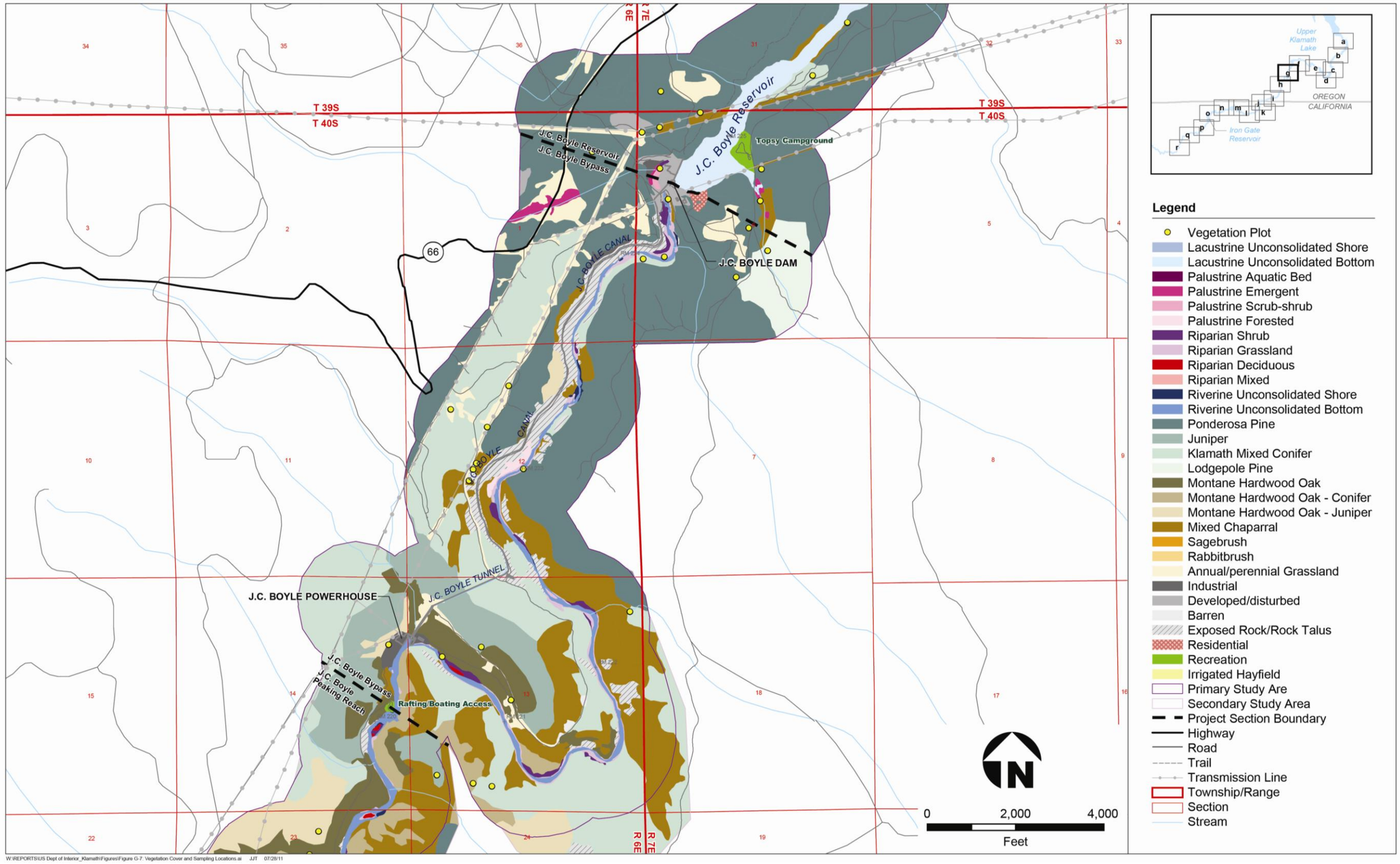



**Figure G-7. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**

**Figure G-8. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**

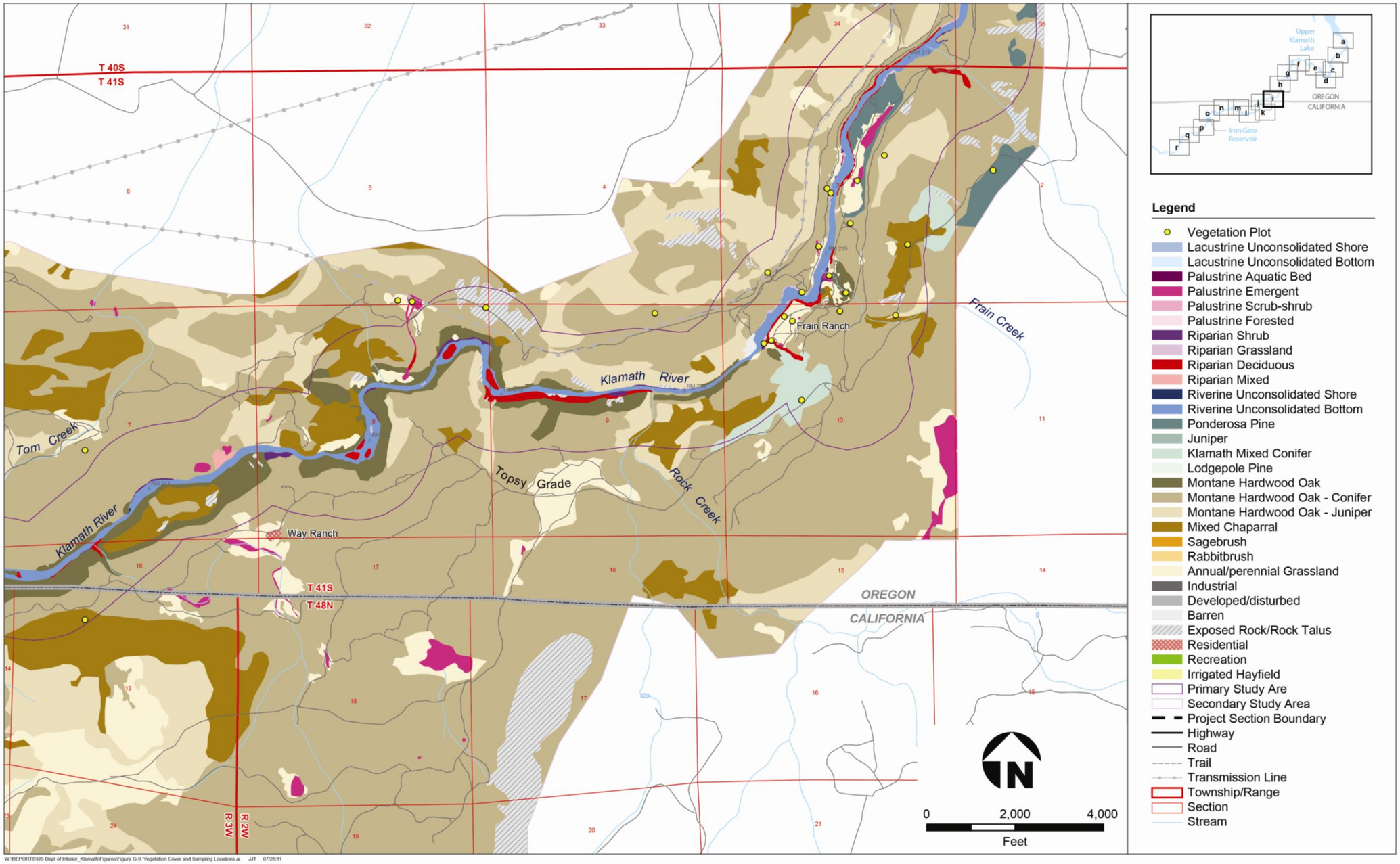



**Figure G-9. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**

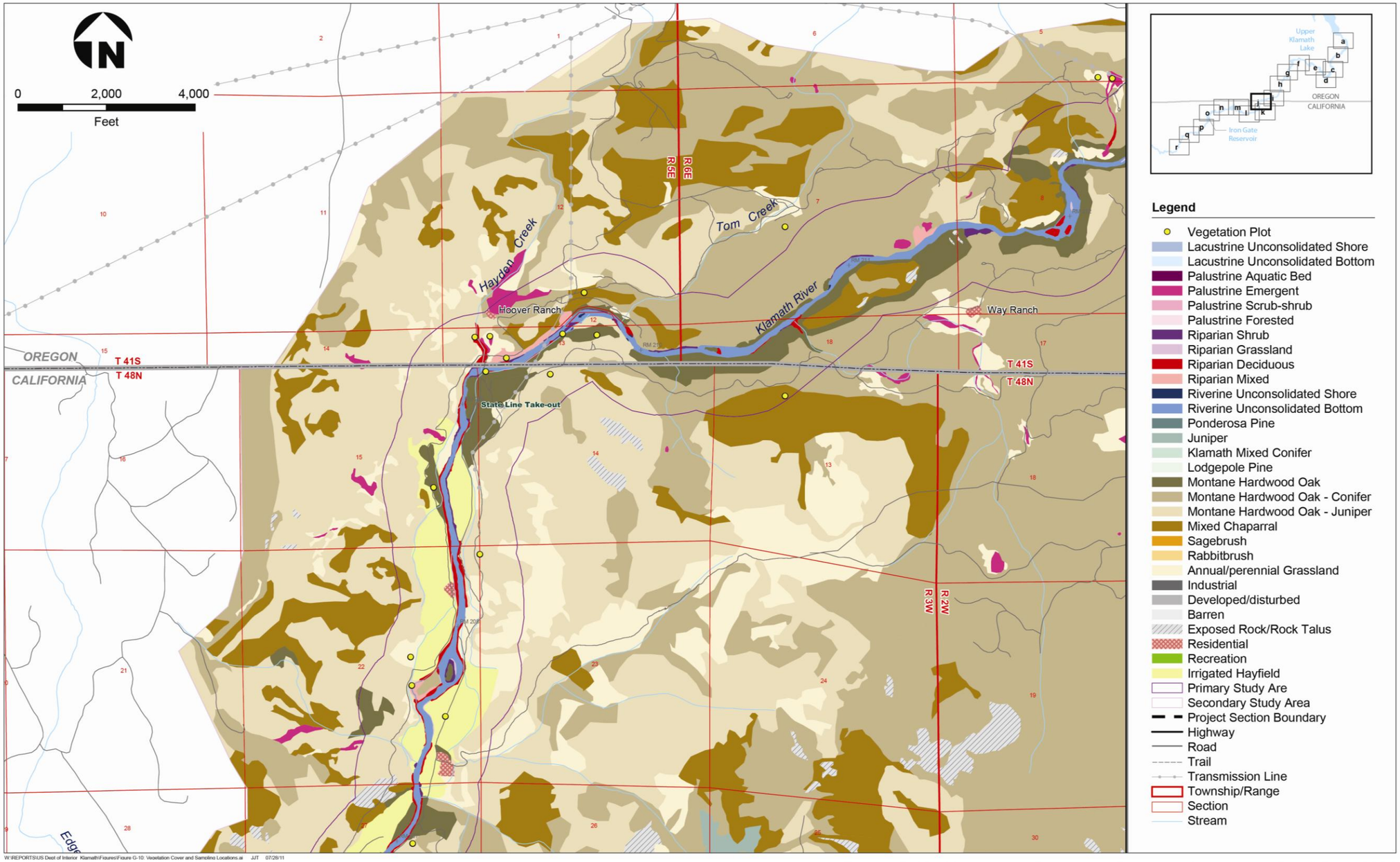



**Figure G-10. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**

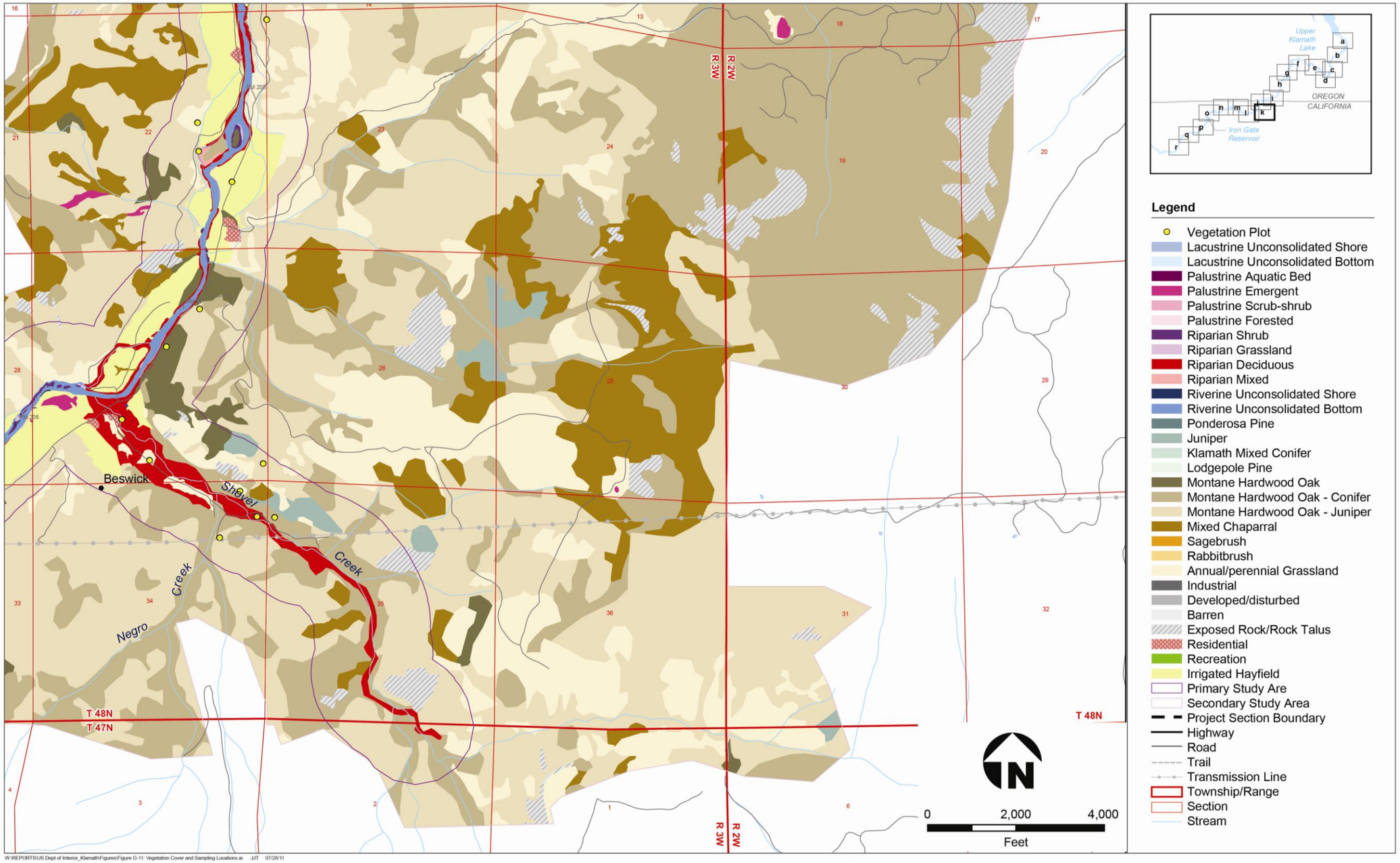



**Figure G-11. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**

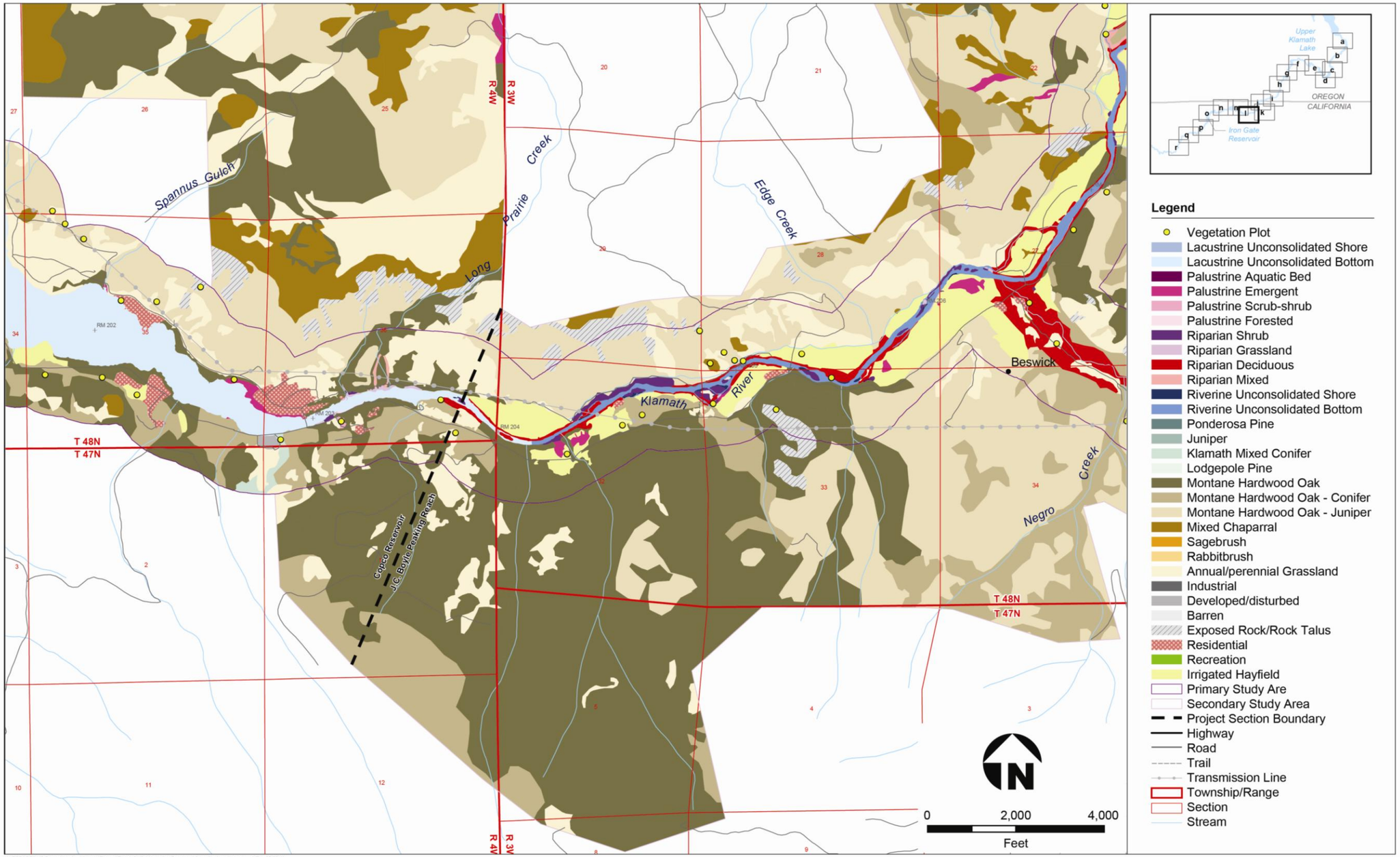



**Figure G-12. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**

**Figure G-13. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**

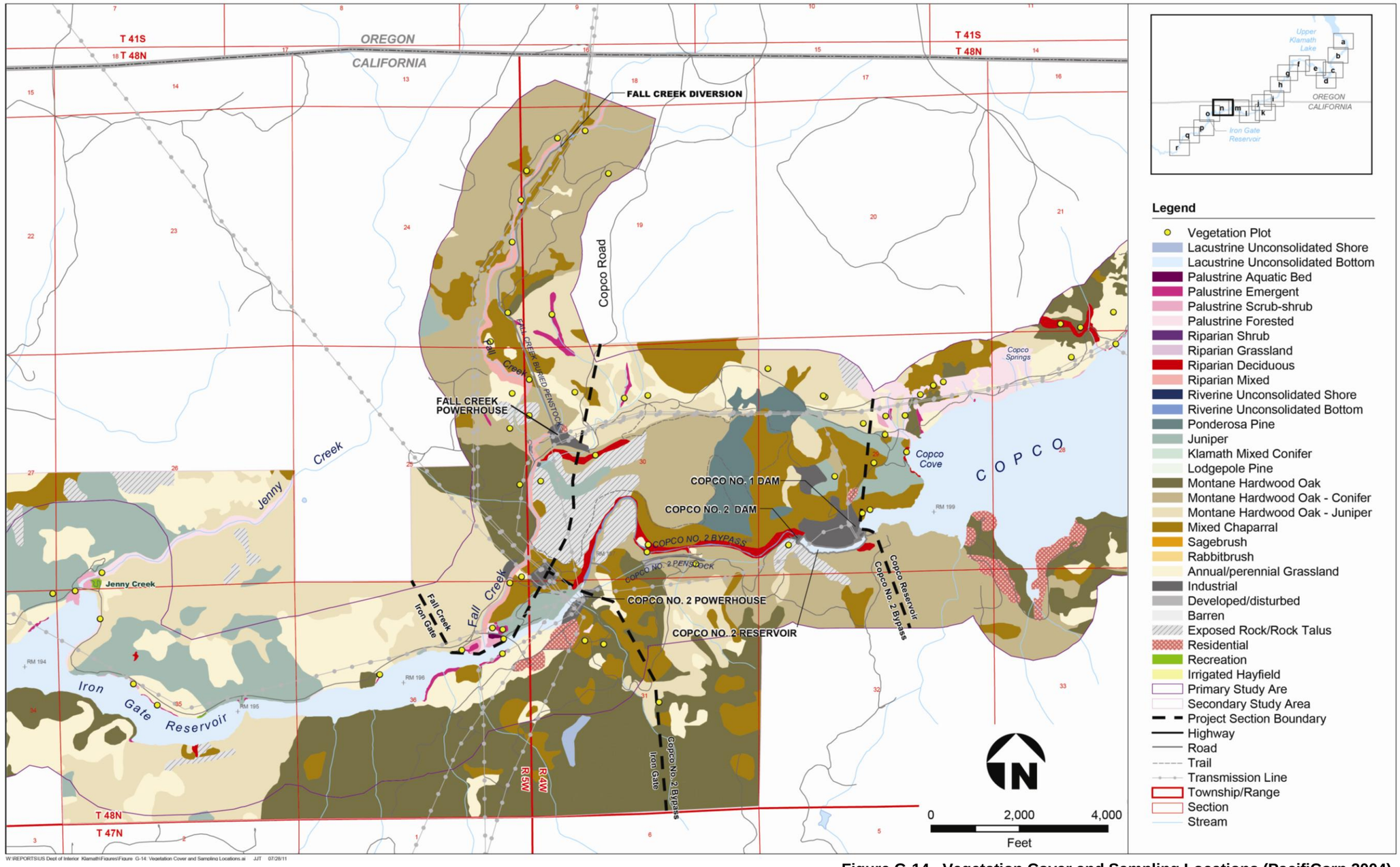



**Figure G-14. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**

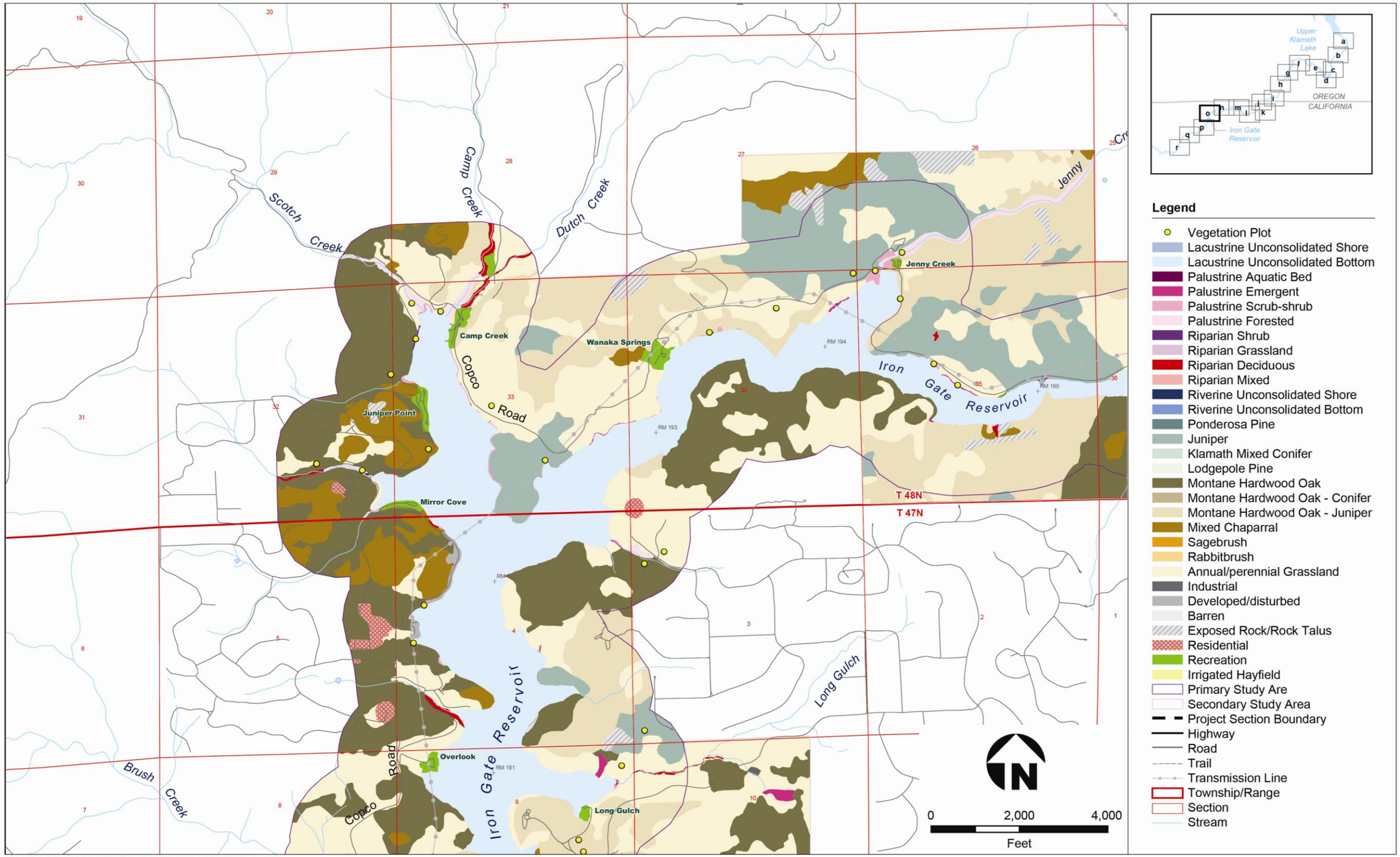



**Figure G-15. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**

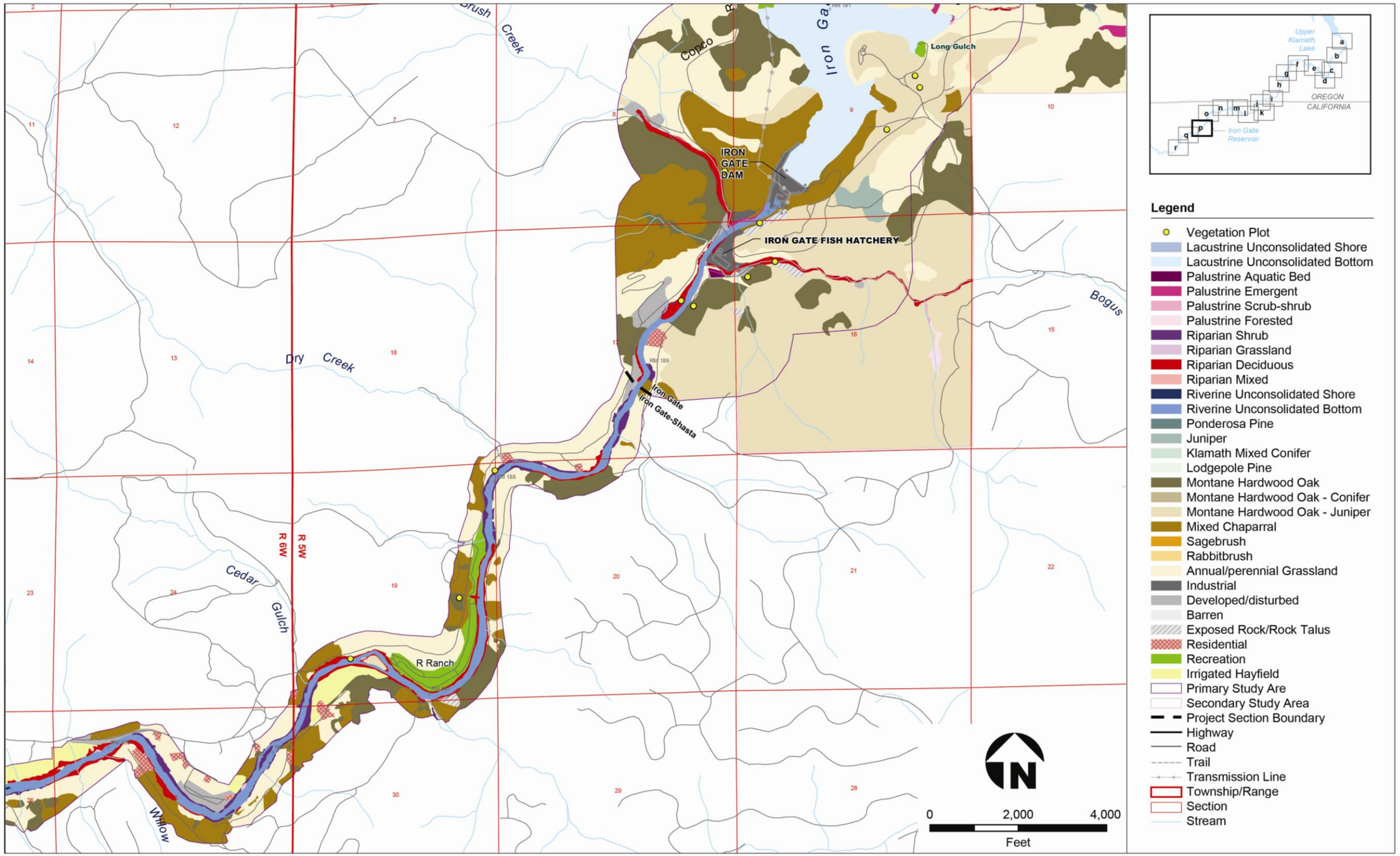



**Figure G-16. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**

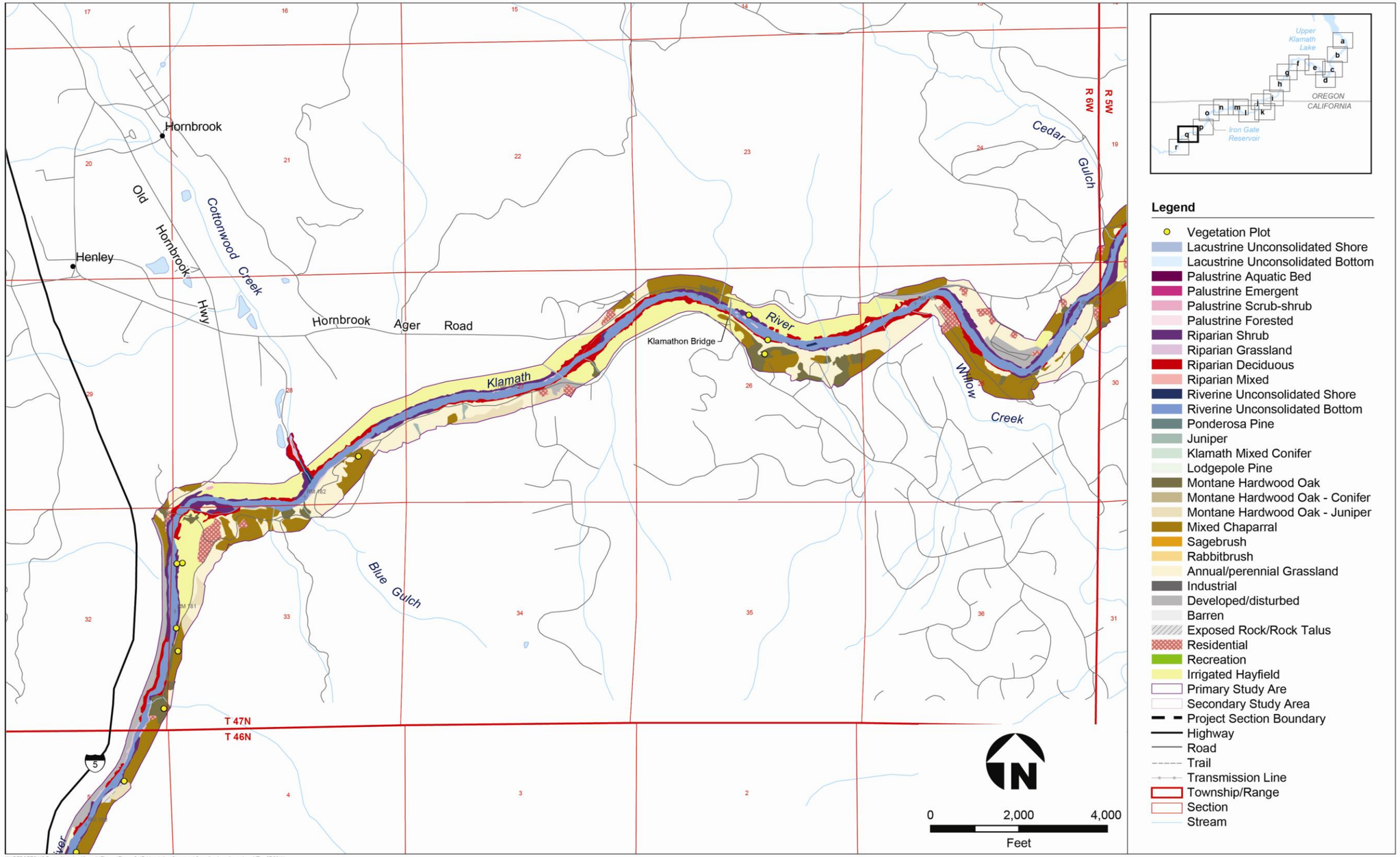



**Figure G-17. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**

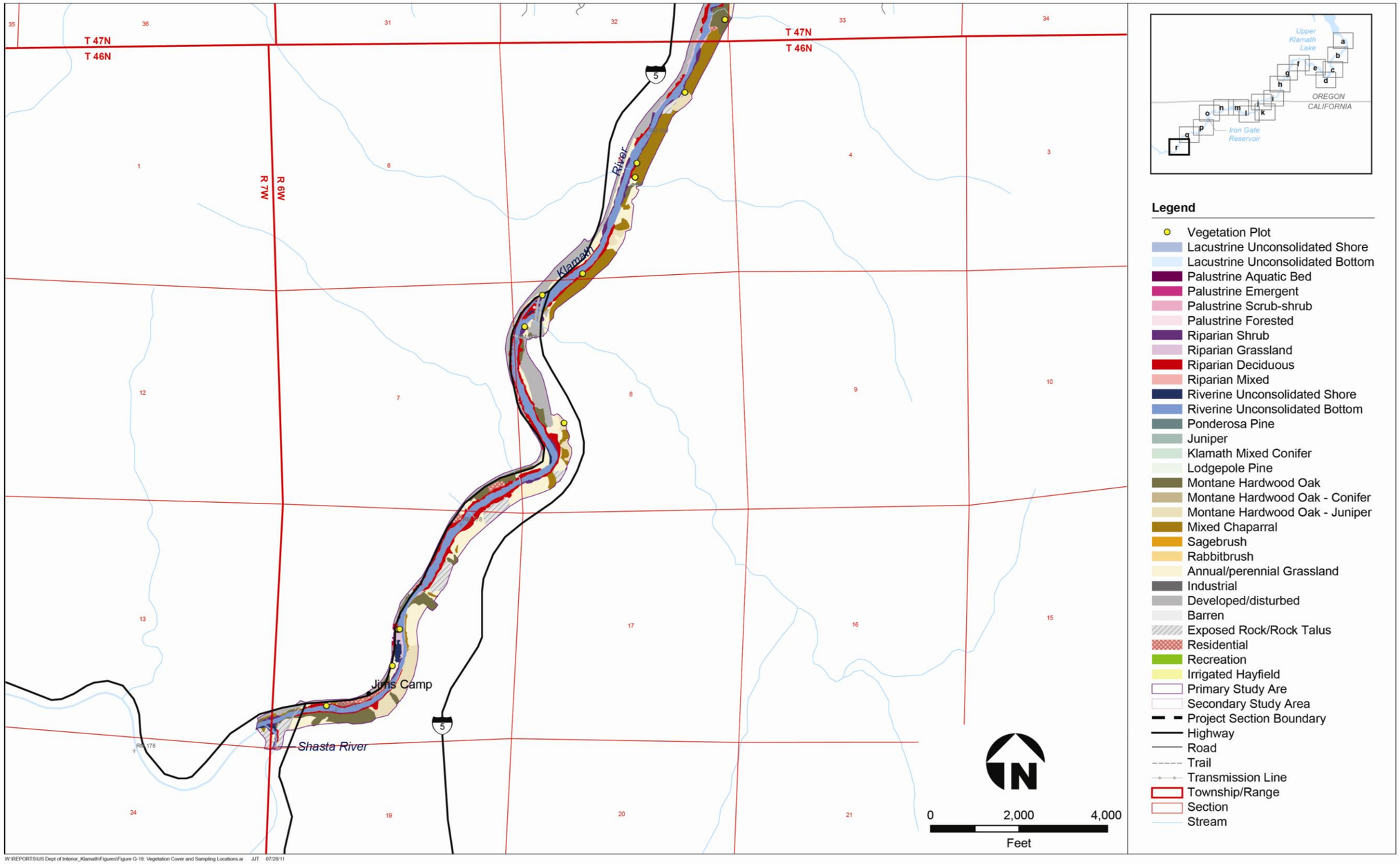



**Figure G-18. Vegetation Cover and Sampling Locations (PacifiCorp 2004)**

# References

PacifiCorp. 2004. Terrestrial Resources Final Technical Report. Klamath Hydroelectric Project (FERC Project No. 2082). Portland, Oregon.

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