

**Placer County Water Agency
Middle Fork American River Project
(FERC No. 2079)**

FINAL

**AQ 10 – RIPARIAN RESOURCES
TECHNICAL STUDY REPORT – 2010**



Placer County Water Agency
P.O. Box 6570
Auburn, CA 95604

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1.0 INTRODUCTION

This report describes the riparian study conducted by the Placer County Water Agency (PCWA) in 2007–2009 in accordance with the AQ 10 – Riparian Resources Technical Study Plan (AQ 10 – TSP) for the Middle Fork American River Project (MFP or Project). The stakeholder-approved TSP was included in Supporting Document (SD) H of the Pre-Application Document (PAD) filed with the Federal Energy Regulatory Commission (FERC or Commission) on December 13, 2007 (PCWA 2007a).

This draft report was distributed to the Aquatic Technical Working Group (TWG) on July 12, 2010 for a 60-day comment period. The comment period will end on September 10, 2010. Comments will be addressed in the Final Application for New License.

The riparian study was conducted to characterize the riparian vegetation along the bypass and peaking reaches associated with the MFP, Project reservoirs and diversion pools, and in areas potentially affected by the Hell Hole Reservoir Seasonal Storage Increase Betterment (proposed Project enhancement). The riparian study also included surveys in river reaches unaffected by Project operations (comparison river reaches). The riparian study focuses on the areas where riparian vegetation is present within Riparian Conservation Areas (RCAs). RCAs are areas and habitat specifically designated for protection and management of riparian resources by the U.S. Department of Agriculture-Forest Service (USDA-FS).

Distribution mapping of the riparian habitat upstream and downstream of the Project dams and diversions was completed in 2005 and 2006 and reported in the 2005 and 2006 Physical Habitat Characterization Reports (PCWA 2006 and 2007b). Quantitative riparian surveys were completed on the bypass and peaking reaches in 2006 and are also reported in the 2006 Physical Habitat Characterization Report (PCWA 2007b). The unimpaired comparison river reaches and Project reservoirs were surveyed in 2007 to map and characterize riparian resources, and areas potentially affected by the Hell Hole Reservoir Seasonal Storage Increase Betterment were surveyed in 2008. The riparian study included the following evaluations: (1) relationship between riparian resources and the hydrologic regimes in the bypass and peaking reaches and comparison stream reaches; and (2) relationship between riparian resources and water surface elevation (WSE) fluctuations in Project reservoirs.

The following sections provide a detailed description of the study objectives, study implementation, extent of the study area, study approach, study results, and literature cited.

2.0 STUDY OBJECTIVES

The objectives of the riparian study in the AQ 10 – TSP include the following:

- Characterize the relationship between riparian resources and the hydrologic regimes(s) in the bypass and peaking reaches.

- Characterize the relationship between riparian resources and WSE fluctuations in Project reservoirs.
- Document the location of riparian resources at proposed Project facilities; potential Project betterment construction and staging areas; and new inundation areas.

3.0 STUDY IMPLEMENTATION

Figure AQ 10-1 shows the AQ 10 – TSP objectives and the study elements and activities that were completed in 2005–2009. Study elements completed in 2005–2006 were documented in the 2005 and 2006 Physical Habitat Characterization Reports (PCWA 2006 and 2007b). Study elements completed in 2007–2009 are documented in this report. Figure AQ 10-1 also shows how the information developed during the study will be documented and provided to the stakeholders. The following sections summarize the study elements completed, any deviations from the TSP, outstanding study elements, and proposed modifications to the TSP.

3.1. STUDY ELEMENTS COMPLETED

The following study elements were completed in 2007–2009:

Riparian Resource Characterization in the Bypass, Peaking, and Comparison Reaches

- Summarized information on the life history requirements of the dominant woody riparian species.
- In consultation with the Aquatic TWG, selected five unimpaired comparison reaches (river reaches unaffected by MFP operations) for detailed riparian surveys to compare with bypass and peaking reaches potentially affected by MFP operations.
 - o Characterized the riparian resources, including community composition, age class structure, regeneration, encroachment, and special-status and invasive plant species, in these unimpaired comparison river reaches¹.
 - o Compared the riparian community characteristics between the bypass and peaking reach study sites and the appropriate comparison river reach study site.
- Characterized the relationship between historic and existing land uses, recreation activities, and riparian resources.

Riparian Resources and Hydrologic Regime Relationships

- Determined WSEs over a wide range of discharges appropriate to the Project

¹ Quantitative riparian survey methods and analyses completed for the unimpaired comparison study sites were consistent with those previously completed in the bypass and peaking reaches (PCWA 2007b).

hydrology at 17 study sites on the bypass and peaking reaches and unimpaired comparison river reaches.

- o Developed stage-discharge relationships at these study sites.
- o Evaluated the extent of inundation of floodplains and bars over a range of flows; the frequency, duration, and timing of inundation of riparian zones; flow recession rates in selected reaches; flow paths through bars and floodplain surfaces; and water availability during summer months at these study sites.
- o Compared the riparian and hydrologic regime relationships at the bypass and peaking reach study sites with the appropriate comparison river reach study site.
- Collected and analyzed tree cores from one study site on the Rubicon River and one study site each on the North Fork American and the North Fork of the Middle Fork American rivers.
 - o Using results of the tree core analyses², compared recruitment classes, regeneration success, and species composition on the bypass and peaking reaches to appropriate unimpaired comparison river reaches.
- Evaluated the position of the vegetation in relation to the channel.

Riparian Resources around Project Reservoirs

- Characterized the distribution, characteristics, and condition of the riparian vegetation around Project reservoirs including French Meadows and Hell Hole reservoirs, Middle Fork Interbay, and Ralston Afterbay.
- Summarized annual patterns and inter-annual fluctuations in WSEs and inundation area-WSE relationships at each of the Project reservoirs.

Riparian Resources Associated with the Hell Hole Reservoir Seasonal Storage Increase Betterment

- Identified and mapped riparian vegetation around Project facilities, construction and staging areas, and roads associated with the Hell Hole Reservoir Seasonal Storage Increase Betterment.
- Identified and characterized riparian vegetation that may be affected by changes in WSE associated the Hell Hole Reservoir Seasonal Storage Increase Betterment.
 - o Conducted detailed riparian field surveys in the potential inundation zone around Hell Hole Reservoir, including tributary inflow areas (Rubicon River, Five Lakes Creek, and a small un-named drainage).
 - o Collected and analyzed ten tree cores from woody riparian trees established along Five Lakes Creek.

² Including results of tree core analyses reported in PCWA (2007b).

Project Maintenance Activities near Riparian Resources

- Summarized current Project maintenance activities that occur near existing riparian resources.

3.2. DEVIATIONS FROM TECHNICAL STUDY PLAN

The riparian studies were conducted as outlined in the AQ 10 – TSP with one enhancement:

- Additional riparian vegetation field surveys were conducted immediately upstream and downstream of the South and North Fork Long Canyon Creek diversions, where the greatest potential for changes in riparian vegetation due to Project operations, if any, could occur.

3.3. OUTSTANDING STUDY ELEMENTS

- Develop indicators for riparian health in consultation with the Aquatic TWG. This study element will be discussed and developed in consultation with the Aquatic TWG during development of the protection, mitigation, and enhancement (PM&E) measures. This information will be included in the Application for New License.

3.4. PROPOSED MODIFICATION TO TECHNICAL STUDY PLAN

There are no proposed modifications to the AQ 10 – TSP.

4.0 EXTENT OF STUDY AREA

The study area included bypass reaches and the peaking reach, comparison river reaches (Table AQ 10-1), and Project reservoirs and diversion pools (Table AQ 10-2). The locations of the riparian study sites are shown on Map AQ 10-1. The study area also included areas around the proposed Hell Hole Reservoir Seasonal Storage Increase Betterment (Table AQ 10-3) including:

- 100 feet around trails; staging and disposal sites; and new inundation areas.
- 300 feet around construction areas associated with new facilities and roads.

5.0 STUDY APPROACH

The AQ 10 riparian study documented in this report was preceded by initial riparian characterization studies that were completed in 2005 (Phase 1) and 2006 (Phase 2). For these early studies, riparian and meadow habitat upstream and downstream of Project dams and diversions and comparison rivers were identified, mapped, and described (PCWA 2006 and 2007b). The objectives of these initial characterization studies are summarized in Figure AQ 10-1. The main study elements of these initial characterization studies are described below.

Phase 1 included:

- Reviewing and summarizing existing information on riparian resources in the study area, and
- Mapping and describing the distribution of the riparian vegetation (including species composition and age class) from historical and recent aerial photography, helicopter surveys, and ground surveys on the Project bypass and peaking reaches and around Project reservoirs.

Phase 2 included:

- Quantitative riparian field surveys at the agency-approved bypass and peaking reach study sites listed in Table AQ 10-1;
 - o Surveys to describe the composition, distribution, and age class structure of riparian habitat, including regeneration and the position of the vegetation along the channel; and
 - o Tree core analyses in specific reaches on the bypass and peaking reaches (two reaches on the Rubicon River, two reaches on the Middle Fork American River downstream of Middle Fork Interbay, and two reaches on the Middle Fork American River peaking reach).
- Mapping of riparian vegetation distribution, composition and coverage upstream of Project diversions and reservoirs and on unimpaired comparison river reaches;
- Identification of potential unregulated streams in the vicinity of the MFP to serve as comparison reaches; and
- Identification of potential historical and existing land use activities that could have or currently may be affecting the development of riparian habitat.

Using information developed during these initial riparian characterization studies, the Aquatic TWG developed the AQ 10 – TSP to identify additional information needed to evaluate the MFP and assist in the development of future PM&E measures. The following describes the study approach implemented in 2007–2009 in accordance with the AQ 10 – TSP.

5.1. RIPARIAN RESOURCE CHARACTERIZATION IN THE BYPASS, PEAKING, AND COMPARISON REACHES

5.1.1. Life History Requirements of Dominant Woody Riparian Species

A literature review of the life history requirements of the dominant woody riparian species (Fremont and black cottonwoods [*Populus fremontii* and *Populus balsamifera*, respectively], white and mountain alders [*Alnus rhombifolia* and *Alnus incana* ssp. *tenuifolia*, respectively], and willows [*Salix* sp.]) present in the study area was conducted. Specifically, information on seed initiation (e.g., dispersal, germination, and initial seed/root growth); microsite characteristics necessary for germination (e.g., water

table depth, substrate); establishment (survival and growth until maturity); and maturation (e.g., age of maturity, rooting depth, and tree height) was collected, reviewed, and summarized.

5.1.2. Riparian Community Characteristics – Comparison of Bypass and Peaking Reaches with Unimpaired Comparison Stream Reaches

Five unimpaired comparison study sites on four non-Project rivers were selected in consultation with the Aquatic TWG to compare with the bypass and peaking reach riparian study results, which were included the 2006 Physical Habitat Characterization Report (PCWA 2007b). The unimpaired comparison river reaches included one site each on the North Fork of the Middle Fork American River, South Fork Long Canyon Creek, and Duncan Creek; and two sites on the North Fork American River (Table AQ 10-1, Map AQ 10-1, and site photographs in Appendix E). Table AQ 10-4 identifies the unimpaired comparison river reaches and associated bypass and peaking river reaches which have similar physical channel characteristics and unimpaired hydrologic patterns.

Quantitative riparian surveys were completed at each of the unimpaired comparison study sites consistent with the earlier surveys completed at the study sites in the bypass and peaking reaches (PCWA 2007b). The results of these surveys were then compared to the results of the surveys on the bypass and peaking reach study sites.

The following summarizes the data collected and survey methods conducted on the unimpaired comparison river reaches. Methods are described in detail in the 2006 Physical Habitation Characterization Study Report (PCWA 2007b).

- ***Community composition across the riparian zone*** – Line-intercept survey along surveyed transects.
 - o A transect tape was laid perpendicular to the stream channel from the water's edge of the summer flow to the valley wall or hillslope. The length of each dominant and sub-dominant ground, shrub, and tree species and/or other cover types (e.g., bare ground, leaf litter, large woody debris, and different substrate size classes, etc.) that intersected the transect tape was recorded.
- ***Community composition along the stream banks*** – Greenline³ method (Winward 2000).
 - o One greenline, with an approximate length of 100 meters (328 feet), was established on the left and right bank within each study site⁴. Along the greenline, the length of cover by each dominant and sub-dominant plant species (ground, shrub, and tree layers) or other attribute (such as boulder or bedrock), percentage covered, and tree height (when applicable) were recorded.

³ The greenline is identified as the first line of rooted perennial vegetation parallel to the stream (Winward 2000).

⁴ The total length of the greenline did not extend 100 meters when a large bedrock outcrop was encountered

- **Woody riparian age class structure⁵ and regeneration** – Paired plots along surveyed transects, seedling counts along stream banks, and tree core dating techniques (at a sub-set of study sites).
 - o Tree diameter measurements and shrub stem size class measurements were collected for individuals rooted within paired plots (5x2 square meters). The paired plots were established at obvious changes in elevation and/or shifts in dominant species along the line-intercept transects. Age class distributions were also evaluated at selected quantitative study sites using tree core dating techniques (described in Section 5.2.2 below).
 - o Regeneration information was collected during the greenline surveys. Young individuals and seedlings rooted within 2 meters (6.6 feet) of the greenline were counted.
- **Canopy structure** – Paired plots along surveyed transects.
 - o Ground layer and dominant herbaceous species cover information were collected in 1x1-square-meter plots established along the line-intercept transects at the same locations as the 5x2-square-meter plots described above. Within the 5x2-square-meter plots, the relative percentage of each plot covered by the shrub and tree canopy layers, each species, and individual were recorded.
- **Riparian health** – Paired plots along surveyed transects.
 - o Observations of unhealthy vegetation were noted during the field surveys. In addition, the relative decadence⁶ of each species and individual were noted. Any potential causes for the unhealthy or dead vegetation, such as fire, insect herbivory, or trimming, were also noted.

These data were analyzed and summarized for each unimpaired comparison river reach. The river miles surveyed along each reach, the type of survey conducted, and the number of transects and plots at the study sites are summarized in Table AQ 10-1.

The specific methods used in the analyses are described below.

Community Composition – The results of the line-intercept and greenline surveys at each of the unimpaired comparison river reaches were used to characterize the dominant species and riparian community types or plant associations along the stream channel and across the riparian zone. The vegetation community types were identified using Potter (2005). The frequency of the occurrence of shrub and tree species present within the riparian corridor was also determined from species data collected in the

⁵ Age class structure was based on categories of shrub stem densities per individual and tree diameters, as follows: Seedlings (S); Young (Y): shrubs with less than 10 stems per individual or trees with diameters (diameter at breast height [DBH]) less than 3 inches; Medium-aged (M): shrubs with between 10 and 60 stems per individual or trees with DBHs between 3 and 9 inches; and Old/Mature (O): shrubs with more than 60 stems per individual or trees with DBHs greater than 9 inches.

⁶ Relative decadence refers to the proportion of dead stems on an individual tree or shrub or of the canopy layer as a whole.

5x2-square-meter paired plots. These data were summarized in tabular format for the unimpaired comparison river reaches and compared to the appropriate bypass and peaking reach. The proportions of hydric species and native species, and species richness were graphically compared among the bypass, peaking, and unimpaired comparison reach study sites.

Age Class Structure and Regeneration – The results of the paired plot surveys, regeneration surveys, and tree core analyses along the bypass, peaking, and unimpaired comparison reaches were used to compare the maturity of the riparian vegetation in relation to the hydrologic regimes. The results of the regeneration surveys (numbers of seedlings and sprouts) were summarized in tabular format. The results of the tree cores analyses (e.g., ages) were also used to identify and compare successful recruitment events along the bypass, peaking, and unimpaired comparison reaches (see description below). The results of the paired plot surveys and rooted elevations of trees and shrubs were used to characterize the position of the riparian vegetation along the channel.

Canopy Structure – Data collected as part of the paired plot surveys were used to describe and compare the canopy coverage of the herbaceous, shrub, and tree layers among the bypass, peaking, and unimpaired comparison reaches.

Riparian Health – Data collected as part of the paired plot surveys were used to characterize and compare decadence within the riparian community among the bypass, peaking, and unimpaired comparison reaches, and identify any obvious damage to vegetation by fire, insect herbivory, or trimming. The average decadence of the shrub and tree canopy layers and dominant species within the riparian corridor were summarized in tabular format. Land use observations were included in the data summary tables and discussed in the results section, as appropriate.

Additional Vegetation Surveys

South and North Fork Long Canyon Creeks – Additional surveys were conducted to compare the riparian vegetation immediately upstream and downstream of the South and North Fork Long Canyon Creek diversions. These surveys were focused on the section of the streams (e.g., immediately downstream of the diversions) where the greatest potential for changes, if any, in riparian vegetation due to hydrology would be expected⁷.

The riparian corridors along South and North Fork Long Canyon creeks were surveyed for approximately ½ mile immediately upstream and downstream of the diversions (Table AQ 10-1). Vegetation data collected included dominant and sub-dominant woody and herbaceous species, canopy cover, and age class present. The substrate was also characterized. A hip chain and Global Positioning System (GPS) were used to

⁷ The study site on South Fork Long Canyon Creek (Map AQ 10-1 and PCWA [2007b]) was located almost a mile downstream from the diversion. Quantitative riparian surveys were not conducted on North Fork Long Canyon Creek upstream of the diversion, as a suitable comparison study site to the reach downstream from the diversion was not found (PCWA 2007b) (Table AQ 10-1).

identify distances from the diversions where transitions in the riparian community were observed. The species information was used to classify the riparian vegetation into plant associations, as defined in Potter (2005). The vegetation (dominant and sub-dominant species, canopy cover by dominant species, and structure information) and substrate were summarized in tabular format. Other observations made in the field, such as locations of large woody debris, channel bars, seeps, or land uses, were also included in the summary table.

Middle Fork American River Peaking Reach – In addition to the transect surveys completed at study sites in the peaking reach (Table AQ 10-1), riparian vegetation composition and structure (dominant woody species) were also mapped at the two AQ 1 – Instream Flow 2-D study sites (MF4.8 and MF14.1 [Table AQ 10-1] [PCWA 2010]) on high resolution aerial photographs in the field. The vegetation mapping was used in combination with the water surface elevation modeling at these specific study sites to evaluate relationships between inundation and vegetation position along the channel (Section 5.2.2.). The vegetation polygons were digitized in Geographic Information Systems (GIS) and maps of the dominant riparian species and age classes at these study sites were developed. The attribute data, including dominant species, ground cover types, and presence of large woody debris, were summarized in tabular format by polygon identification number.

5.1.3. Historic and Existing Land Uses and Recreation Activities at Riparian Study Sites

Historic and existing land uses (e.g., grazing, mining, timber management), recreation activities, and fires at riparian study sites and along the study reaches that may adversely affect riparian resources were summarized based on field observations and information included in earlier reports and documents (e.g., PCWA 2007b).

5.2. RIPARIAN RESOURCES AND HYDROLOGIC REGIME RELATIONSHIPS

The relationship between the riparian vegetation and hydrologic regime at each of the bypass, peaking, and unimpaired comparison reach study sites was evaluated. This evaluation included: (1) characterizing general impaired and unimpaired hydrology patterns at each study site and a few other locations (e.g., downstream ends of reaches); and (2) evaluating vegetation and inundation relationships at study sites, including characterizing successful riparian recruitment events and the position of the riparian vegetation along the stream channel.

5.2.1. Hydrology Patterns

Unimpaired and impaired daily flow data for the bypass and peaking reaches and the North Fork of the Middle Fork American River for water year 1975 through 2007 developed by the Operations Model Technical Team (comprised of PCWA, resource agencies, and other stakeholders) were used. For the North Fork American River NF31.3 study site, flow data from the U.S. Geological Survey (USGS) gaging station 1427000 was used in the analysis.

For North Fork American River NF53.7 study site, a scaling approach was used to calculate the site-specific hydrology based on a comparison of empirical discharge measurements collected during the spring and summer 2008 at the site with 15-minute flow data from USGS gaging station 1427000 (additional information on this calculation is provided in Appendix A).

For each study site, the following hydrology analyses were completed:

- **Annual Hydrology and Attenuation Patterns** – Annual hydrographs of the monthly average daily flows by water year type were developed for different locations along the bypass, peaking, and comparison reaches;
- **Recurrence Intervals** – The Q1.5, Q2, Q5, Q10, and Q25 flows were calculated for impaired and unimpaired flow conditions;
 - o The number of days that the unimpaired recurrence intervals were exceeded under impaired and unimpaired flow conditions by water year type and all years combined, and by year for the period of record was summarized;
- **Timing of High Flows** – The number of days that the unimpaired Q1.5, Q2, Q5, Q10, and Q25 flows were exceeded by month by water year type and all years combined was determined; and
- **Recession Rates (rate of change in stage over time (days))** – Recession rates of spring/early summer flows during the time of spring seed release were evaluated for selected years at the instream flow study sites. Recession rates were evaluated for years that were identified as successful recruitment events based on the tree core analyses (Recruitment Events sub-section) or years with potentially suitable spring flows based on a review of the early spring through summer hydrographs.

5.2.2. Water Surface Elevation Analysis at Riparian Study Sites

Water surface elevation data (stage) were collected over a wide range of discharges to develop stage-discharge relationships at the 17 study sites on the bypass and peaking reaches and unimpaired comparison river reaches (PCWA 2010). Where possible, stage-discharge relationships were developed using the Instream Flow 1-D and 2-D modeling results at the same riparian transects surveyed in 2006. For the 2006 riparian transects not specifically modeled in the Instream Flow study, a stage-discharge relationship from a representative instream flow modeling transect located within the same reach was used (Table B-1). Factors such as the type of habitat unit, proximity to the riparian transect location, and channel geometry were used to select the most appropriate stage-discharge relationship for the riparian transect. Model stage-discharge model development and results for each study site (transect) are described in detail in the AQ 1 – TSR (PCWA 2010).

Vegetation and Inundation Relationships

Changes in inundation characteristics (e.g., frequency, duration, width of inundation) were related to vegetation patterns (e.g., species composition, age structure,

established position) across the surveyed transects. Inundation patterns were also evaluated for the specific time period between May and June, which is the time of spring seed release and seed setting, and spring high flow recession.

At the two AQ 1 – Instream Flow 2-D peaking reach study sites, site maps were created illustrating increases in flow (stage) and vegetation inundation. In addition, representative transects were selected within the two study sites to show relationships between the vegetation lateral distribution across the transect and inundation frequency throughout the year, during May and June seed setting, and inundation stage (water depth).

Recruitment Events (Tree Core Analyses)

Tree cores were collected and dated along seven bypass and peaking river reaches and two reaches on the unimpaired comparison rivers in 2006 and 2007 (Table AQ 10-1 and Map AQ 10-2):

- Rubicon River: R25.7 (RM 25.5–RM 25.8) (2007); R20.9 (RM26.6–RM 21) (2006); R2.6 (RM 2.3–RM 3) (2006);
- Middle Fork American River Bypass Reach: MF29.4 (RM 29.3–RM 29.5) (2006); MF28.6 (RM 28.5–RM 28.9) (2006) ;
- Middle Fork American River Peaking Reach: MF17 (RM 16.3–RM 17.3) (2006); MF4.8 (RM3.9–RM 5.8) (2006);
- North Fork of the Middle Fork American River: NFMF2.3 (RM 2.3–RM 2.8) (2007); and
- North Fork American River: NF31.3 (RM 30.5–RM 31.7) (2007).

The approach outlined in the AQ 10 – TSP was to core and date trees of various species (e.g., cottonwoods, willows, and alders). The analysis, however, focused on white alders because the majority of the trees located in the study reaches was white alders and most willows in the bypass, peaking, and comparison reaches were shrubby (stems too small to core) and could not be dated. Cottonwoods were only present in a few reaches and were a sub-dominant species at those sites. Where present at the tree coring sites, cores were collected from cottonwood trees. However, many of these cores could not be dated as the centers were rotten, which is not uncommon for this species. White alders distributed across the floodplain or bar were selected for sampling. Results from the 2006 tree core analyses were incorporated into the analysis (PCWA 2007b).

Ages of the trees at the study sites were evaluated in relation to the hydrology to identify and characterize successful recruitment events (e.g., magnitude, timing, recession rates). The rooted elevations of the cored trees were related to frequency of inundation at the study sites. Recession rates (inches per day) during the time of spring seed release and seed setting (during the receding limb of the hydrograph) were evaluated for years with successful recruitment events at the bypass and peaking reach study

sites (Hydrology Section). For each study site, a set of recession rate curves were developed (1 inch per day, 1.6 inches per day, 2 inches per day, and 3 inches per day). The curves were developed from an average stage-discharge relationship for the run and low gradient riffle transects (AQ 1 – TSR [PCWA 2010]). These curves were then used to compare recession rates under impaired and unimpaired flow conditions.

Riparian Vegetation Position along Channel

The elevations of the riparian trees along the transects were compared at the bypass, peaking, and unimpaired comparison reach study sites to evaluate the position of the riparian vegetation in relation to the stream channel. Specifically, the elevation at which mature woody riparian vegetation was established; the rooted elevations of the trees dated with the tree cores; inundation width, frequency, and duration along the channel; observations following large flood events; and observations of sediment accumulation or sediment berm formation (if any) within streamside vegetation that could result in a permanent shift in the positions of the channel banks and a narrowing of the stream channel were evaluated.

5.3. RIPARIAN RESOURCES AROUND PROJECT RESERVOIRS

Vegetation ground surveys were conducted at various locations around French Meadows Reservoir, Ralston Afterbay, Middle Fork Interbay, and Hell Hole Reservoir in 2007 to characterize the relationship between riparian resources and WSE at Project reservoir (Table AQ 10-2 and Map AQ 10-3)⁸. The survey methods are summarized below. A more extensive survey of the riparian vegetation was conducted around Hell Hole Reservoir than the surveys completed at the other three reservoirs to provide data needed to assess potential effects of the Hell Hole Reservoir Seasonal Storage Increase Betterment (Section 5.4).

French Meadows Reservoir, Middle Fork Interbay, and Ralston Afterbay

Vegetation data were collected along surveyed transects that were established perpendicular to the water body, starting at the edge of the reservoir pool on the day of the survey and extending to the upland community transition (Map AQ 10-3). Along each transect, line-intercept surveys were conducted to collect vegetation and substrate data, including the dominant and sub-dominant woody and herbaceous species, age classes present, and percent cover. Ten transects were surveyed at French Meadows Reservoir and three were surveyed at Ralston Afterbay. Only one transect was surveyed at Middle Fork Interbay, as the riparian species composition and distribution were observed to be similar (e.g., PCWA [2006]) and established at similar elevations around the reservoir. The reservoir is generally operated at full pool except for a few weeks during the maintenance outage in the fall. During the surveys, locations of ponded water and the location of any drift (e.g., deposited woody debris or other plant material) accumulation along the transects and any seeps within close proximity to the

⁸ Additional vegetation community mapping information is included in the TERR 1 – Vegetation Communities and Wildlife TSR – 2007 (PCWA 2008) and the 2005 Physical Habitat Characterization Study Report (PCWA 2006).

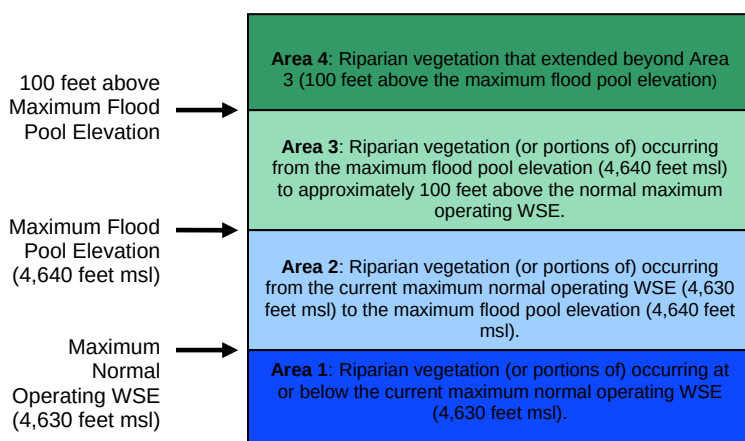
transects were noted. Evidence of other land uses (e.g., grazing and recreation) was also noted. The species information was then used to classify the riparian vegetation into plant associations, as defined in Potter (2005). The plant associations were subsequently graphed along the surveyed transects to illustrate transitions in plant communities with distance and reservoir WSE.

For French Meadows Reservoir, the annual trends in WSEs were summarized for the entire period of record and by water year type from 1975 through 2007. The area surrounding the reservoir that would be inundated by the average June WSE (when the reservoir is at its highest) during wet water years was compared to the area inundated during critically dry water years. The elevations were digitized in GIS and the area within each band was calculated.

Hell Hole Reservoir

Riparian vegetation established around the reservoir perimeter, including along main tributary inflows (Rubicon River, Five Lakes Creek, and a small un-named drainage located in between the Rubicon River and Five Lakes Creek), was identified and mapped on aerial photographs and/or locations were recorded in the field using GPS. Information on species present, age, and substrate was also collected. Photographs of the vegetation along the reservoir and streams were taken in the field. The field maps were then digitized in GIS.

The area (in square feet and acres) covered by riparian vegetation by species (or portion thereof) was then calculated in relation to contour lines representing various elevations associated with current Project operations. These different elevations associated with Project operations are shown on Schematic 1 below.



Schematic 1. Study Area around Hell Hole Reservoir for the Existing Project.

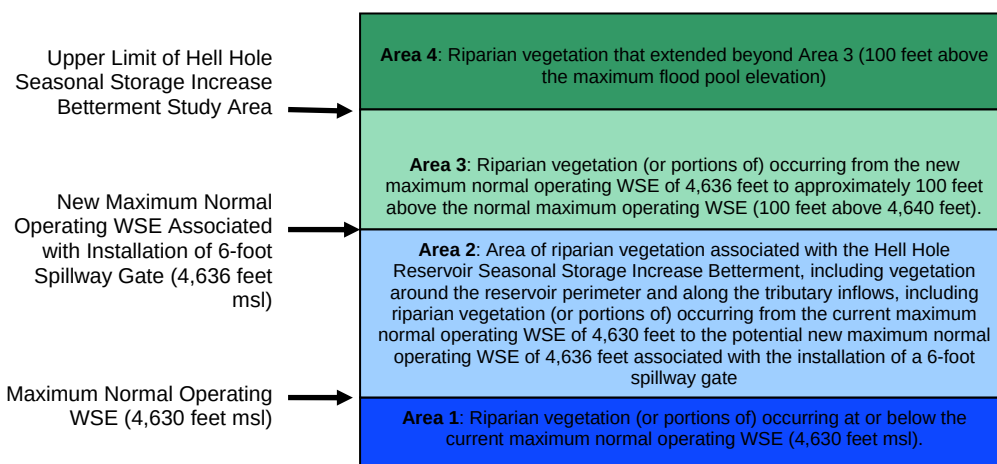
The annual trends in Hell Hole Reservoir WSEs were summarized for the entire period of record and by water year type from 1975 through 2007. The area surrounding the reservoir that would be inundated by the average June WSE (when the reservoir is at its highest) during wet water years was compared to the area inundated during critically dry

water years. The elevations were digitized in GIS and the area within each band was calculated.

5.4. RIPARIAN RESOURCES ASSOCIATED WITH THE HELL HOLE RESERVOIR SEASONAL STORAGE INCREASE BETTERMENT

The riparian vegetation surveys described in Section 5.3 for Hell Hole Reservoir were extended to include new areas around the reservoir and its associated tributaries that would be inundated by the Hell Hole Reservoir Seasonal Storage Increase Betterment. Information collected for these surveys and those described in Section 5.3 will be used to assess the potential effects of the Hell Hole Reservoir Seasonal Storage Increase Betterment on the riparian resources around the reservoir, including along the tributaries.

Under the proposed betterment, PCWA would install a 6-foot inflatable gate at the Hell Hole Dam Spillway to seasonally increase the storage capacity of the reservoir. The acreage of the riparian vegetation (or portion thereof) that could be affected (i.e., seasonally inundated) by installation of 6-foot spillway gates was calculated. A schematic showing elevations associated with installation of a 6-foot spillway gate in Hell Hole Dam is provided in Schematic 2 below.



Schematic 2. Study Area for Hell Hole Reservoir Associated with the Hell Hole Reservoir Seasonal Storage Increase Betterment.

In addition to the mapping described in Section 5.3, vegetation and topography were surveyed along 12 transects on Five Lakes Creek that extended across the existing riparian corridor to the valley walls using belt-transect surveys. These transects were longitudinally distributed upstream from the reservoir to sample the vegetation found at locations with different inundation frequencies under existing operations. Information on riparian corridor width, dominant species, cover, decadence, height, tree and shrub size (diameter at breast height [DBH] and stem sizes), and substrate were collected. The number of seedlings was also counted. In addition, ten cores were collected from

seven trees (some trees had multiple trunks) and dated. Tree cores were collected from all suitable alders, willows, and black cottonwoods along the creek (e.g., large enough to core, without rotten centers). The elevation of each cored tree was surveyed in relation to the surveyed topography. The locations of the trees were mapped in relation to the water surface elevations associated with existing operations and the betterment operations.

5.5. PROJECT MAINTENANCE ACTIVITIES NEAR RIPARIAN RESOURCES

Current Project maintenance activities that are conducted near riparian resources in the Project area were reviewed and summarized.

6.0 STUDY RESULTS

6.1. RIPARIAN RESOURCE CHARACTERIZATION IN THE BYPASS, PEAKING, AND COMPARISON REACHES

This section presents the results of the vegetation analyses, including summaries of: (1) life history strategies of the common woody riparian species; (2) comparisons of riparian community characteristics on the bypass, peaking, and unimpaired comparison river reaches; and (3) historic and recent land use and recreation activities that have occurred or were observed during the surveys at the study sites or along the stream reaches.

A comprehensive plant list of all the species encountered during the various surveys at each study site was developed, including any special-status plants, noxious weeds, and mosses. This list is provided in Appendix C and is an updated version of the one provided in the 2006 Physical Habitat Characterization Report (PCWA 2007b).

6.1.1. Life History Requirements of Dominant Woody Riparian Species

Life history strategies of the common woody riparian species found along the bypass, peaking, and unimpaired comparison study reaches (cottonwood, alder, and willow) are summarized in Table D-1 in Appendix D. The timing of seed dispersal of these common species is summarized in Table D-2.

6.1.2. Riparian Community Characteristics – Comparison of Bypass and Peaking Reaches with Unimpaired Comparison Stream Reaches

The confined valley walls and bedrock and/or coarse substrate that are characteristic of large sections of the bypass and comparison streams and rivers considerably influence riparian abundance and distribution patterns (Tables AQ 10-4 and AQ 10-6; also PCWA 2006 and 2007b). Specifically, riparian vegetation was sparsely or discontinuously distributed along at least 60 percent of the Middle Fork American River from French Meadows Reservoir to Middle Fork Interbay, the Rubicon River, Duncan Creek, Long Canyon Creek, and South Fork Long Canyon Creek bypass reaches. The width of the riparian corridor along the stream channel varied depending on the width of the suitable alluvial substrate, summer water availability, and stages of the winter/spring high flows.

Characteristics of the riparian communities at the bypass and peaking reach study sites (distribution, abundance, species composition, age classes, canopy structure, and vegetation health) were compared with those at suitable study sites on the unimpaired comparison rivers (D9.0, SFLC4.2, NFMF2.3, NF31.3, and NF53.7) (Table AQ 10-5 and Tables E-1–E-8⁹), and are summarized below. Relationships of vegetation and inundation/hydrology and position along the transects are discussed in Section 6.2. Regeneration and young individuals were observed at all bypass, peaking, and unimpaired comparison study sites (Table 10-6). The majority of species encountered in the surveys were native species (Figures AQ 10-2 and 10-3). Typically, the majority (>50 percent) of these species were riparian and wetland species (OBL, FACW, FAC)¹⁰.

Photographs of the riparian corridors; tables summarizing the community composition, age class structure and regeneration, canopy structure, and riparian health data for the unimpaired comparison stream study sites; and additional discussion of the comparisons between the bypass, peaking, and unimpaired comparison reach study sites are presented in Appendix E. Similar information and photographs for the bypass and peaking reach study sites were provided in PCWA (2007b).

Middle Fork American River Bypass Reach – The distributions and abundances of riparian vegetation along the Middle Fork American River between French Meadows Reservoir and Ralston Afterbay and the unimpaired North Fork of the Middle Fork American River were similar, occurring primarily as continuous lines along the channel, where present. Along both rivers, the establishment of riparian vegetation was limited by bedrock and boulder substrate, steep side slopes, and few depositional surfaces available for riparian establishment (Table AQ 10-5). Community composition and age structure were similar along the two rivers. Alders with willows were the common species at the study sites on both rivers (Figures AQ 10-2 and 10-3), and mixed age classes or primarily young and medium-aged vegetation were observed (Table AQ 10-5). No major differences in riparian composition, age structure, canopy structure, or vegetation health were observed between the bypass and unimpaired comparison river reaches.

Middle Fork American River Peaking Reach – Riparian distribution and abundance was greater, with more mature patches in the peaking reach upstream of the confluence compared to the North Fork American River comparison reach and the North Fork American River downstream of the confluence with the Middle Fork American River (Table AQ 10-6). The riparian community composition along the peaking reach and the unimpaired North Fork American River upstream of the Middle Fork American River confluence were similar; both dominated by alders, willows, and cottonwoods (Figure AQ 10-3 and Tables AQ 10-5; F-1 and F-2; Maps F-1 to F-4). Large gravel-

⁹ This information for the peaking and bypass reach riparian study sites was presented in the Habitat Characterization Reports (PCWA 2006 and 2007a). Maps showing the community abundance and age class distributions are also included in those reports. Refer to these reports for additional results and discussion.

¹⁰ OBL: (Obligate): Almost always occur in wetlands (99 percent). FACW (Facultative Wetland): Usually occur in wetlands (67–99 percent). FAC (Facultative): Equally likely to occur in wetlands and non-wetlands (34–66 percent).

cobble bars were present within the two peaking reach study sites (MF14.1 and MF4.8) and the unimpaired comparison study site at NF31.3. At the two peaking reach study sites, large portions of the gravel-cobble bars were relatively sparsely vegetated with various types of herbaceous species (e.g., grasses), and willows and alders along the bar perimeters. Blackberry bushes and California grape were a common understory species and dominated some areas along the stream banks at the study sites in the peaking reach and at NF31.3. At MF4.8, a high-flow channel and seep supported willows and alders within the bar on river-right. Some trees were also established along the straighter sections of the peaking reach study sites and along the cutbanks (Figures F-3 and F4). At the unimpaired comparison study site NF31.3, vegetation was also established along the straighter sections. The woody vegetation at the peaking reach study sites was comprised of a range of size classes, with most of the vegetation comprised of mature or old willows and white alders (75 percent based on area). Although the total area covered by seedlings or young individuals was comparatively small (14 percent), hundreds of seedlings or young trees were often located in a relatively small area (Maps F-5 to F-6; Table F-2). In comparison, along the North Fork American River upstream of the Middle Fork American River confluence, the riparian vegetation was primarily young and medium-aged trees. Vegetation health was similar within the peaking reach and unimpaired comparison river reach.

Rubicon River – The riparian community characteristics in the upper bypass reach (R25.7 and R20.9) reflected changes in the valley and channel morphology that resulted from the 1964 Hell Hole Dam failure and flood, and the subsequent adjustments in channel form and regeneration in response to the impaired flow and sediment regimes after the dam was constructed (Section 6.1.3). Large bars were present within all the study sites (R25.7, R20.9, R3.5, and NF53.7). The bar substrate size at NF53.7 was more similar to the bars at R3.5 than at R20.9. The boulders on the bars at NF53.7 were substantially smaller than those present on the bars at R20.9 (Table AQ 10-4).

Along most of the Rubicon River bypass reach, the vegetation was primarily sparsely or discontinuously distributed. Riparian vegetation was not mapped on the North Fork American River up to the comparison river reach (NF53.7) (Table AQ 10-6). However, based on the study site surveys, the abundance of riparian vegetation along the bar perimeters overhanging the stream margins was greater along the Rubicon River where vegetation was present compared to the NF53.7 study site. At NF53.7, most of the vegetation was established near the bases of the hillslopes. The composition of the riparian community at NF53.7 was similar to that on the Rubicon River (Table E-9). The riparian communities were dominated by alders and willows. In addition, cottonwoods were co-dominant in some reaches on the Rubicon River (Figures AQ 10-3 and Appendix B, B-1). A range of willow and alder size classes, including seedlings and sprouts, were present at the study sites on both rivers. The Rubicon River vegetation was mostly comprised of young and medium-aged vegetation. No major differences in riparian composition, age structure, or health of the riparian trees and shrubs were observed.

South Fork Long Canyon Creek – Riparian vegetation distribution and abundance and community composition and age structure were similar in the bypass and unimpaired

comparison reach (Table E-9). The riparian community was sparsely or discontinuously distributed both upstream and downstream of the diversion. Where present, the white alder-dominated community was primarily distributed as a narrow corridor along the stream banks both upstream and downstream of the diversion. Willows were commonly interspersed, and were more common downstream than upstream of the diversion. Indian rhubarb was abundant in patches downstream from the diversion and was a sub-dominant species within the community upstream from the diversion. Black cottonwood was a component of the riparian community both upstream and downstream from the diversion. At the study sites upstream and downstream of the diversion, all age classes were present, with younger individuals interspersed with a few older ones. The reach downstream from the diversion was a little steeper (3.5 percent) than the surveyed reach upstream from the diversion (2.1 percent) (Table E-9). The channel was braided in the upper portion of the surveyed reach where it flows through an old debris flow; all channels were dry (subsurface flow remained) during the summer 2007 survey. No major differences in riparian health or canopy cover were observed.

North Fork Long Canyon Creek – Very little woody riparian vegetation was present upstream of the diversion; only a few willows and no alders were observed. In comparison, mature willows and willow seedlings were interspersed throughout the riparian corridor downstream from the diversion. From approximately 1/5- to 1/2-mile downstream from the diversion, the woody riparian community was dominated by mature white alders, typically with 100 percent cover within the riparian corridor (Figure AQ 10-3). All age classes were observed downstream of the diversion. The overstory canopies upstream and downstream from the diversion were both dominated by Douglas fir, and Indian rhubarb was common within the channel (Table E-9). The channel substrate was similar upstream and downstream from the diversion, primarily comprised of boulders and cobbles. The reach upstream from the diversion was considerably steeper (7.8 percent) compared to the surveyed reach downstream from the diversion (4.5 percent).

Duncan Creek – Riparian vegetation distribution and community composition and age structure were similar in the bypass and unimpaired comparison study sites. The riparian community was sparse or discontinuously distributed along the majority of Duncan Creek and, where present, was primarily comprised of alders and willows with some cottonwoods interspersed. The riparian corridor was typically narrow, confined by the narrow deposition surfaces along the channel. Indian rhubarb was common within the channel. The riparian communities were fairly young, comprised mostly of young and medium-aged vegetation. The abundance of riparian vegetation was a little greater and occurred in larger patches upstream of the diversion compared to downstream (Table AQ 10-6). The lower sections of Duncan Creek near the confluence with the Middle Fork American River, in particular, are very narrow with few locations where vegetation could establish. No major differences in canopy cover or riparian health were observed.

6.1.3. Historic and Existing Land Uses and Recreation Activities at Riparian Study Sites

Historic and existing land uses (e.g., grazing, mining, timber management), recreation activities, fires, and large floods at riparian study sites and along the study reaches that may affect the characteristics of the riparian resources (e.g., distribution, species composition, age classes) were summarized based on field observations and information included in earlier reports and documents (e.g., PCWA 2007a). Each of these is briefly summarized below.

Mining – Mining activities on the principal tributaries of the American River, including the North Fork and Middle Fork, began in 1848. Exploration occurred further upstream, possibly up to French Meadows Reservoir in the 1850s. Mining also occurred along many of the streams tributary to the Middle Fork American River. The Middle Fork American River is believed to be the most productive placer mining main tributary of the American River. At some locations, the river course was completely altered to expose gold-bearing gravels within the river bed by re-routing the channel through an adjacent bluff. Almost all the bars in the Middle Fork American River were reportedly dredged. Hillsides and channel bars were denuded to supply lumber to build the flumes and other structures needed to support the mining activities. Entire towns were built on the bars for the miners. Small dredging operations continue today in some sections of the Middle Fork American and Rubicon rivers. Mining activities were observed during the field studies along the lower Rubicon River, and the two unimpaired comparison rivers (North Fork of the Middle Fork American River and the North Fork American River).

Grazing – In the vicinity of French Meadows and Hell Hole reservoirs, seasonal sheep and cattle grazing began prior to the 1850s and continues today. In addition, many of the Project facilities and bypass streams lie within the boundaries of or adjacent to a range allotment. Evidence of recent grazing (e.g., scat, browsed vegetation) was observed at French Meadows Reservoir and along the North and South Fork of Long Canyon Creek in the vicinity of the diversions.

Timber Management – Extensive timber harvesting and construction occurred from 1949 through the mid-1980s, and continues today (PCWA 2007a). Recent timber management activities (e.g., cut trees) were observed within or immediately adjacent to the riparian corridor along Duncan, North Fork Long Canyon, and South Fork Long Canyon creeks, lower Rubicon River (e.g., downstream of Long Canyon Creek confluence), and upper Middle Fork American River (MF44.7).

Recreation Activities – During the 1960s, a number of recreational facilities were constructed in conjunction with the MFP. As the Licensee, PCWA is currently responsible for a total of seven single-unit campgrounds, three group campgrounds, three picnic areas, four boat launches, and one scenic vista. The Project recreation facilities are in close proximity to French Meadows Reservoir, Hell Hole Reservoir, Ralston Afterbay, and the South Fork Long Canyon Creek. Non-project recreation facilities in the Project vicinity include numerous Forest Service trails, off-highway vehicle (OHV) staging areas, picnic areas, campgrounds, dispersed recreation areas,

and whitewater boating accesses. Recent recreation activities, including fisherman, fire rings/pits, trampled vegetation, were observed during riparian surveys on the Middle Fork American River on the peaking reach, Duncan Creek, North Fork Long Canyon Creek, Rubicon River, and Long Canyon Creek.

Fires – Large, catastrophic fires have occurred in the MFP. The most recent catastrophic fire, the Red Star Fire occurred in 2001. The fire consumed approximately 17,500 acres of forest within the Eldorado National Forest (ENF) and Tahoe National Forest (TNF) and on private land, including considerable portions of the upper Middle Fork American River watershed (near MF44.7) and through the riparian corridor on upper Duncan Creek. A smaller fire (Ralston Ridge fire) occurred in the Middle Fork American River watershed in 2006, and burned upland areas and portions of the understory within the riparian zone at the 2006 MF-6 and MF-7 study sites (Table AQ 10-1).

Floods – High flows have occurred relatively recently on the Middle Fork American and Rubicon rivers (e.g., 1997 [unimpaired recurrence interval >25 years] and 2006 [unimpaired recurrence interval: 5–10 years]). A time series of aerial photographs taken prior to and after the 2006 high flow at riparian study sites on the Rubicon and Middle Fork American rivers shows the effects of these types of high magnitude flows on the riparian vegetation (Figure AQ 10-4 and Figure 3-14 in the 2006 Physical Habitat Characterization Report [PCWA 2007b]). Substantial amounts of riparian vegetation were scoured (completely removed or knocked down) from near the channel and channel bars during these events.

In addition to these relatively infrequent high flow events (recurrence intervals >five years), an extremely large flood occurred on the Rubicon River in 1964 caused by the failure of Hell Hole Dam during construction. The flood surge associated with the dam failure occurred over approximately one hour, with an estimated mean flow of approximately 260,000 cubic feet per second (cfs) (PCWA 2007b). The geomorphology of the upper Rubicon River watershed below Hell Hole Dam was completely changed, including widening of the stream valley and deposition of coarse, wide bars. These coarse boulder bar deposits support little vegetation. This flood completely removed almost all of the riparian vegetation that was existing along the stream channel.

6.2. RIPARIAN RESOURCES AND HYDROLOGIC REGIME RELATIONSHIPS

This section presents summarizes of: (1) general hydrology patterns for the riparian study sites on bypass, peaking, and unimpaired comparison reaches; and (2) vegetation and inundation relationships, including successful recruitment events and the position of the vegetation along the stream channel.

6.2.1. Hydrology Patterns

Annual hydrology, including frequency, timing, and attenuation of high flows, and recession rates of high flow events for the bypass and peaking reaches are summarized below.

Annual Hydrology, Frequency, Timing, and Attenuation of High Flows

Middle Fork American River Bypass Reach – Project operations have altered flows throughout the year (Table A-1, Tables A-2 to A-13, and Figures A-1 to A-8) in the two sub-reaches below French Meadows Dam and Middle Fork Interbay Dam. High flow events (>unimpaired Q1.5 magnitude flows) that naturally occurred (unimpaired flows) during winter storm events and spring runoff were almost always captured in French Meadows Reservoir. Under unimpaired conditions, the unimpaired Q1.5 magnitude flow events typically occurred during the spring runoff periods, while the larger magnitude flows often were associated with winter storm or reservoir spill events. For existing conditions (impaired), most of the high-flow events occurred during wet water years and were associated with spills from French Meadows and/or accretion flows. Middle Fork Interbay also captured almost all of the spring runoff high flows. Flow accretions from the surrounding sub-watersheds resulted in a more unimpaired seasonal flow pattern (high winter/spring flows and lower summer/fall flows) and a few more days of higher flows in the lower sections of the two sub-reaches compared to immediately downstream of both dams. In the summer and fall seasons, flows were often equal to or greater than unimpaired conditions as water was released from storage to meet minimum instream flow requirements.

Middle Fork American River Peaking Reach – Intra- and inter-day flows fluctuated daily due to releases from Oxbow Powerhouse to meet power demands or to support whitewater recreation. Project operations resulted in daily flow fluctuations between the minimum flow requirement (75 cfs) and the capacity of the Oxbow Powerhouse (1,025 cfs). In the summer, average daily flows were relatively high compared to the unimpaired flows as a result of releases from Oxbow Powerhouse, and substantially higher than those in the North Fork American River comparison reach. Under current operations, the frequency and duration of high-flow events, associated with spring runoff (>unimpaired Q1.5 magnitude flows) have been reduced and the timing of the unimpaired Q1.5 magnitude events has been shifted, with more flows of this magnitude occurring in the winter compared to later in the spring (Table A-1, Tables A-14 to A-22, and Figures A-9 to A-14). Partly due to unimpaired inflows to the top of the reach from the North Fork of the Middle Fork American River and other accretion inflows, winter high flows were very similar for both impaired and unimpaired conditions. In the lower section of the peaking reach, inflows from the North Fork of the Middle Fork American River and North Fork American River, as well as smaller tributaries, resulted in a more unimpaired seasonal flow pattern (high winter/spring flows and lower summer/fall flows).

Rubicon River – The frequency, duration, and timing of high flow events (>unimpaired Q1.5 magnitude flow) have been modified by current operations, particularly in the upper portions of the bypass reach (Table A-1, Tables A-23 to A-31, and Figures A-15 to A-20). Flows were typically reduced and more stable during the winter/spring/early summer season. Immediately downstream from the dam, high flows primarily occurred in the wettest years, often associated with winter storm events and spills from Hell Hole Reservoir, and were of substantially shorter duration and magnitude than the unimpaired flows. Under unimpaired flow conditions, the majority of the unimpaired Q1.5 magnitude flows occurred in the spring, while the unimpaired Q.2 magnitude flows occurred in the winter and spring. Flows equal to or greater than the unimpaired

Q.5 magnitude flows were almost always associated with winter storm events. Under impaired conditions, with increased distance downstream, tributary inflows resulted in an increased frequency of the unimpaired Q1.5 magnitude flows and produced a more unimpaired seasonal hydrograph pattern (high winter/spring flows), albeit with lower magnitude. In the summer and fall seasons, flows were often equal to or greater than unimpaired conditions as water was released from storage to meet minimum instream flow requirements.

Long Canyon Creeks – On the Long Canyon creeks (South Fork and North Fork Long Canyon creeks and Long Canyon Creek near RM 9.0 and the Rubicon River confluence), almost all the impaired high flow events (>unimpaired Q1.5 magnitude flows) occurred in wet and above normal water years, with the highest flows occurring during the wettest years (Table A-1, Tables A-32 to A-43, and Figures A-21 to A-28). The impaired and unimpaired high flow frequency and timing patterns were similar during wet water years when the winter storm events and spring runoff often exceeded the capacity of the diversion facilities. During above normal water years, current operations have reduced the frequency and durations of these high flow events. The large, scouring events (e.g., >unimpaired Q5 flow magnitudes) were not captured by the diversion facilities and continued to flow downstream. During the summer/fall season, the diversions were not operated and unimpaired flow was passed downstream into the bypass reaches.

Duncan Creek – Under unimpaired flow conditions, the majority of flows that exceeded the unimpaired Q1.5 magnitude flow occurred in wet and above normal water years (Table A-1, Tables A-44 to A-49, and Figures A-29 to A-32). Current operations have reduced the frequency and duration and shifted the timing of high-flow events (>unimpaired Q1.5 magnitude flow) in wet and above normal water years, particularly in the upper portions of the bypass reach. Few high flows occurred in above normal years under current operations. Most of the spring runoff high flows that were between the unimpaired Q1.5 and Q2 magnitude flows were captured by the diversion facilities, such that a greater proportion of the flows occurred in the winter compared to unimpaired conditions when more occurred during the spring runoff season. Near the bottom of the bypass reach, contribution from accretion flows resulted in an increase in the number of flows occurring during the spring runoff period, as well as a relatively seasonal flow pattern (high winter/spring flows and lower summer/fall flows). The timing of the unimpaired Q2 magnitude flows was similar between the unimpaired and impaired hydrology. Most of the flow associated with the largest, scouring events was not captured by the diversion facilities and continued to flow downstream. During the summer/fall season, the diversion was not operated and unimpaired flow was passed downstream into the bypass reach.

Unimpaired Comparison Rivers – Average monthly flows for the unimpaired comparison river reaches are presented in Figures A-33 to A-38. The number of days that the Q1.5, Q2, Q5, Q10, and Q25 flows were exceeded by month for the comparison river reaches is provided in Tables A-50 to A-58.

Recession Rates

On the larger Project rivers and Duncan Creek, recession rates during the end of the receding limb of the spring snowmelt hydrograph, which coincides with the timing of spring seed release and seed setting (early May to late June), were generally faster than unimpaired flow conditions, particularly in wet water years, and decreased with distance downstream. On the Long Canyon Creek bypass streams, impaired flow recession rates were generally fairly slow and within the ranges for high seedling survival success identified in the literature (<1.6 inch per day) (Figure A-39) (Tables D-1 and D-2). The receding limbs of spills were also typically slower during above normal water years. Recession rates are discussed for each bypass reach below.

Middle Fork American River Bypass Reach – Immediately downstream from French Meadows Dam, recession rates during the evaluated years were typically fast in wet and above normal water years (at least 3 inches per day) compared to unimpaired recession rates for the same events (<1.6 inches per day) (Figure A-39). At the lower end of the reach, rates were generally still approximately 3 inches per day during wet water years, but were typically slower in above normal water years (1 to 2 inches per day). Downstream of Middle Fork Interbay, recession rates were variable, ranging from less than 1.6 inches per day to greater than 3 inches per day. Unimpaired recession rates for the same events were slower (1 to 1.6 inches per day).

Middle Fork American River Peaking Reach – Impaired recession rates during wet water years were typically between 1 to 2 inches per day. Impaired recession rates during above normal water years were generally a little slower. Spring flows in the peaking reach included unimpaired flows from the North Fork of the Middle Fork American River and the North Fork American River.

Rubicon River – Impaired recession rates during wet water years at all sites were typically fast (3+ inches per day) (Figure A-39). During above normal water years, recession rates were generally slower (1 to 1.6 inches per day) and were within the range for high seedling survival success (except for at R25.7, where no high spring flows occurred during above normal water years). Impaired recession rates also typically decreased with distance downstream with accretion flow additions. Unimpaired flow recession rates were slow, generally about 1 inch per day.

Long Canyon Creeks – On the Long Canyon Creek bypass reaches, recession rates of the selected events were the same or very similar under impaired and unimpaired conditions (Figure A-39). Winter and early spring flows may have been captured during those years, but during the “big” water years, spills occurred in the late spring and early summer that maintained appropriate recruitment flow recession rates (Figure A-39) (Tables D-1 and D-2).

Duncan Creek – Recession rates typically decreased with distance from the diversion. At D6.3, recession rates were generally between 2 and 3 inches per day (some years, rates were a little faster, other years a little slower) and were typically faster than would have occurred under unimpaired flow conditions. Impaired and unimpaired recession

rates at the bottom of the reach near the confluence with the Middle Fork American River were similar (about 1 to 2 inches per day [Figure A-39]).

6.2.2. Water Surface Elevation Analysis at Riparian Study Sites

Vegetation and Inundation Relationships

Channel and floodplain inundation (frequency and duration) along the surveyed transects at the unimpaired comparison and bypass reach study sites and in the 2-D peaking reach-study sites was characterized with respect to the position of the vegetation and species composition (Figure B-1) and age class structure (Figure B-2). Figure B-1 also shows graphs for each study site that show how wetted width and stage change on the transects with increases in flow at each of the study sites. The main findings of the inundation patterns along the surveyed transects are summarized below.

- The difference in inundation characteristics (e.g., inundation width, inundation frequency and duration, and water depths) between impaired and unimpaired flow conditions on the bypass, peaking, and unimpaired comparison rivers depended on the topographic characteristics of the channels at the study sites (e.g., steepness of stream banks, confined canyon).
 - o At most of the study sites, the extent of inundation (or width of inundation) was typically similar under impaired and unimpaired flow conditions up to the highest modeled flow (approximately unimpaired Q2).
 - o In the narrower stream sections on both the small and large streams, the width of inundation was relatively narrow beyond the summer base flow channel under both impaired and unimpaired flow conditions. Few areas with suitable substrate, available water, or protection for riparian vegetation from scouring high flows to establish existed in these types of reaches.
 - o In wider reaches on the bypass reaches, the width of inundation was often similar under unimpaired and impaired flow conditions. However, inundation frequency and duration under unimpaired flows were often greater than under impaired flows adjacent to the channel, particularly in May and June. In many of these reaches, the substrate further away from the channel was bedrock and/or boulder and would not be favorable for riparian vegetation establishment.
- The riparian vegetation at some study sites was also supported by sources of water other than the stream. In the steep and confined reaches, runoff from side slopes recharge the ground water table and support the existing riparian vegetation on alluvium at the base of the side slopes. Prominent seeps that also recharge the ground water and support riparian vegetation were observed at a few study sites (e.g., D6.3, MF44.7, and R20.9). Side channels and high-flow channels were present in a few of the study sites (e.g., R25.7, MF26.2, and the peaking reach study sites). These side channels provide flow and moisture to established vegetation at flows lower than those required to overtop the stream banks. Riparian vegetation was often observed along these features.

- Impaired summer/early fall flows were often a little higher than those that would have occurred under unimpaired flow conditions on the Middle Fork American River peaking and bypass reaches and the Rubicon River, providing a source of water during potentially limiting time periods under unimpaired flow conditions.

The inundation characteristics at the bypass and peaking reach study sites and the position of the riparian vegetation in relation to inundation are discussed and compared with the appropriated unimpaired comparison study site below.

Vegetation and Inundation Relationships by Reach

Middle Fork American River Bypass Reach – At the two study sites in the sub-reach below French Meadows Dam (MF44.7 and MF36.2), the greatest change in the width of inundation and depth (stage) occurred as flows increased from base flows up to approximately 400+ cfs (30 to 60 feet increase in width and a 5–6 feet increase in depth). As flow magnitudes increased above 400+ cfs up to approximately the unimpaired Q2 flows, the width of inundation and depth increased more slowly (approximately 10 feet in total width and 2 feet in depth) (Figure B-1). The width of inundation was also greater under unimpaired flow conditions than impaired conditions at the upper study site, but was similar at the lower end of the sub-reach (MF36.2) due to accretion flows (Figure B-1). At all the bypass reach study sites, the frequency and duration of inundation were greater under unimpaired flow conditions than impaired conditions, particularly in May and June.

In the sub-reach downstream of Middle Fork Interbay, the width of inundation was similar under impaired and unimpaired flows, as elevations increased fairly quickly with distance from the channel. In sections of the river where the stream banks were less steep and elevations rose more gradually away from the channel (e.g., MF26.2, Transect 3), the frequency and duration of inundation along the channel was greater under unimpaired than impaired flow conditions, particularly in the spring (May and June). In the summer and fall seasons, water availability under existing operations was often equal to or greater than unimpaired conditions, as water was released from storage to meet minimum instream flow requirements (Appendix A). Similar to the sub-reach upstream of Middle Fork Interbay, the greatest change in width of inundation and depth occurred as flows increased from base flows up to approximately 400+ cfs (30 to 60 feet in width and approximately 3 feet in depth).

Most of the willows in the bypass reach and the unimpaired comparison river site (NFMF2.3) were established near or within the low flow channel where they were frequently inundated (Figure B-2). The dated alders within the sub-reach between Middle Fork Interbay and Ralston Afterbay that established following the high 1997 flows were rooted at elevations that corresponded to the stages of the spring flows that occurred during the subsequent years (Table G-1), and at elevations with similar inundation frequencies to dated trees at NFMF2.3.

Middle Fork American River Peaking Reach – At MF4.8 and MF14.1, the channel width inundated by impaired and unimpaired flows (up to 20,000 cfs) was similar (Figure F-1). The duration of inundation was a little more (5–20 percent) in May and June on the wider transects under unimpaired flow conditions than impaired flow conditions. Inundation duration, however, was often greater on average under impaired than unimpaired conditions near the channel due to the elevated flows during the summer. The large bars at the two study sites were not inundated up to 6,000 cfs at MF14.1 and 8,000 cfs at MF4.8 due to the high elevations of the bar surfaces. At MF4.8, the back portion of the bar was inundated as flow entered the bar through the high flow channel starting at flows between 1,000 and 3,000 cfs.

Most of the vegetation at the peaking reach study sites was established at elevations that would be inundated at flows between 80 and 1,000 cfs. The species at these lower elevations were typically alders and willows, with black locust interspersed. Cottonwoods tended to be found in the comparatively narrower sections of the reach or along the high flow channel at MF4.8, and at higher elevations than the willows and alders (Figure F-2). At the NF31.3 comparison site where the bars generally gradually sloped away from the channel, the dominant riparian species (willows, white alders, and Fremont cottonwood) were distributed at different elevations on the bars. The willows were established at closest to, and sometimes within the channel. White alders were established at higher bar elevations compared to the willows, and the Fremont cottonwood trees were established farthest from the channel (Figures F1 and F-2).

Rubicon River – The inundated width and frequency and duration of inundation in areas adjacent to the channel at both the upper Rubicon River bypass study sites (R25.7 and R20.9) were typically less under impaired than unimpaired flow conditions, particularly during the receding limb of the hydrograph (May and June) (Figure B-1). In the summer and fall seasons, water availability under existing operations was often equal to or greater than unimpaired conditions, as the minimum instream flow requirements were often a little greater than unimpaired flows (Appendix A).

At R25.7, the width of inundation increased between 40 and 120 feet as flows increased from base flows to approximately 600 cfs, and increased comparatively less (10-25 feet) as flows continued to increase up to approximately 3,600 cfs. Depths increased by approximately 4 feet as flows increased from base flows to 600 cfs, as well as with flow increases from 600 cfs to 3,600 cfs.

At R20.9, the canyon was more confined compared to the upstream study site at R25.7. Tributary inflows (e.g., South Fork Rubicon River, Deer Creek) produced a more seasonal hydrograph flow pattern (high winter/spring flows) than occurred at R25.7, albeit with lower magnitudes than unimpaired flow conditions (Figures A-17 and A-19). The inundated width increased less with greater flows compared to R25.7 with flows up to 600 cfs (20 to 30 feet) due to the steeper stream banks. Depths increased between 3 and 4 feet with increased flows up to 600 cfs. As flows increased from 600 cfs to 4,000 cfs, the width of inundation increased from 5 to 20 feet in total and depths increased 3 to 5 feet. Similar to the upper study site, the bars were inundated only during infrequent high events due to the high elevations of the bar topography.

In the most downstream study site at R3.5, the stream channel was wider and stream banks were less steep compared to the study sites further upstream (R25.7 and R20.9). Accretion flows produced a more natural hydrograph shape than the study sites upstream. The width of inundation increased by up to 120 feet as flows increased from base flows to approximately 1,200 cfs due to the more gradually sloping banks compared to the upstream study sites. Depths increased by approximately 3 feet. The rate of change in width and depth in relation to increased flow magnitudes was slower with greater flows (when flows increased from 1,200 cfs to 3,400 cfs, width increased between 20 and 40 feet in total and depth increased 2 to 3 feet) (Figure B-1).

The position of the vegetation was different at most of the Rubicon River study sites (particularly R25.7 and R20.9) compared to the comparison river study site NF53.7. At the Rubicon River study sites, white alders and willows were established at two main elevational bands at the time of the surveys – at slightly higher elevations that were infrequently inundated under impaired flow conditions or within the stream channel or immediately adjacent to the summer low flow channel along the perimeters of large, coarse sparsely vegetated bars (Table AQ 10-5). At R25.7 and R20.9, the majority of the dated alder trees established after the 1997 high flows, at elevations that corresponded to low magnitude spills that occurred during subsequent years (less than 6 feet above the base flow water elevation). A few trees were dated that were established at the higher elevations (Table G-1). These trees were typically older than the trees that were established at lower elevations (early 1970s), and have survived the high flow spill events that have occurred since that time. Some riparian trees at R20.9 were also established at the base of the hillslopes on small colluvial deposits and supported by seeps. In comparison at NF53.7, the majority of the individuals and the larger trees and shrubs were established towards the rears of the bar near the base of the hillslopes (Figures B-1 and B-2). Only relatively young individuals and seedlings were typically observed along the outer edges of the bars near the stream channel. In the narrower sections of the NF53.7 study site where no bars were present, the riparian vegetation was established near the summer base flow water's edge and extended to the valley wall.

The alders at R3.5 were established farther away from the active channel compared to the bypass reach study sites upstream, and likely reflects the individuals that survived the high flows in 2005 and 2006 that scoured and/or damaged much of the vegetation that had been observed near the channel prior to these events (Figure AQ 10-4). Similar to the two upstream study sites, the majority of the dated alders established following the 1997 high flow event (Table G-1).

Long Canyon Creeks – At NFLC1.9 and SFLC2.3, the width of inundation adjacent to the stream channel increased by approximately 10–15 feet with increased flow from base flows up to 20–30 cfs, respectively, and then increased minimally with greater flows up to the unimpaired Q2 flows (approximately 5 feet). Water depths increased by less than 2 feet with increased flows up to the unimpaired Q2 flows (Figure B-1). The width of inundation and inundation frequency and duration were very similar across the surveyed transects under impaired and unimpaired flow conditions. Along all three creeks (including Long Canyon Creek), there was a relatively narrow transition zone

between areas that were infrequently and frequently inundated where most of the vegetation was established along the transects. In some sections of South Fork Long Canyon Creek where lower gradient features were present adjacent to the channel (e.g., SFLC2.3, Transect 2.3), this transition zone was wider (<10 feet) and the frequency and duration of inundation along the channel margins was greater under unimpaired than impaired flow conditions (Figure B-1).

Inundation during higher magnitude flows was similar under impaired and unimpaired flow conditions because these peak flows typically were not diverted (Appendix A). The diversions were not operated in the summer; therefore, summer water availability was the same under impaired and unimpaired flow conditions. Alders were established at elevations that ranged from frequently inundated (near the water's edge) to elevations that were only periodically inundated each year (Figures B-1 and B-2). Willows were established at lower elevations near the low flow stream channel.

At SFLC4.2 comparison study site, alders and willows were established at elevations similar to those at the study site downstream of the diversion (Figure F-2).

Duncan Creek – At most cross-sections in the D6.3 study site, impaired inundation frequency and duration decreased relatively quickly with distance from the channel. The width of inundation on average increased between 10 to 60 feet with flows greater than base flows up to approximately 100 to 120 cfs. Increases in depths ranged from 2 to 6 feet, depending on the channel characteristics. At greater flows up to 400 cfs, wetted widths increased minimally (<5 to 10 feet) and depths increased from 2 to 4 feet in total (Figure B-1). In the narrower stream transects with steep banks (e.g., D6.3, Transect 3 (left bank) and D9.0, Transect 3), inundation frequency was minimal beyond the low flow channel under impaired and unimpaired flows due to the confined valley bottom and steep side slopes. In comparison, at the wider transects at D6.3, although the width of inundation was similar under impaired and unimpaired flow conditions, inundation frequencies and durations were reduced under impaired flow conditions, particularly during the receding limb of spring hydrographs (May and June, Figure B-1). Inundation during higher magnitude flows (>Q1.5) would be expected to be similar under impaired and unimpaired flow conditions as these peak flows typically were not captured (Appendix A). Flow depths increased with flow magnitude increased (Figure B-1).

Water availability and instream flows during the summer and fall were the same under impaired and unimpaired flow conditions, as the diversion was not operated at this time.

At D6.3 and D9.0, alders were often established over a range of elevations from the water's edge to the base of the hillslopes. At D9.0, willows were established near or within the stream channel. In comparison, willows were established across the riparian zone at D6.3 (Figure B-2).

Recruitment Events (Tree Core Analyses)

The frequency and types of successful recruitment flow events at the study sites were similar for the dated riparian trees on the bypass, peaking, and unimpaired comparison reaches. The majority of the dated trees established during years following particularly high magnitude winter events (e.g., 1986 and 1996–1997) (recurrence intervals greater than every 5–10 years) that scoured banks and bars, and prepared seed beds. These events were then followed by relatively moderate to low peak winter and spring flows with fairly slow recession rates during the subsequent years (<unimpaired Q1.5 magnitude flows) that provided sufficient moisture to the seedlings and sprouts, but were not large enough to scour the new individuals (Figures G-2 - G-4 and Table G-1). The trees established at elevations along the streams where summer water was available, as well as survive winter/spring scouring flows (Figure G-5 and Table G-1). A few trees were dated from the early 1970s at R25.7 and NFMF2.3, and many of these were rooted at higher elevations than those that established more recently (Table G-1). Earlier events may have also had suitable conditions for riparian recruitment at the study sites, but it is possible that trees established during these events were scoured by more recent events. Appendix G provides a brief discussion of recruitment related to willows, alders, and cottonwoods.

Recruitment along each of the reaches where tree core analyses were completed is summarized in Appendix G. The summarized tree core data and associated hydrology for the period of record (1975 to 2007) is provided in Appendix G. The tree core results are presented in Table G-1 and a comparison of the number of trees dated and the cumulative distribution established per year on the Middle Fork American River, Rubicon River, and the unimpaired comparison rivers are shown in Figure G-1. The successful recruitment events for each river are graphed in relation to the hydrology in Figures G-2 to G-4. The locations of the tree core sites are shown on Map AQ 10-2. The relationship between the rooted elevation of the dated trees above the summer base flow and inundation is shown in Figure G-5 and summarized in Table G-1 (for all years, wet and above normal water years, and drier years).

Encroached Vegetation

The position of the riparian trees along the bypass and peaking reach channel margins and the appropriate unimpaired comparison study site are discussed and compared below.

Middle Fork American River Bypass Reach –Along the majority of both of the Middle Fork American River bypass sub-reaches (French Meadows Dam to Middle Fork Interbay and Middle Fork Interbay to Ralston Afterbay), the vegetation along the stream margins was established at similar locations (elevations and inundation frequency ranges) as that which was established at the unimpaired comparison study site NFMF2.3. Along the sub-reach downstream of Middle Fork Interbay where tree cores were analyzed, some trees were established closer to the low flow channel (e.g., MF28.6) compared to the unimpaired comparison reach on NFMF2.3 (Table G-1). The elevations at which most of these trees were rooted reflected the magnitude of

moderate to small magnitude spills that occurred after a high magnitude scouring event (e.g., 1997) (Figure G-2). The Middle Fork American River bypass reach is characterized as supply-limited. These types of channels are able to transport more material than is supplied by the river, resulting in mixed bedrock-alluvial channels with limited storage of colluvial and alluvial materials in the channel or the valley bottom (PCWA 2007b). Sediment accumulation (sediment berms) was not observed within the established vegetation along these reaches (Figures B-1 and B-2 and Figure G-5).

Middle Fork American River Peaking Reach – In the peaking reach, the amount of vegetation was greater and typically occurred in larger corridors and closer to the channel than the comparison North Fork American River. However, the amount of summer water available (approximately 1,000 cfs in the peaking reach compared to approximately 40–100 cfs on the North Fork American River, depending on water year type) was a significant difference in the hydrologic regime between these two rivers. In drier years in particular on the North Fork American River, seedlings need to establish relatively close to the channel to survive through the summer, and consequently are eroded by subsequent spring and winter flows. In comparison, seedlings along the peaking reach can establish a little farther away from the channel and still survive through the summer due to the higher summer low flows, and therefore, are not as susceptible to scouring during spring flows. In addition, high winter flows have occurred in the peaking reach, which do mobilize bar substrate and periodically scoured vegetation when the events occurred (e.g., few really old trees were observed or dated during the studies and Figure AQ 10-4). Excessive sediment deposition within the vegetation and berm development were not observed.

Rubicon River – The riparian vegetation at the upper Rubicon River bypass reach study sites (R25.7 and R20.9) was established closer to the low flow channel compared to the study site on the North Fork American River (NF53.7) (Figures B-1 and B-2 and Figure G-5). Riparian vegetation was also established closer to the low flow channel in certain locations in the lower Rubicon River bypass reach (e.g., near RM0.8 to 1.4) compared to the unimpaired comparison reaches, but this was not observed throughout most of the reach. The elevations at which the majority of the vegetation was rooted on the Rubicon River reflected the magnitude of moderate to small magnitude spills that occurred after a high magnitude scouring event (e.g., 1997) (Table G-1 and Figure G-3). At the upper Rubicon River study sites (R25.7 and R20.9), these elevations were located adjacent to the channel or on the perimeters of the large bars (Table G-1).

Some sediment accumulation was observed within the vegetation at the upper study sites (R25.7 and R20.9) along the edges of the bars, but no berms have formed due to vegetation-induced sediment accumulation. Sediment sources are limited in the upper section of the Rubicon River due to Hell Hole Dam and few tributary inflows, which would be expected to limit the amount of sediment that can accumulate and form new banks. The channel and position of the vegetation may still be adjusting to the channel and valley geomorphic changes caused by the Hell Hole Dam failure and the impaired flow regime. Sediment accumulation (sediment berms) was not observed within the R3.5 reach.

The potential for increased sediment accumulations within the vegetation line or adverse effects on instream habitat quality depends on the frequency of the large, flashy winter storm flows that “reset” the riparian community, as well as the potential to store sediment. Recent high flows have occurred on the Rubicon River (e.g., 2005 and 2006) that scoured vegetation or knocked it down, particularly at R3.5 (Figure AQ 10-4). In addition, the Rubicon River is characterized as supply-limited. These types of channels are able to transport more material than is supplied by the river, resulting in mixed bedrock-alluvial channels with limited storage of colluvial and alluvial materials in the channel or the valley bottom (PCWA 2007b).

Small Bypass Streams (Duncan Creek, South Fork Long Canyon Creek, North Fork Long Canyon Creek, and Long Canyon Creek) – No discernable differences in vegetation composition, age structure, or coverage were observed during the surveys conducted upstream and downstream of the diversions on the North Fork and South Fork Long Canyon creeks. Along the majority of the length of these bypass reaches, inundation frequency and duration and the width of inundation were similar up to the unimpaired Q2 magnitude flow. Inundation would also be expected to be similar or the same at higher magnitude flows as these peak flows, particularly the flashy, high peak magnitude winter flows, typically were not captured by the diversions. Vegetation that may have established near the channel would likely be scoured during these large magnitude events.

Low flow conditions (flows less than the minimum instream flows) in the small bypass streams are not affected by the Project. These conditions occur during the summer and fall, and periodically during the winter and spring during the drier years. Herbaceous species, such as Indian rhubarb were common within the bypass and unimpaired comparison reach channels, and sedges and grasses were similarly established along the low flow channel margins in the summer. Sediment accumulation within established vegetation that might form new banks or berms was not observed at the study sites.

6.3. RIPARIAN RESOURCES AROUND PROJECT RESERVOIRS

Riparian vegetation was surveyed and related to water surface elevations at the Project reservoirs¹¹. The main findings of the surveys are summarized below.

French Meadows Reservoir

The surveys were completed in late August and early September 2007 (dry water year) when the reservoir was drawn down to approximately 5,214 to 5,220 feet mean sea level (msl) (Figures H-1 and H-2, Map H-1). The maximum reservoir WSE in 2007 was 5,244 feet msl (May 24–June 2, 2007). The maximum reservoir WSE is 5,262 feet msl (high water mark).

Along the shoreline, willows and mature vegetation were established at elevations that typically would be inundated in June and become exposed in late June or early July (approximately 5,252 to 5,256 feet msl) (Figure H-1). Willow seedlings, sedges, and

¹¹ Other vegetation community types were surveyed as part of the TERR 1 – TSR (PCWA 2008).

other herbaceous species were found at lower elevations, near the high WSE for 2007. Upland vegetation was established at elevations higher than the maximum operating WSE (5,262 feet msl). Evidence of grazing was observed at all the transects at the upper most portion of the reservoir.

Water surface elevations during water year 2007 (Figure H-3) and graphs summarizing the annual and inter-annual fluctuations in WSEs from 1975 through 2007 are provided in Figures H-4 and H-5. Most of the difference in area inundated in June of wet (with WSEs of 5,259 feet msl) and critically dry (WSEs of 5,222 feet msl) water years around the reservoir occurs at the upper end of the reservoir where the Middle Fork American River flows into reservoir. This is the same area where the riparian transect studies were focused (Map H-2).

Middle Fork Interbay

Minimal riparian vegetation was present along the south side of the reservoir. On the north side of the water body, the riparian vegetation generally occurred as a narrow discontinuous line (PCWA 2006). It was comprised primarily of alders with some willows interspersed. The alders were established along the water's edge, while the willows occurred within a broader elevational range above the water's edge (approximately 10 feet) (Figure H-8, Map H-6). Under existing operations, WSEs were typically kept relatively constant in Middle Fork Interbay (approximately 2,524 to 2,527 feet msl).

Ralston Afterbay

In general, the riparian vegetation along the Ralston Afterbay surveyed transects was comprised of alder and willows, with a few cottonwoods interspersed (Figure H-7, Map H-5). The island near the dam and wider areas around the north side of the reservoir (e.g., at the confluence with the Middle Fork American River and just upstream of the dam) were vegetated with mature alders and willows. Along the perimeter of Ralston Afterbay where riparian vegetation was present, willows were established from just below the typical WSE (1,171 feet msl) to approximately 3 feet above it. Cottonwoods and alders were established at slightly higher elevations (approximately 3 feet to 6 feet higher (1,174 to 1,177 feet msl). At other areas where riparian vegetation was present, it typically was observed to be established at similar elevations as the survey locations. Under existing operations during most water year types, the WSE in Ralston Afterbay was kept between 1,169 to 1,175 feet msl.

Hell Hole Reservoir

Riparian vegetation around the Hell Hole Reservoir shoreline and main tributary confluences is shown by species in relation to various elevations associated with current Project operations in Map H-3. Attributes of the riparian vegetation by numbered polygon which corresponds to those labeled on Map H-3 are summarized in Table H-1.

The majority of the riparian vegetation was established in the upper one-third of the reservoir near the Five Lakes Creek and Rubicon River confluence areas. Little riparian

vegetation was present along the shoreline of the lower two-thirds of the reservoir where there is little suitable substrate to support riparian vegetation. The majority of the riparian vegetation present along the shoreline and the main tributary confluences was established below the maximum normal operating WSE (4,630 feet msl). The areal coverages of each species at different elevations (Section 5.2) are summarized in Table H-2. The vegetation within each of the survey areas is summarized below.

- **Area 1** (below the maximum normal operation WSE 4,630 feet msl) includes a total of 2.4 acres of woody riparian vegetation on the tributaries that flow into Hell Hole Reservoir (primarily on Five Lakes Creek). The most common species were willows, with alders and black cottonwoods. Along the shoreline, approximately 6 acres (260,643 square feet) of woody riparian vegetation was mapped. The vegetation was primarily comprised of willows.
- **Area 2** (between the maximum normal operating WSE [4,630 feet msl] and the maximum flood pool elevation [4,640 feet msl]), woody riparian vegetation was only established along Five Lakes Creek (0.20 acre) and around a small portion of the reservoir perimeter (0.08 acre [3,274 square feet], composed primarily of willows).
- **Area 3** (above the maximum flood pool elevation [4,640 feet msl] to 100 feet above the maximum flood pool elevation), a few small areas of woody riparian vegetation were established on the Rubicon River (0.05 acre [2,304 square feet] and Five Lakes Creek [0.07 acre, 3,068 square feet]). No woody riparian vegetation was present at these elevations on the un-named tributary or around the Hell Hole Reservoir shoreline.
- No riparian vegetation extended beyond Area 3 (above 100 feet above the maximum flood pool elevation).

Graphs summarizing the annual and inter-annual fluctuations in WSEs from 1975 through 2007 are provided in Figure H-5 and H-6. Most of the difference in inundated area in June of wet (WSEs of 4,625 feet msl) and critically dry (WSEs of 4,558 feet msl) water years occurs at the upper one-third of the reservoir where the majority of the riparian vegetation was mapped (Map H-4).

6.4. RIPARIAN RESOURCES ASSOCIATED WITH THE HELL HOLE RESERVOIR SEASONAL STORAGE INCREASE BETTERMENT

The Hell Hole Reservoir Seasonal Storage Increase Betterment will increase the storage capacity of Hell Hole Reservoir approximately 7,600 acre-feet. The betterment would increase the maximum operating elevations six feet (from 4,630 to 4,636 feet msl) during the spring and summer. The betterment would result in a greater area of inundation around the reservoir and within the tributary inflows into the reservoir (e.g., the Rubicon River and Five Lakes Creek), as well as change the timing of when areas will be inundated during years when sufficient runoff is available for capture (predominantly wet water year types). Refer to Appendix I for additional information on this betterment, including a description of the construction activities and modifications to existing operations during construction (PCWA 2007a). Potential effects on riparian

vegetation due to changes in operations that would alter the timing of inundation of the riparian vegetation will be included as part of the betterment impacts analysis that will be completed at a later date. Riparian vegetation established near the facilities, along the tributary inflows, and associated with the installation of the 6-foot betterment spillway gate is described below.

Riparian Vegetation Near Facilities – One cottonwood tree was observed near the construction and/or staging work areas. These areas and the location of the cottonwood tree are shown on Map I-1.

Riparian Vegetation Along Tributary Confluences – Riparian vegetation mapped along the three tributaries (Rubicon River, Five Lakes Creek, and the un-named drainage) into Hell Hole Reservoir that would be inundated under the proposed betterment are shown on Map H-3. Riparian attribute data for each numbered polygon are summarized in Table H-1.

Riparian Vegetation Associated with the Installation of a 6-foot Spillway Gate – Riparian vegetation mapped around the Hell Hole Reservoir shoreline and along the tributary inflows that would be inundated within the new maximum normal operating WSE associated with installation of a 6-foot spillway gate (36 acres) is shown on Map I-3 and is summarized below. The areal coverage of each species by polygon within these areas (Section 5.2) is summarized in Table H-2. The areal coverages of each species at different elevations associated with the installation of a 6-foot spillway gate as part of the Hell Hole Reservoir Seasonal Storage Increase Betterment (Section 5.2) are summarized in Table I-3.

- **Area 2** (between the maximum Normal Operating WSE [4,630 feet msl] and the new maximum operating WSE associated with the installation of a 6-foot spillway gate [4,636 feet msl]) included approximately 0.07 acre (3,045 square feet) of alders, willows, and black cottonwoods on Five Lakes Creek and 0.07 acre (3,069 square feet) of primarily willows along the shoreline of the reservoir.
 - o Along Five Lakes Creek, riparian vegetation occurred as a discontinuous corridor, and was primarily comprised of alders and willows, with black cottonwood interspersed. The community was structurally diverse, with relatively large, older individuals and numerous seedlings and young individuals present along the stream margins (Table I-1 and Figure I-1). The locations of the transects are shown in Map I-2.
 - o Tree cores were collected from alders and willows and one black cottonwood. Four of the six dated trees were established within the maximum operating WSE (4,630 feet msl), and two relatively large alders (DBHs >8 cm) that were rooted towards the upper end of the surveyed reach were established between 4,630 feet msl and the 4,636 feet msl (maximum operating WSE with the installation of a 6-foot spill way gate) (Map I-2).
 - o The majority of the trees found along the creek established within the past 25 years, following events in 1985–1986 and 1995–1996. The trees that established following the 1985–1986 events were located within 3 feet of the

summer base flow elevation. Trees that established following the 1995–1996 events were rooted over a range of elevations from less than 3 feet to more than 9 feet above the summer base flow elevation. The older cottonwood tree was rooted almost 14 feet above the summer base flow elevation.

6.5. PROJECT MAINTENANCE ACTIVITIES NEAR RIPARIAN RESOURCES

Vegetation management, which includes vegetation trimming by hand and to a lesser extent, the use of herbicides and fungicides, is implemented by PCWA at Project facilities and features, roads, and trails. Vegetation management at Project developed recreation facilities is completed by USDA-FS under a collection agreement (No. 03-CO-11051754-014 and No. 03-CO-1105035312). The frequency and type of Project-related vegetation management activities at Project facilities, Project recreation facilities, and new betterment facilities where RCAs are located are summarized in Table J-1.

PCWA performs most of their vegetation management activities during the spring and early summer to avoid work during high fire danger periods. Vegetation management is implemented only within the area necessary to reduce fire hazard, protect Project facilities, and provide for worker/public health and safety. At most Project facilities, clearance distances are limited by the steep and rugged topography. Typical clearance distances around various Project facilities and features are summarized in the table below.

Vegetation Management Area	Existing Project Facilities, Features, or Recreation Facilities
2 feet	▪ on either side of trails
5 feet	▪ around the perimeter of the dams ▪ outside the perimeter fence of powerhouses, switchyards, and substations ▪ around ancillary support facilities and Project fences
10 feet	▪ on either side of penstocks, valve houses, and removable sections on either side of communication lines, powerlines, photovoltaic poles and lines, and roads and access points
50 feet	▪ around intakes, gatehouses, surge tanks, adits, portals, microwave reflectors, radio towers, sediment disposal areas, drop inlets, and recreation facilities

7.0 LITERATURE CITED

Amlin, N.M., and S. B. Rood. 2002. Comparative tolerances of riparian willows and cottonwoods to water-table decline. *Wetlands*. 22: 338-346.

Anderson, Michelle. 2006. *Salix exigua*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/> [2009, June 24].

- Braatne J.H., S.B. Rood, and P.E. Heilman. 1996. Life history, ecology and conservation of riparian cottonwoods in North America. *In: Biology of *Populus* and its Implications for Management and Conservation*. Eds. R.F. Stettler, H.D. Bradshaw, Jr., P.E. Heilman, and T.M. Hinkley. NRC Research Press, National Research Council of Canada, Ottawa, ON. Pp. 57-86.
- CALFED Bay Delta Program (CALFED). 1999. Flow regime requirements for habitat restoration along the Sacramento River between Colusa and Red Bluff. Sacramento, California.
- Calflora: Information on California plants for education, research, and conservation. [web application]. 2006. Berkeley, California: The Calflora Database [a non-profit organization]. Available: <http://www.calflora.org/>. (Accessed: August-December, 2006).
- California Data Exchange Center (CDEC). 2009. NF American R at North Fork Dam (NFD) – 15-minute flow data. Available at: http://cdec.water.ca.gov/cgi-progs/stationInfo?station_id=NFD.
- California Department of Food and Agriculture (CDFA). 2004. Noxious Weed Pest Ratings. Division of Plant Health and Pest Protection Services. Available: <http://www.cdfa.ca.gov/phpps/ipc/encycloweedia/pdfs/noxiousweed_ratings.pdf>. Accessed March 2006.
- California Invasive Plant Council (Cal-IPC). 2006. California Invasive Plant Inventory. Accessed April 2006 from: http://www.calipc.org/file_library/CalipcInventory2006.pdf.
- California Native Plant Society. [web application]. 2006. Online Rare Plant Inventory Database v7-06d. Updated 10-03-06. Sacramento, CA. Available at: <http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi> (Accessed 12-19-06 and July 2006).
- Harrington, C.A., L. C. Brodie, D. S. DeBell, and C.S. Schopmeyer. 2009. *Alnus P. Mill.* In: United States Department of Agriculture – Forest Service Woody Plant Seed Manual. Available at: <http://nsl.fs.fed.us/wpsm/>. Accessed March 27, 2009.
- Hickman, James C. (Ed). 1993. *The Jepson Manual: Higher Plants of California*. University of California Press, Berkeley, CA.

- Jamison, B, and J. Braatne. 2001. Riparian Cottonwood Ecosystems and Regulated Flows in Kootenai and Yakima Subbasins; Impacts of Flow Regulation on Riparian Cottonwood Forests of the Yakima River", 2000-2001 Technical Report, Project No. 200006800, 53 electronic pages, (BPA Report DOE/BP-00000005-3cottonwood ecosystem & regulated flows in Kootenai and Yakima sub-basins. Available at: <http://pisces.bpa.gov/release/documents/documentviewer.aspx?pub=H00000005-3.pdf>
- Karrenberg, S P., J. Edwards and J. Kollman. 2002. The life history of Salicaceae living in the active zone of floodplains. *Freshwater Biology*. 47:733-748.
- Law, D.J., C.B. Marlow, J.C. Mosley, S. Custer, P. Hook, and B. Leinard. 2000. Water table dynamics and soil texture of three riparian plant communities." *Northwest Science*. 2000; 74(3): 234-241
- Lisle, T. E., 1989. Channel-dynamic control on the establishment of riparian trees after large floods in northwestern California. USDA Forest Service Gen. Tech. Rep. PSW-110. 1989. Available at: http://www.fs.fed.us/psw/publications/documents/psw_gtr110/psw_gtr110_a_lisle.pdf.
- Mahoney, J.M. and S.B. Rood. 1998. Streamflow requirements for cottonwood seedling recruitment – an integrative model. *Wetlands*. 18: 634-645.
- McBain and Trush. 1997. Trinity River Maintenance Flow Report, Prepared for Hoopa Valley Tribe, Hoopa, CA.
- McBain & Trush, Inc. (eds.). 2002. San Joaquin River Restoration Study Background Report. Prepared for Friant Water Users Authority, Lindsay, CA, and Natural Resources Defense Council, San Francisco, CA. Pp. 8-1 to 8-112. Available at: http://www.restoresjr.net/program_library/05-Pre-Settlement/Final%20SJR%20Background%20Report/Chapter8%20Vegetation.pdf
- Placer County Water Agency (PCWA). 2006. Middle Fork American River Project (FERC Project No. 2079). 2005 Physical Habitat Characterization Study Report-Supporting Document G.
- PCWA. 2007a. PCWA Middle Fork American River Project (FERC Project No. 2079), Pre-Application Document (PAD), Submitted to FERC on December 13, 2007.
- PCWA. 2007b. Middle Fork American River Project (FERC Project No. 2079). 2006 Physical Habitat Characterization Study Report-Supporting Document G.
- PCWA 2008. FINAL TERR 1 – Vegetation Communities and Wildlife Technical Study Report.
- PCWA. 2009b. FINAL AQ 9 – Geomorphology Technical Study Report.

PCWA. 2010. DRAFT AQ 1 – Instream Flow Technical Study Report.

Potter, D.A. 2005. Riparian Plant Community Classification. West Slope, Central, and Southern Sierra Nevada, California. United States Forest Service Pacific Southwest Region. R5-TP-022. December 2005.

Roberts, M.D., D.R. Peterson, D.E. Jukkola, V.L. Snowden. 2002. A pilot investigation of cottonwood recruitment on the Sacramento River. The Nature Conservancy, Sacramento River Project. May 2002. 20 pp. Available at: http://www.sacramentoriverportal.org/eco_indicators/forest_regen.htm.

Stella, J.C., J.J. Battles, B.K. Orr, J.R. McBride. 2006. Synchrony of seed dispersal, hydrology and local climate in a semi-arid river reach in California. *Ecosystems* 9:1200-1214.

Uchytel, Ronald J. 1989a. *Alnus rhombifolia*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/> [2007, August 13].

Uchytel, Ronald J. 1989b. *Alnus incana* subsp. *tenuifolia*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/> [2007, August 13].

United States Department of Agriculture – Forest Service (USDA-FS). 2009. Fire Effects Information System. Available at: <http://www.fs.fed.us/database/feis/plants/>. Accessed March 24, 2009.

United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS). 2008. Fremont's Cottonwood. Prepared by J. Henson, M. Stevens, and G. Fenchel. Available at: http://plants.usda.gov/plantguide/doc/cs_pofr2.doc.

United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS). 2009. PLANTS database. Available at: <http://plants.usda.gov/>. Accessed March 28, 2009.

United States Fish and Wildlife Services (USFWS). 1988. National list of vascular plant species that occur in wetlands. US Fish and Wildlife Biological Report 88 (24).

USFWS. 1997. Revised National list of vascular plant species that occur in wetlands. US Fish and Wildlife Biological Report 88 (24).

Winward, A. H. 2000. Monitoring the Vegetation Resources in Riparian Areas. United States Department of Agriculture Forest Service, Rocky Mountain Research Station RMRS-GTR-47.

Zasada, J.C., D.A. Douglas, and W. Buechler. 2009. Salix L. In: United States Department of Agriculture – Forest Service Woody Plant Seed Manual. Available at: <http://nsl.fs.fed.us/wpsm/>. Accessed March 27, 2009.

TABLES

Table AQ 10-1. Riparian River and Stream Survey Study Sites.

Site	2006 Study Site Name	Bypass Reach	Peaking Reach	Comparison Reach	Reservoir Inlet	Bypass and Peaking Reach Surveys	Comparison River Surveys	Tree Core Analyses	Riparian Mapping at 2-D Modeling Sites (AQ 1)	Stage-discharge Sites (AQ 1 1-D and 2-D Study Sites)	No. Riparian Transects	No. 5 x 2 Plots (No. 1 x 1 Plots)
Middle Fork American River from French Meadows Reservoir to Middle Fork Interbay												
MF44.7	QSS MF-10	●				44.7-44.8	-		-	●	3	26 (36)
MF36.2	QSS MF-9	●				36.1-36.2	-		-	●	3	26 (36)
Middle Fork American River from Middle Fork Interbay to Ralston Afterbay												
MF29.4	QSS MF-7	●				29.3-29.5	-	●	-		3	26 (36)
MF28.6	QSS MF-6	●				28.5-28.9	-	●	-		3	32 (36)
MF26.2	QSS MF-4	●				26.1-26.2	-		-	●	3	32 (36)
Middle Fork American River Downstream of Ralston Afterbay												
MF17	QSS MF-3		●			16.3-17.3	-	●	-		3	30 (38)
MF14.1	-		●			-	-		13.8-14.5	●	-	-
MF10.4	QSS MF-2		●			9.8-10.8	-		-		3	26 (36)
MF4.8 ¹	QSS MF-1		●			3.9-5.8	-	●	-		3	35 (38)
MF4.8 ¹	-		●			-	-		4.1-4.8	●	-	-
Rubicon River												
R28.1	QSS R-16	●				28-28.2	-		-		3	30 (36)
R25.7	QSS R-15	●				25.5-25.8	-	●	-	●	3	30 (36)
R20.9	QSS R-13	●				26.6-21	-	●	-	●	3	30 (38)
R19.5	QSS R-12	●				19.3-19.7	-		-		3	32 (38)
R14.3	QSS R-10	●				14-14.4	-		-		3	32 (36)
R3.8	QSS R-5	●				3.7-4	-		-		3	28 (36)
R3.5	QSS R-4	●				3.4-3.5	-		-	●	2	18 (24)
R2.6	QSS R-3	●				2.3-3	-	●	-		3	30 (36)
R1.2	QSS R-2	●				0.8-1.4	-		-		3	30 (36)
R0.7	QSS R-1	●				0.7	-		-		1	12 (12)
Five Lakes Creek	-				●	0.1-0.5	-	●	-		12	-
South Fork Long Canyon Creek												
SFLC4.2	-			●		-	4.7-4.8		-	●	3	26 (24)
Upstream of Diversion	-			●		-	3.3-3.8		-		-	-
Downstream of Diversion	-	●				-	2.8-3.3		-		-	-
SFLC2.3	QSS SFLC-1	●				2.2-2.5	-		-	●	3	26 (36)
North Fork Long Canyon Creek												
Upstream of Diversion	-			●		-	3.1-3.6		-		-	-
Downstream of Diversion	-	●				-	2.5-3.1		-		-	-
NFLC1.9	QSS NFLC-1	●				1.7-1.9	-		-	●	3	26 (36)
Long Canyon Creek												
LC9.0	QSS LC-2	●				8.8-9	-		-	●	3	28 (38)
LC0.0	QSS LC-1	●				0.1-0.2	-		-		3	30 (36)
Duncan Creek												
D9.0	-			●		-	9-9.2		-	●	3	28 (22)
D8.3	QSS D-3	●				8.2-8.4	-		-		3	26 (36)
D6.3	QSS D-2	●				6.2-6.4	-		-	●	3	24 (36)
D4.6	QSS D-1	●				4.5-4.6	-		-		3	26 (36)
North Fork of the Middle Fork American River												
NFMF2.3	-			●		-	2.3-2.8	●	-	●	3	28 (20)
North Fork American River												
NF53.7	-			●		-	53.1-53.3		-	●	3	26 (26)
NF31.3	-			●		-	30.5-31.7	●	-	●	4	44 (28)

¹ The riparian transect surveys were not completed within the AQ 1 2-D modeling study site. Detailed mapping of the riparian vegetation was completed within the AQ 1 2-D modeling study site. The riparian transect surveys were completed in an adjacent reach.

Table AQ 10-2. Riparian Reservoir Survey Study Sites.

Site	No. Riparian Transects
Hell Hole Reservoir	- ¹
French Meadows Reservoir	11
Middle Fork Interbay	1
Ralston Afterbay	3

¹Extensive riparian mapping was completed as part of the betterment surveys.

Table AQ 10-3. Riparian Betterment Survey Study Sites.

Site	Reservoir Inlet	Reservoir	Betterment Surveys	
			Study Site River Miles	No. Riparian Transects
Hell Hole Reservoir		●		-
Rubicon River (R36.2)	●		35.7-35.8	-
Five Lakes Creek	●		0.1-0.5	12
Unnamed Inflow	●		0-0.2	-

Table AQ 10-4. Riparian and Geomorphology Characteristics of the Bypass, Peaking, and Comparison River Study Sites.

Study Site	Bypass Reach	Peaking Reach	Comparison Reach	Characteristics		
				General Topography	Stream Gradient	Dominant Substrate
Middle Fork American River - Bypass Reach						
MF26.2	●			Similar general topography: Both are mixed bedrock-alluvial channels MF26.2: Narrow valley bottom with steep side walls NFMF2.3: Alternating steep and moderately steep valley walls	Similar slopes	Similar substrate: MF26.2: Channel: Boulder, cobble, and gravel particle sizes NFMF2.3: Channel: Boulder and cobble particle sizes
NFMF2.3			●			
Middle Fork American River - Peaking Reach						
MF4.8 and MF14.1		●		Similar general topography: Alluvial channel Alternating steep and moderately steep valley walls with wide meanders and lateral and point bars	Similar slopes	Similar substrate: Peaking reach: Channel: Cobble dominated NF31.3: Channel: Gravel and cobble particle sizes
NF31.3			●			
Rubicon River						
R20.9 and R3.5	●			Similar general topography: Narrow valley bottom with steep side walls	Moderately dissimilar slopes	Moderately similar substrate: R20.9: Relatively high elevation bars with very coarse substrate R3.5: Boulder, cobble, gravel bars NF53.7: Boulder, cobble, gravel bars
NF53.7			●			
Duncan Creek						
D6.3	●			Similar general topography: Mixed bedrock-alluvial channel Narrow valley bottom and steep side slopes	Similar slopes	Similar substrate: boulder and bedrock
D9.0			●			
South Fork Long Canyon Creek						
SFLC2.3	●			Similar general topography: Mixed bedrock-alluvial channel	Similar slopes	Moderately similar substrate. SFLC4.2: Channel: Cobble particle sizes SFLC2.3: Channel: Sand to gravel particles sizes, with some boulders
SFLC4.2			●			

Table AQ 10-5. Summary of Riparian Vegetation Community Characteristics at the Comparison River Study Sites.

Stream Valley and Riparian Width	Substrate	Vegetation Distribution and Community Composition	Age Class Structure and Regeneration ¹	Canopy Structure	Riparian Health
South Fork Long Canyon Creek – SFLC4.2					
Along the majority of the study site reach, the riparian corridor was narrow, limited by a narrow floodplain (a few feet). Along comparatively shorter sections of river where bars or wider floodplains were present, the riparian vegetation width was considerably wider (~15 feet).	The substrate was primarily cobble and boulder.	The riparian vegetation was primarily distributed in a narrow continuous or discontinuous corridor along the stream channel. A relatively narrow and dense riparian corridor, dominated by white alder, was present at the comparison study site. Indian rhubarb was established within the channel and incense cedar and white fir were the common overstory species. Other dominant species present within the riparian corridor included creeping snowberry, wild mock orange, bracken fern, and bitter gooseberry. Fifty different species were identified at the site; the majority were native (96%) and approximately one half were riparian and wetland species.	White alders ranged in size from seedlings to 24 inches in diameter. The majority of the trees were between 1 and 6 inches in diameter, with quite a few large trees (diameters between 11 and 24 inches). The white alders were distributed across the riparian zone, but typically did not occur at the lowest elevations along the low flow channel margins. Only white alder seedlings and sprouts (42 individuals) were observed along the stream banks.	Observed tree densities were 2.7 trees per 10 square meters (108 square feet), with relatively high densities of white alders (13 trees per 10 square feet). Total and tree canopy coverages were high (> 96% on average), very low coverage by shrubs (< 10%). Cover by ground layer species was moderate (32% on average).	Tree and shrub canopy decadence was low (< 5%). Very little decadence of alders was observed (< 1% on average).
Duncan Creek – D9.0					
The Duncan Creek comparison study site was located within a narrow stream valley and steep side slopes with a riparian corridor width that ranged from 9 to 26 feet.	The substrate was primarily boulder and bedrock with interstitial gravel.	The riparian vegetation was primarily distributed in a narrow continuous or discontinuous corridor. The riparian community was dominated by alders with willows, dogwood, and black cottonwood interspersed and a white fir and incense cedar overstory. The alders, willows, and black cottonwood were typically found nearer the stream channel, with the upland trees established near the hillslope and overhanging the riparian species. Fifty-two species were identified; almost all were native species and approximately one-third were riparian and wetland species. The common herbaceous species included Boykinia major, twinberry, compact phacelia, Fremont's silktassel, streambank trefoil, and bracken fern. Indian rhubarb was typically found within the stream channel.	Young and medium-aged (up to 6 inches in diameter) black cottonwoods were observed at D9.0. The observed individuals were established near the water's edge. The majority of the white alder stems were larger than one inch in diameter. The largest stems observed were 5 inches in diameter. The willow shrubs were typically smaller, with fewer and smaller stems. The willows were typically established closer to the channel than the mountain alders. Black cottonwood (69 individuals), alder (18 individuals), and willow (6 individuals) seedlings and sprouts were observed along the stream banks.	Observed tree densities were fairly low (<1 tree per 10 square meters (108 square feet)). The only riparian tree species found in the study site was black cottonwood (0.2 tree per 10 square meters). Tree canopy coverage was high, with lower coverage by shrubs on average (36%) and ground layer species (31%). Total canopy cover was 75% on average.	Tree and shrub canopy decadence was low. Minimal shrub decadence was observed. Some decadence of white fir and incense cedar decadence in the overstory was observed.

¹ Age class structure was based on categories of shrub stem densities per individual and tree diameters, as follows: Seedlings (S); Young (Y): shrubs with less than 10 stems per individual or trees with diameters (diameter at breast height (DBH)) less than 3 inches; Medium-aged (M): shrubs with between 10 and 60 stems per individual or trees with DBHs between 3 and 9 inches; and Old/ Mature (O): shrubs with more than 60 stems per individual or trees with DBHs greater than 9 inches.

Table AQ 10-5. Summary of Riparian Vegetation Community Characteristics at the Comparison River Study Sites (continued).

Stream Valley and Riparian Width	Substrate	Vegetation Distribution and Community Composition	Age Class Structure and Regeneration	Canopy Structure	Riparian Health
North Fork of the Middle Fork American River - NFMF2.3					
The stream valley within the study site was between 70 and 140 feet wide, with a total riparian corridor width ranging from 20 to 53 feet wide.	The substrate was primarily composed of boulders and cobbles.	The riparian vegetation was primarily distributed in narrow corridors along the stream margins, with bedrock sections that were sparsely vegetated. The riparian community was dominated by white alders with willows and a few Fremont cottonwoods interspersed. The alders and willows were distributed across the floodplain to the hillslopes, transitioning to upland species nearer the hillslopes. Other dominant species included Indian rhubarb, California wild grape, chaparral virgin's bower, wild mock orange, torrent sedge, Douglas' sagewort (mugwort), mountain coffeeberry, Sierra currant, and toyon. Twenty-seven different species were identified. The majority of the species were native (85%). Three non-native species were present (ripgut grass, bouncing bet, and field hedge parsley). Approximately 45% of the species present were riparian and wetland species.	White alders ranged in size from less than one inch in diameter to 11 inches in diameter. Trees of different ages were distributed throughout the corridor with distance from the river, with more young individuals observed nearer the channel. Willows were fairly young (almost all the stems were less than 3 inches in diameter). The majority of the willows were observed at low elevation near the stream channel. Riparian seedlings and sprouts were observed along the stream banks (11 alders; 29 willows; and 3 Fremont cottonwoods).	Observed tree densities were fairly low (<1 tree per 10 square meters (108 square feet)). The only riparian tree species found in the study site were white alder (2.4 trees per 10 square meters) and one mature Fremont cottonwood. Tree canopy coverage was high, with lower coverage by shrubs on average (44%) and ground layer species (32%). Total canopy cover was 85% on average.	Tree and shrub canopy decadence were relatively low. Some alder (14%) and willow (21%) decadence was observed due to recent high flow events that scoured and partially uprooted some individuals.
North Fork American River – NF53.7					
The upper study site on the North Fork American River was located within a wide and deep stream valley with cobble bars. The riparian corridor width ranged from 16 feet to 175 feet.	The substrate was primarily boulder and bedrock with cobbles and fines. A boulder bar with interstitial sands was present within the study site.	Riparian vegetation was primarily distributed in narrow discontinuous corridors. The riparian community was dominated by willows and alders. The cobble bar within the study site had minimal woody riparian vegetation (mostly young), except at the rear of the bar where alders were established. In the narrower sections of the study site, woody riparian vegetation was established near the water's edge and extended to the hillside. The upland overstory near the hillslopes was comprised of California bay and big leaf maple. Other dominant species included Himalayan blackberry, California wild grape, torrent sedge, whitebark raspberry, and poison oak. Forty-five species were identified. The majority of the species were native (82%) and were riparian and wetland species (67%).	White alders ranged in size from seedlings to nine inches in diameter. The majority of the individuals were between 3 and 6 inches in diameter. A diversity of willow sizes were present, with stem sizes ranging in size from seedlings to five inches in diameter. The willows were established closer to the channel, while the white alders were established at higher elevations. Approximately 250 willow seedlings and sprouts were observed along the stream channel. Comparatively few alders (19 individuals) and cottonwoods (2 individuals) were observed.	Observed tree densities were 1.1 trees per 10 square meters (108 square feet). The majority of the study site was unvegetated. Total canopy coverage was 44%, with 30% or less coverage by trees, shrubs, or ground layer species.	Tree and shrub canopy decadence were low (< 5%). Some willow and alder decadence (5% each) was observed due to recent high flow events that scoured and partially uprooted some individuals.

Table AQ 10-5. Summary of Riparian Vegetation Community Characteristics at the Comparison River Study Sites (continued).

Stream Valley and Riparian Width	Substrate	Vegetation Distribution and Community Composition	Age Class Structure and Regeneration	Canopy Structure	Riparian Health
North Fork American River – NF31.3					
The stream valley within the study site ranged from approximately 180 feet to 320 feet in width. The riparian corridor width ranged from 28 feet to 123 feet in width.	A cobble bar was present within the study site; with the opposite bank confined by steep bedrock and boulders.	Riparian vegetation was primarily distributed in narrow corridors along the stream channel on large channel bars. Willows were the most common species, with alders and cottonwoods also prominent species within the community. Willows and alders commonly occurred along the water, with alders and Fremont cottonwoods established on higher surfaces. Linear willow stands with alders with cottonwoods interspersed were established on the cobble bar. Seventy-six different species were identified. Approximately two-thirds of the species (68%) were native species; twelve non-native species were observed. Most species (59%) were riparian and wetland species. Other dominant species included California wild grape, torrent sedge, Himalayan blackberry, California brome, Oregon false goldenaster, skeletonweed, and California button willow.	The majority of the white alder trees observed were young or mature (seedlings to 6 inches in diameter). Cottonwoods up to 9 inches in diameter were observed. The majority of the alders were observed at mid to high elevations adjacent to the channel. The Fremont cottonwoods were typically established at higher elevations than the white alders. The majority of the willows had fairly small stems (smaller than 1 inch in diameter) and the shrubs were established near the low flow channel. Riparian seedlings and sprouts were observed in the study site. Almost 800 willows seedlings and sprouts were rooted on the cobble bar. A few alders (6 individuals) and Fremont cottonwood (13 individuals) seedlings and sprouts were found.	Observed tree densities were fairly low (< 1 tree per 10 square meters (108 square feet)). The only riparian tree species found in the study site were white alder (0.5 tree per 10 square meters) and Fremont cottonwood (0.3 tree per 10 square meters). Total canopy coverage was moderate (52%), with most coverage by shrub species (41%). Coverage by the tree canopy and ground layer vegetation was considerably lower (24% each).	Tree and shrub canopy decadence was low. Some willow decadence was observed due to recent high flow events that scoured and partially uprooted some individuals.

Table AQ 10-6. Comparison of General Riparian Abundance and Age Class Distribution Patterns on the Bypass, Peaking, and Comparison Rivers¹.

Community Type	Abundance Distribution			Age Class Distribution ²		
	Polygon	Continuous Line	Discontinuous Line/ Sparse	Mature and Medium-Aged	Mixed Age Classes (All Present)	Young and Medium-Aged Vegetation
Middle Fork American River - French Meadows Reservoir to Middle Fork Interbay						
Alder	-	2%	97%	7%	14%	80%
Willow	-	-				
Alder-Willow Co-Dominant	-	1%				
Alder-Willow-Cottonwood	1%	-				
Middle Fork American River - Middle Fork Interbay to Ralston Afterbay						
Alder	1%	16%	38%	4%	64%	32%
Willow	10%	22%				
Alder-Willow-Cottonwood	4%	9%				
Middle Fork American River - Peaking Reach (to North Fork American River Confluence)						
Alder or Willow or Alder-Willow Co-Dominant	2%	4%	32%	56%	19%	25%
Alder-Willow-Cottonwood	10%	11%				
Alder-Willow-Black Locust	4%	6%				
Alder-Willow-Cottonwood-Black Locust	20%	11%				
Middle Fork American River - Peaking Reach (North Fork American River Confluence to Folsom Reservoir)						
Willow	8%	8%	61%	-	62%	26%
Willow-Cottonwood Co-Dominant	10%	7%				
Alder-Willow-Cottonwood	2%	-				
Alder-Willow-Cottonwood-Black Locust	2%	2%				
Rubicon River						
Alder-Willow Co-Dominant	2%	9%	60%	18%	22%	60%
Alder-Willow-Cottonwood	6%	23%				
Duncan Creek - Bypass Reach						
Alder	-	3%	81%	22%	8%	70%
Alder-Willow Co-Dominant	1%	10%				
Alder-Willow-Cottonwood	2%	3%				

Table AQ 10-6. Comparison of General Riparian Abundance and Age Class Distribution Patterns on the Bypass, Peaking, and Comparison Rivers¹ (continued).

Community Type	Abundance Distribution			Age Class Distribution ²		
	Polygon	Continuous Line	Discontinuous Line/ Sparse	Mature and Medium-Aged	Mixed Age Classes (All Present)	Young and Medium-Aged Vegetation
South Fork Long Canyon Creek - Bypass Reach						
Alder	-	-	64%	2%	42%	56%
Alder-Willow Co-Dominant	-	21%				
Alder-Willow-Cottonwood	2%	13%				
North Fork Long Canyon Creek - Bypass Reach						
Alder	4%	5%	41%	31%	53%	16%
Alder-Willow Co-Dominant	4%	32%				
Alder-Willow-Cottonwood	3%	11%				
Long Canyon Creek - Bypass Reach						
Alder	1%	12%	73%	19%	12%	69%
Alder-Willow Co-Dominant	2%	10%				
Alder-Willow-Cottonwood	<0.5%	1%				
Duncan Creek - Comparison Reach (RM 8.8 - RM 14.0)						
Alder	12%	24%	54%	2%	11%	86%
Alder-Willow Co-Dominant	-	-				
Alder-Willow-Cottonwood	-	-				
South Fork Long Canyon Creek - Comparison Reach (RM 3.2 - RM 8.4)						
Alder	-	9%	71%	-	77%	23%
Alder-Willow Co-Dominant	4%	13%				
Alder-Willow-Cottonwood	-	3%				
North Fork American River (RM 27.4 - RM 35.0)						
Cottonwood	1%	-	53%	3%	3%	94%
Willow	-	7%				
Alder-Willow Co-Dominant	2%	6%				
Alder-Willow-Cottonwood	4%	27%				
North Fork of the Middle Fork American River (RM 0.0 - RM 5.0)						
Alder or Willow or Alder-Willow Co-Dominant	8%	54%	32%	2%	39%	59%
Alder-Willow-Cottonwood	5%	2%				

¹ This table summarizes data that were included in the Physical Habitat Characterization Reports (PCWA 2006 and 2007a). Maps showing the community abundance and age class distributions are also included in those reports.

² Mature/ Old: Shrubs with > 60 stems/ individual or trees with diameters > 9 inches
 Medium-Aged: Shrubs with 10 to 60 stems/ individual or trees with diameters 3 to 9 inches
 Young: Shrubs with < 10 stems/ individual or trees with diameters < 3 inches

FIGURES

Figure AQ 10-1. Riparian Objectives and Related Study Elements and Reports.

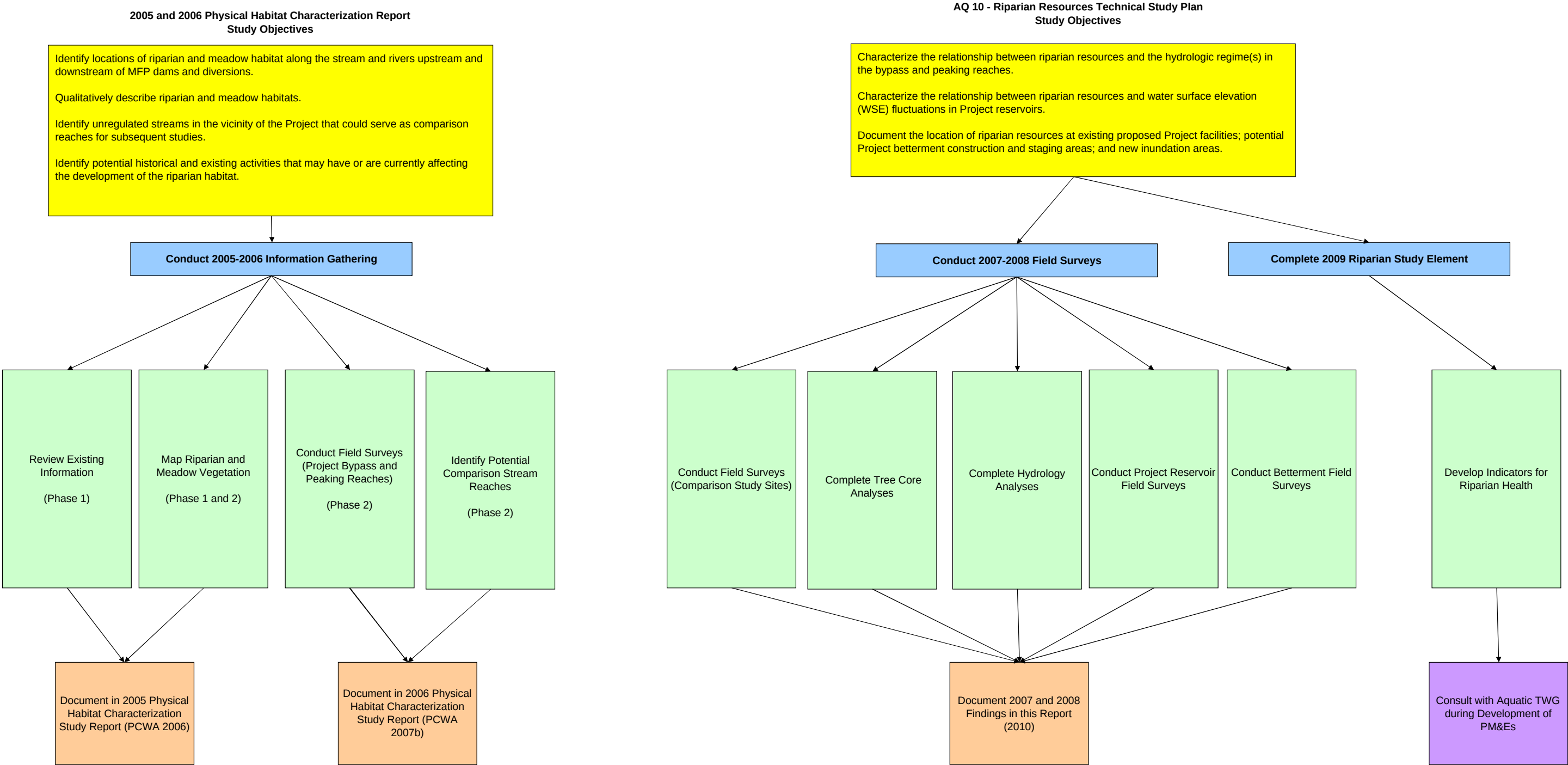


Figure AQ 10-2. Comparison of Species Richness (a), Proportion of Native Species Present (b), and the Proportion of Hydric Species (c) in Project and Comparison Stream Study Sites.

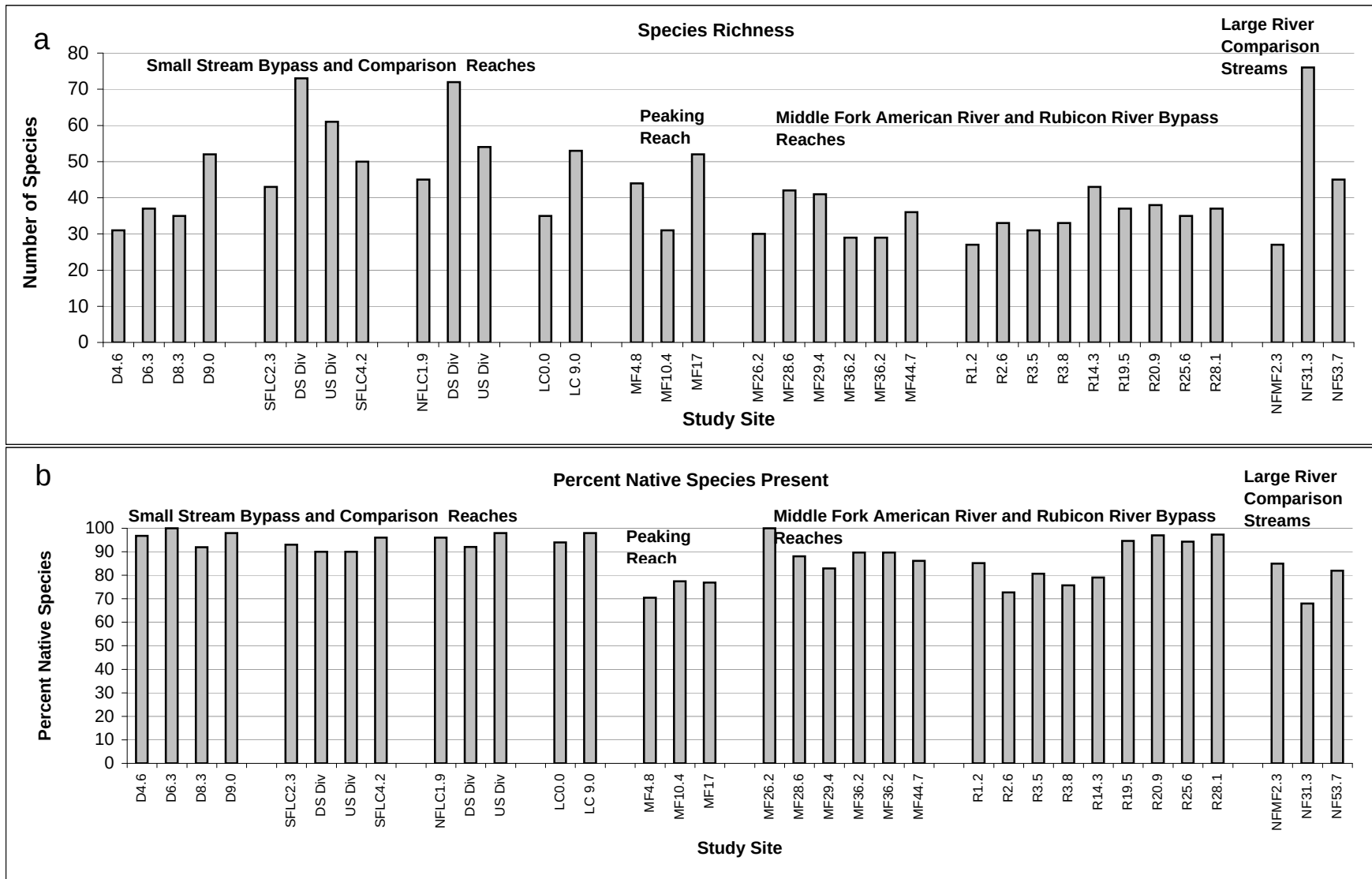


Figure AQ 10-2. Comparison of Species Richness (a), Proportion of Native Species Present (b), and the Proportion of Hydric Species (c) in Project and Comparison Stream Study Sites (continued).

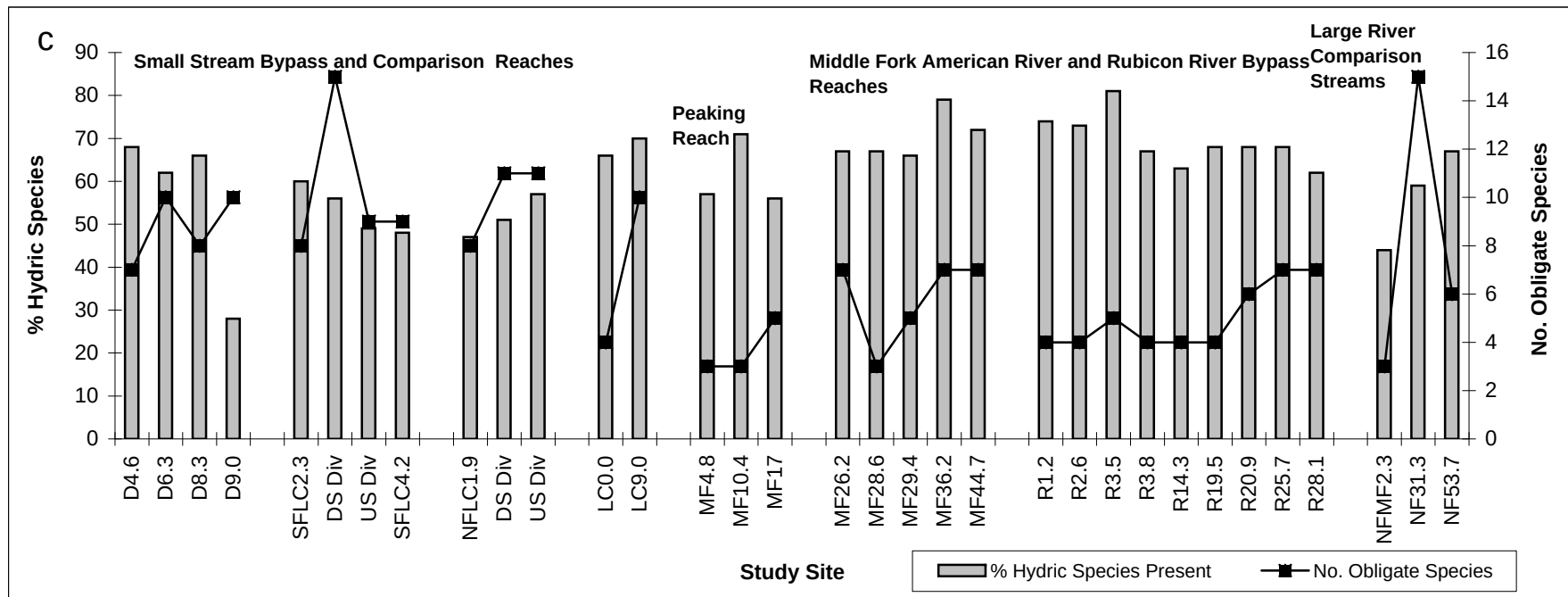
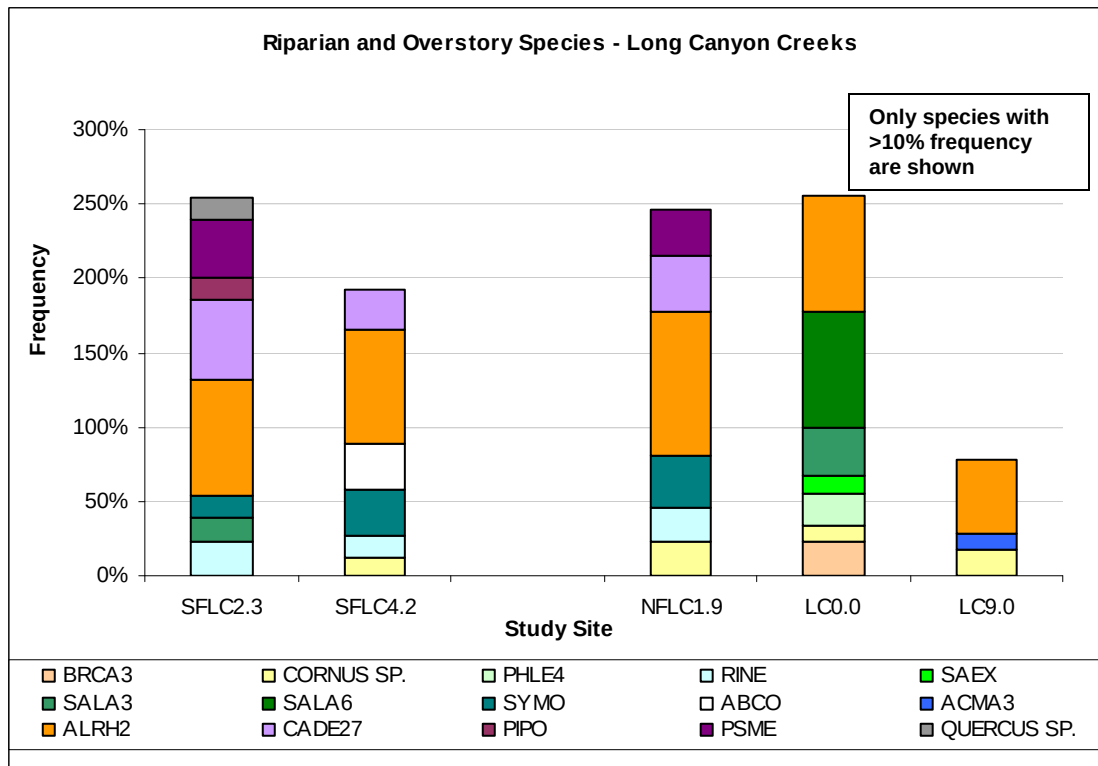


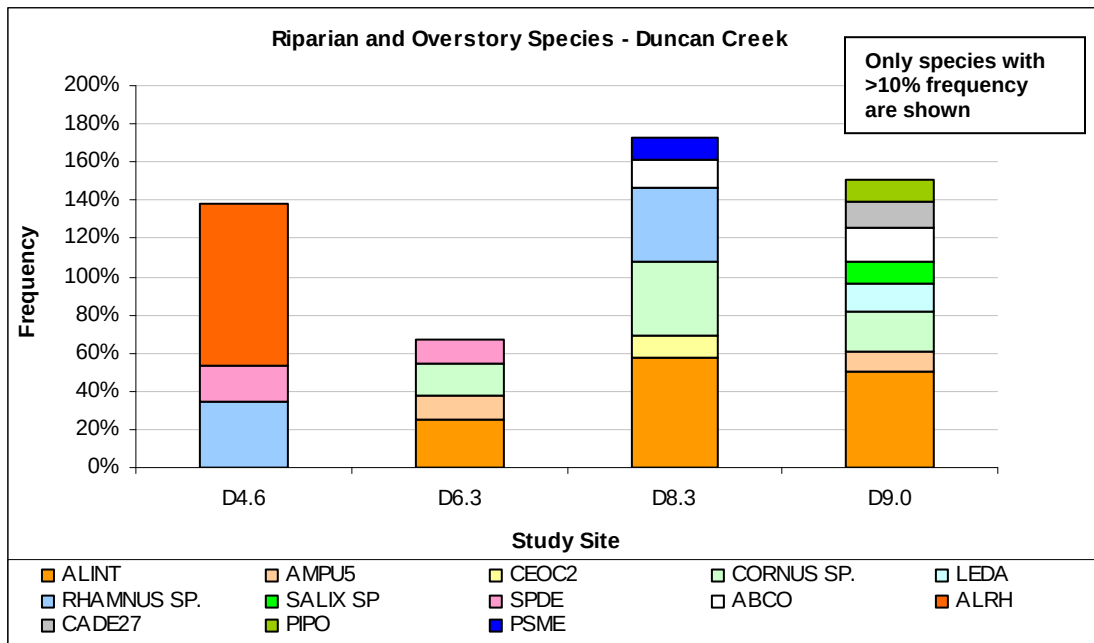
Figure AQ 10-3. Frequency of Species within the Riparian Corridor at the Small Stream Bypass and Comparison Study Sites and Large River Bypass, Peaking, and Comparison Study Sites¹.



Frequency (%) of All Species within the South Fork, North Fork, and Long Canyon Creek Riparian Corridors.

Species Code	Scientific Name	Common Name	SFLC2.3	SFLC4.2	NFLC1.9	LC0.0	LC9.0
AMP05	<i>Amelanchier pumila</i>	dwarf serviceberry					
BRCA3	<i>Brickellia californica</i>	brickellbush				22	7
CORNUS SP.	<i>Cornus sp.</i>	dogwood	8	12	23	11	18
PHLE4	<i>Philadelphus lewisii</i>	wild mock orange				22	
RINE	<i>Ribes nevadense</i>	Sierra currant	23	15	23		7
RUPA	<i>Rubus parviflorus</i>	thimbleberry	8	4			7
SAEX	<i>Salix exigua</i>	narrow leaf willow				11	
SALA3	<i>Salix laevigata</i>	red willow	16			33	7
SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow				78	4
SALU	<i>Salix lucida</i>	shining willow	8				
SYMO	<i>Symphoricarpos mollis</i>	creeping snowberry	15	31	35		
ABCO	<i>Abies concolor</i>	white fir		31			
ACMA3	<i>Acer macrophyllum</i>	big leaf maple			4		11
ALRH2	<i>Alnus rhombifolia</i>	white alder	77	77	96	78	50
CADE27	<i>Calocedrus decurrens</i>	incense cedar	54	27	38		4
PIPO	<i>Pinus ponderosa</i>	ponderosa pine	15				
PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir	38		31		
QUERCUS SP.	<i>Quercus sp.</i>	oak	15	4	4		

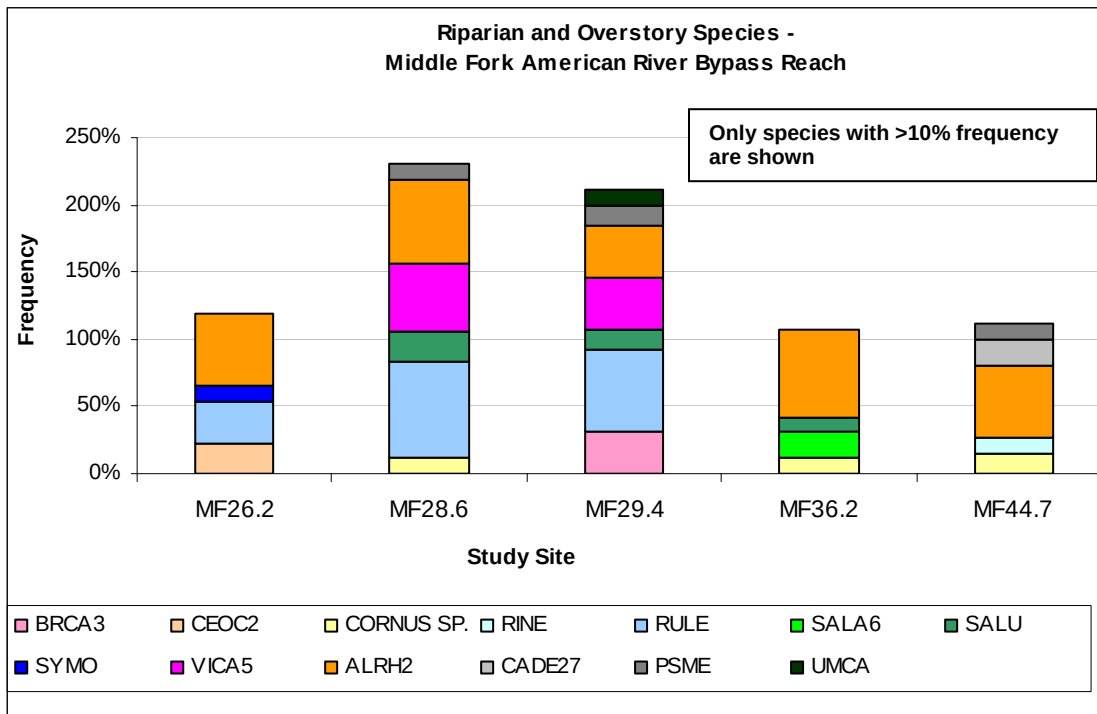
Figure AQ 10-3. Frequency of Species within the Riparian Corridor at the Small Stream Bypass and Comparison Study Sites and Large River Bypass, Peaking, and Comparison Study Sites (continued)¹.



Frequency (%) of All Species within the Duncan Creek Riparian Corridor.

Species Code	ALINT	AMPU5	CEOC2	CORNUS SP.	LEDA	RHAMNUS SP.	RUPA	SALIX SP	SOSC2	SPSPS (SPDE)	SYMO	ABCO	ACGL	ALRH2	CADE27	PIPO	POBAT	PSME	QUERCUS SP.
Scientific Name	<i>Alnus incana</i> ssp. <i>tenuifolia</i>	<i>Amelanchier pumila</i>	<i>Cephalanthus occidentalis</i> var. <i>californicus</i>	<i>Cornus</i> sp.	<i>Leucothoe davisiae</i>	<i>Rhamnus</i> sp.	<i>Rubus parviflorus</i>	<i>Salix</i> sp.	<i>Sorbus scopulina</i>	<i>Spiraea splendens</i> var. <i>splendens</i> (= <i>Spiraea densiflora</i>)	<i>Symphoricarpos mollis</i>	<i>Abies concolor</i>	<i>Acer glabrum</i> var. <i>torreyi</i>	<i>Alnus rhombifolia</i>	<i>Calocedrus decurrens</i>	<i>Pinus ponderosa</i>	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	<i>Quercus</i> sp.
Common Name	mountain alder	dwarf serviceberry	California button willow	dogwood	Sierra laurel	cofeeberry	thimbleberry	willow	mountain ash	spiraea	creeping snowberry	white fir	mountain maple	white alder	incense cedar	ponderosa pine	black cottonwood	Douglas fir	oak
D4.6				8		35				19				85	4				
D6.3	25	13		17		8	8		4	13	8							8	
D8.3	58	8	12	38		38		4				15	4		8			12	
D9.0	50	11		21	14			11			4	18			14	11	7	7	4

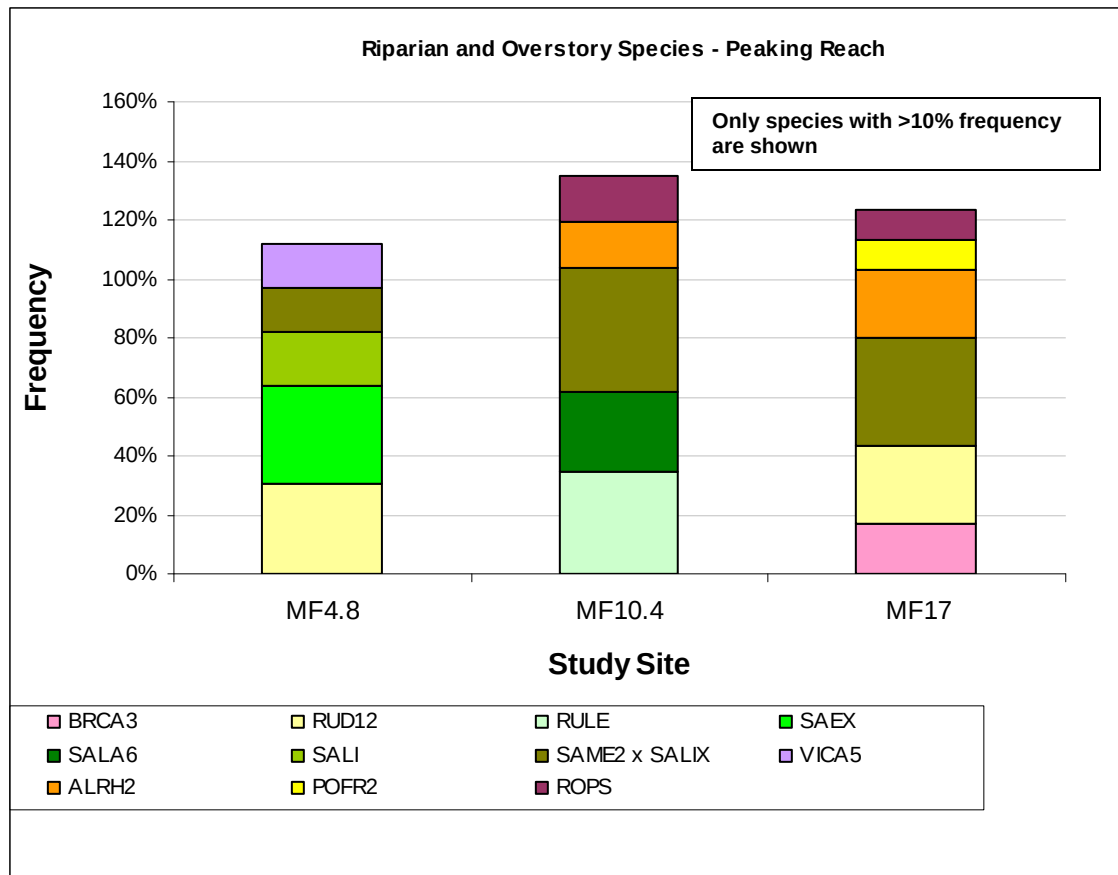
Figure AQ 10-3. Frequency of Species within the Riparian Corridor at the Small Stream Bypass and Comparison Study Sites and Large River Bypass, Peaking, and Comparison Study Sites (continued)¹.



Frequency (%) of All Species within the Middle Fork American River Bypass Reach Riparian Corridor.

Species Code	Scientific Name	Common Name	MF26.2	MF28.6	MF29.4	MF36.2	MF44.7
BRCA3	<i>Brickellia californica</i>	brickellbush					
CEOC2	<i>Cephalanthus occidentalis</i> var. <i>californicus</i>	California button willow	22				
CORNUS SP.	<i>Cornus</i> sp.	dogwood	6	12	4	12	15
RHAMNUS SP.	<i>Rhamnus</i> sp.	cofeeberry	9				
RINE	<i>Ribes nevadense</i>	Sierra currant		6			12
RULE	<i>Rubus leucodermis</i>	whitebark raspberry	31	72	62		
RUPA	<i>Rubus parviflorus</i>	thimbleberry		3			8
SALA6	<i>Salix lasiolepis</i> spp.	arroyo willow	9	3	4	19	4
SALU	<i>Salix lucida</i>	shining willow	6	22	15	12	4
SYMO	<i>Symphoricarpos mollis</i>	creeping snowberry	13				
VICA5	<i>Vitis californica</i>	California wild grape	3	50	38		
ALRH2	<i>Alnus rhombifolia</i>	white alder	53	63	38	65	54
CADE27	<i>Calocedrus decurrens</i>	incense cedar				4	19
POFR2	<i>Populus fremontii</i>	Fremont cottonwood			4		
PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir		13	15		12
SALA3	<i>Salix laevigata</i>	red willow	9			4	
UMCA	<i>Umbellularia californica</i>	California bay	9	9	12		

Figure AQ 10-3. Frequency of Species within the Riparian Corridor at the Small Stream Bypass and Comparison Study Sites and Large River Bypass, Peaking, and Comparison Study Sites (continued)¹.

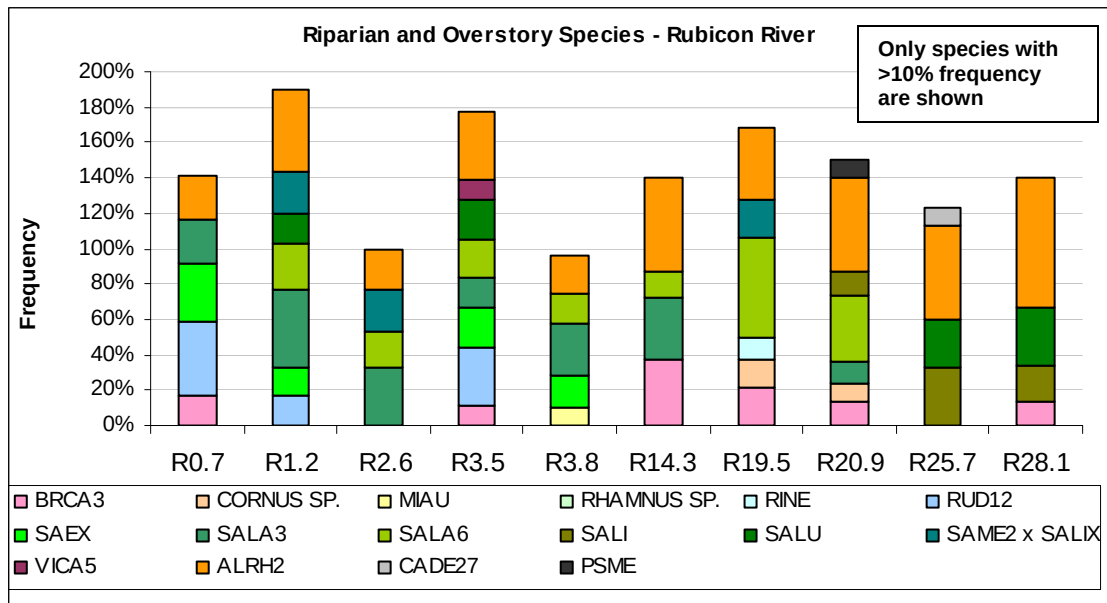


Frequency (%) of All Species within the Middle Fork American River Peaking Reach Riparian Corridor.

Species Code	BRCA3	CEOCC2	RUD12	RULE	RUUR	SAEX	SALA3	SALA6	SALI	SAME2 x SALIX	VICA5	ALRH2	POFR2	ROPS
Scientific Name	<i>Brickellia californica</i>	<i>Cephalanthus occidentalis</i> var. <i>californicus</i>	<i>Rubus armeniacus</i> (= <i>Rubus discolor</i>)	<i>Rubus leucodermis</i>	<i>Rubus ursinus</i>	<i>Salix exigua</i>	<i>Salix laevigata</i>	<i>Salix lasiolepis</i> /spp.	<i>Salix ligulifolia</i>	<i>SAME2 x SALIX</i>	<i>Vitis californica</i>	<i>Alnus rhombifolia</i>	<i>Populus fremontii</i> ssp. <i>Fremontii</i>	<i>Robinia pseudoacacia</i>
Common Name	brickellbush	California button willow	Himalayan blackberry	whitebark raspberry	California blackberry	narrow leaf willow	red willow	arroyo willow	strappleaf willow	willow	California wild grape	white alder	Fremont cottonwood	black locust
MF4.8	9	6	30			33	3	3	18	15	15	3		
MF10.4		8	4	35	8	8	8	27		42	4	15		15
MF17	17		27				7			37		23	10	10

Data were collected at Riparian Study Sites (not AQ 1 2-D modeling sites).

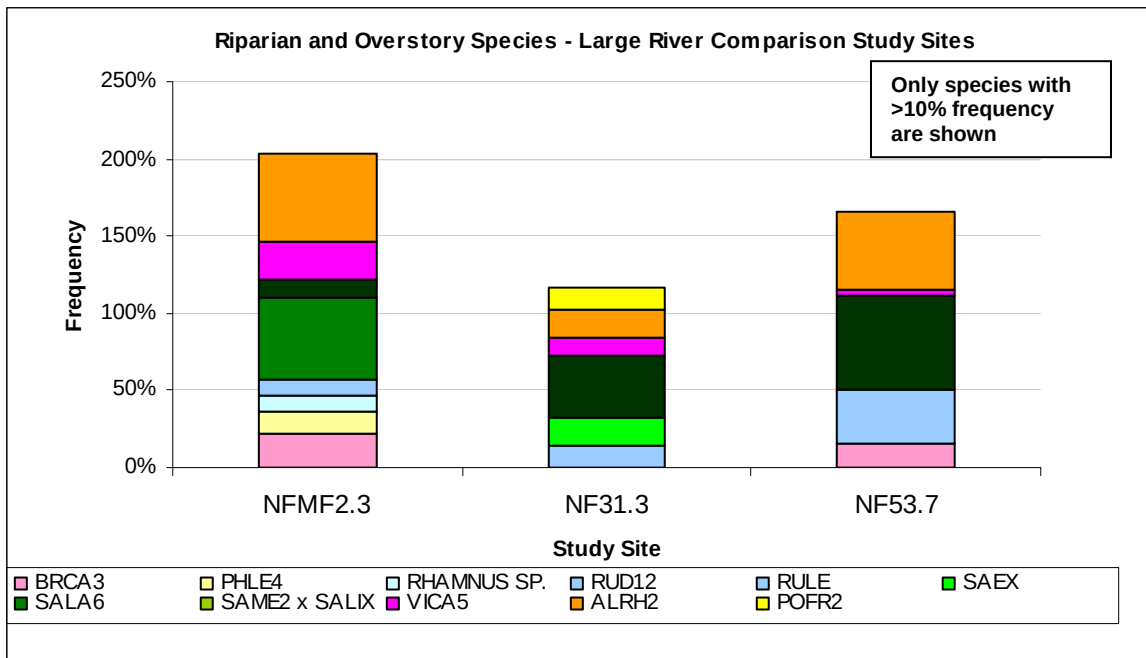
Figure AQ 10-3. Frequency of Species within the Riparian Corridor at the Small Stream Bypass and Comparison Study Sites and Large River Bypass, Peaking, and Comparison Study Sites (continued)¹.



Frequency (%) of All Species within the Rubicon River Riparian Corridor.

Species Code	Scientific Name	Common Name	R0.7	R1.2	R2.6	R3.5	R3.8	R14.3	R19.5	R20.9	R25.7	R28.1
BRCA3	<i>Brickellia californica</i>	brickellbush	17			42			8			8
CORNUS SP.	<i>Cornus</i> sp.	dogwood			7							
MIAU	<i>Dipylaeus aurantiacus</i> (= <i>Mimulus aurantiacus</i>)	sticky monkeyflower					11	3				
RHAMNUS SP.	<i>Rhamnus</i> sp.	cofeeberry			10	33					3	
RINE	<i>Ribes nevadense</i>	Sierra currant						6	13	3	7	
RUD12	<i>Rubus armeniacus</i> (= <i>Rubus discolor</i>)	Himalayan blackberry		17	7				3			
RUBUS SP.	<i>Rubus</i> sp.	blackberry	8			6						
SAEX	<i>Salix exigua</i>	narrow leaf willow	33	17		22	18					
SALA3	<i>Salix laevigata</i>	red willow	25	43	33	17	29	34	3	13		
SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow		27	20	22	18	16	56	37		
SALI	<i>Salix ligulifolia</i>	strappleaf willow			3			3		13	33	20
SALU	<i>Salix lucida</i>	shining willow	8	17				6		7	27	33
SAME2 x SALIX	<i>SAME2 x SALIX</i>	willow		23				6	22	7		
VICA5	<i>Vitis californica</i>	California wild grape	8	3								
ACMA3	<i>Acer macrophyllum</i>	big leaf maple		7				9	6	7	3	
alh2	<i>Alnus rhombifolia</i>	white alder	25	47	23	39	21	53	41	53	53	73
CADE27	<i>Calocedrus decurrens</i>	incense cedar							3	7	10	7
PIPO	<i>Pinus ponderosa</i>	ponderosa pine				6				3	3	
POBAT	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood										
POFR2	<i>Populus fremontii</i> ssp. <i>fremontii</i>	Fremont cottonwood		7			4	3				
PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir						3	6	10	7	
UMCA	<i>Umbellularia californica</i>	California bay										

Figure AQ 10-3. Frequency of Species within the Riparian Corridor at the Small Stream Bypass and Comparison Study Sites and Large River Bypass, Peaking, and Comparison Study Sites (continued)¹.



Frequency (%) of All Species within the Comparison River Riparian Corridors.

Species Code	BRCA3	CEOC2	PHLE4	RHAMNUS SP.	RUD12	RULE	SAEX	SALA3	SALA6	SAME2	SAME2 x SALIX	VICA5	ALRH2	POFR2	ROPS
Scientific Name	<i>Brickellia californica</i>	<i>Cephalanthus occidentalis</i> var. <i>californicus</i>	<i>Philadelphus lewisii</i>	<i>Rhamnus</i> sp.	<i>Rubus armeniacus</i> (= <i>Rubus discolor</i>)	<i>Rubus leucodermis</i>	<i>Salix exigua</i>	<i>Salix laevigata</i>	<i>Salix lasiolepis</i> /spp.	<i>Salix exigua</i> / <i>Salix melanopsis</i>	<i>SAME2 x SALIX</i>	<i>Vitis californica</i>	<i>Alnus rhombifolia</i>	<i>Populus fremontii</i> ssp. <i>fremontii</i>	<i>Robinia pseudoacacia</i>
Common Name	brickellbush	California button willow	wild mock orange	cofeeberry	Himalayan blackberry	whitebark raspberry	narrow leaf willow	red willow	arroyo willow	dusky willow	willow	California wild grape	white alder	Fremont cottonwood	black locust
NFMF2.3	21		14	11		11			54	11		25	57	4	
NF31.3	2	7			14		19	2	2	40	7	12	19	14	2
NF53.7	15			4	35				8	62		4	50		

¹Frequencies were calculated as the proportion of 5x2 plots at each study site in which the species occurred.

Figure AQ 10-4. Change in Riparian Vegetation Abundance Over Time at R3.5, R20.9, R25.7, MF4.8, and MF26.2 Following High Flow Events¹.

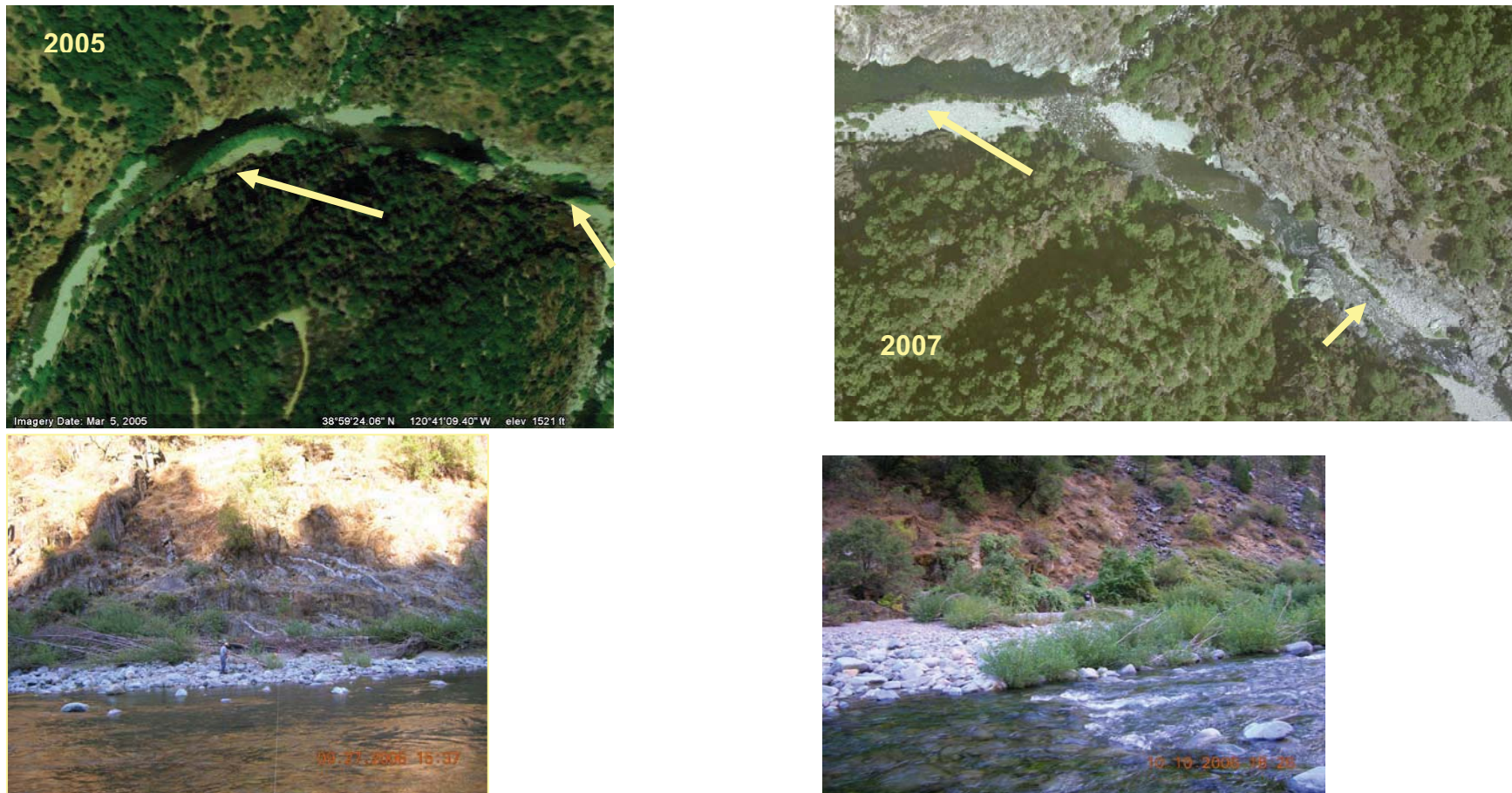
Rubicon River – R3.5



Rubicon River R3.5 in 2005 (left) and 2007 (right). Note change in vegetation abundance on the two bars identified with arrows on the two aerial photographs. 1998 and 2005 photographs from Google Earth.

Figure AQ 10-4. Change in Riparian Vegetation Abundance Over Time at R3.5, R20.9, R25.7, MF4.8, and MF26.2 Following High Flow Events (continued).

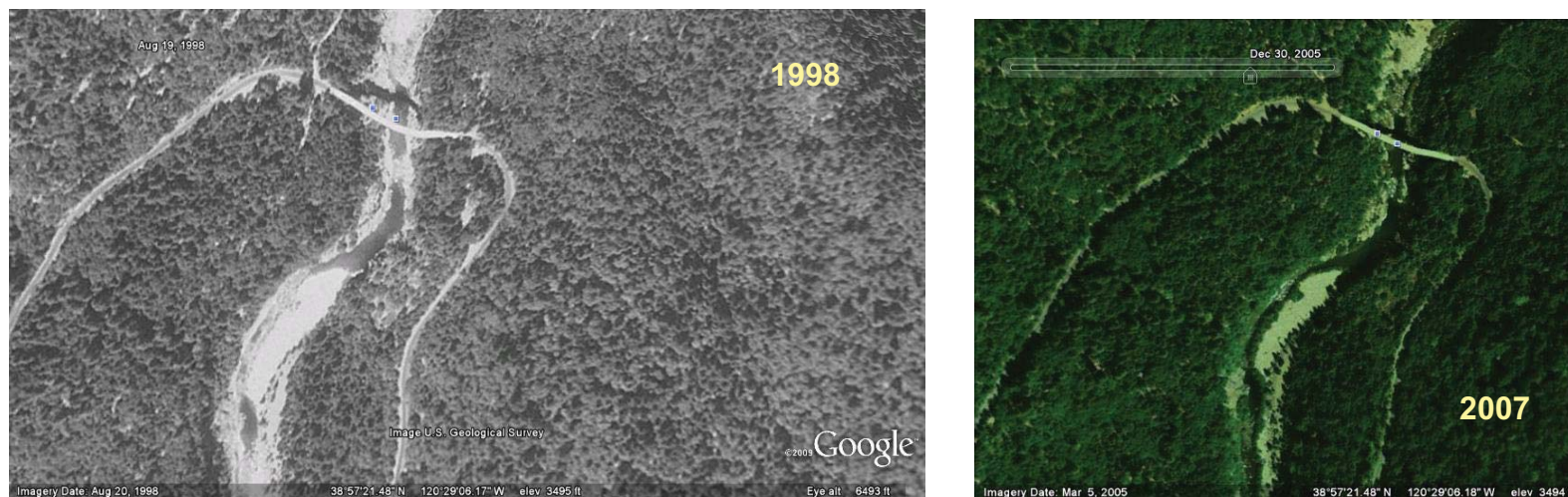
Rubicon River – R3.5



Rubicon River R3.5 in 2005 (left) and 2007 (right). Note change in vegetation abundance on the two bars identified with arrows on the two aerial photographs. 2005 photograph from Google Earth. The two photographs showing the scoured and abraded vegetation were taken at the study site during the 2006 field season.

Figure AQ 10-4. Change in Riparian Vegetation Abundance Over Time at R3.5, R20.9, R25.7, MF4.8, and MF26.2 Following High Flow Events (continued).

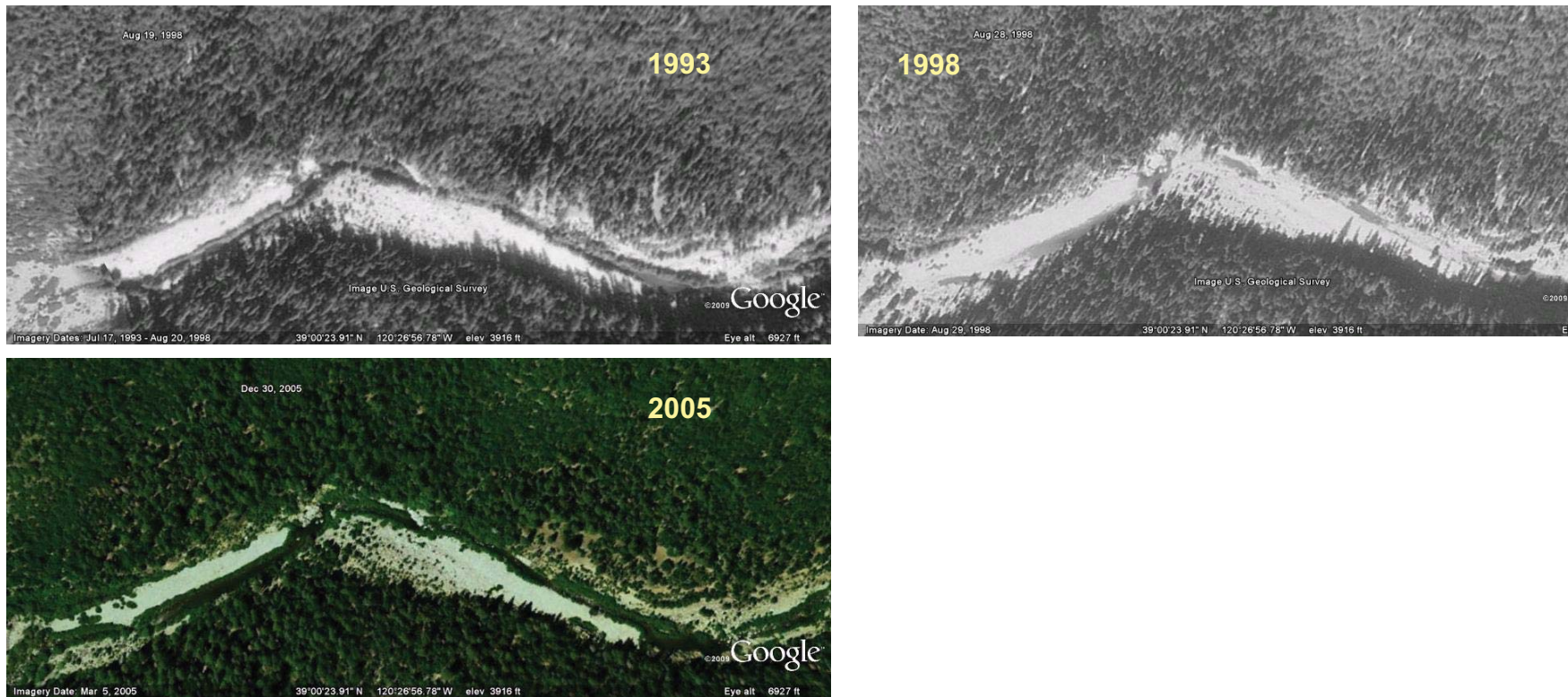
Rubicon River – R20.9



Rubicon River R20.9 (with Ellicott Bridge) in 1998 (left) and 2007 (right). Note change in vegetation abundance on the bars downstream from Ellicott Bridge. Both photographs from Google Earth.

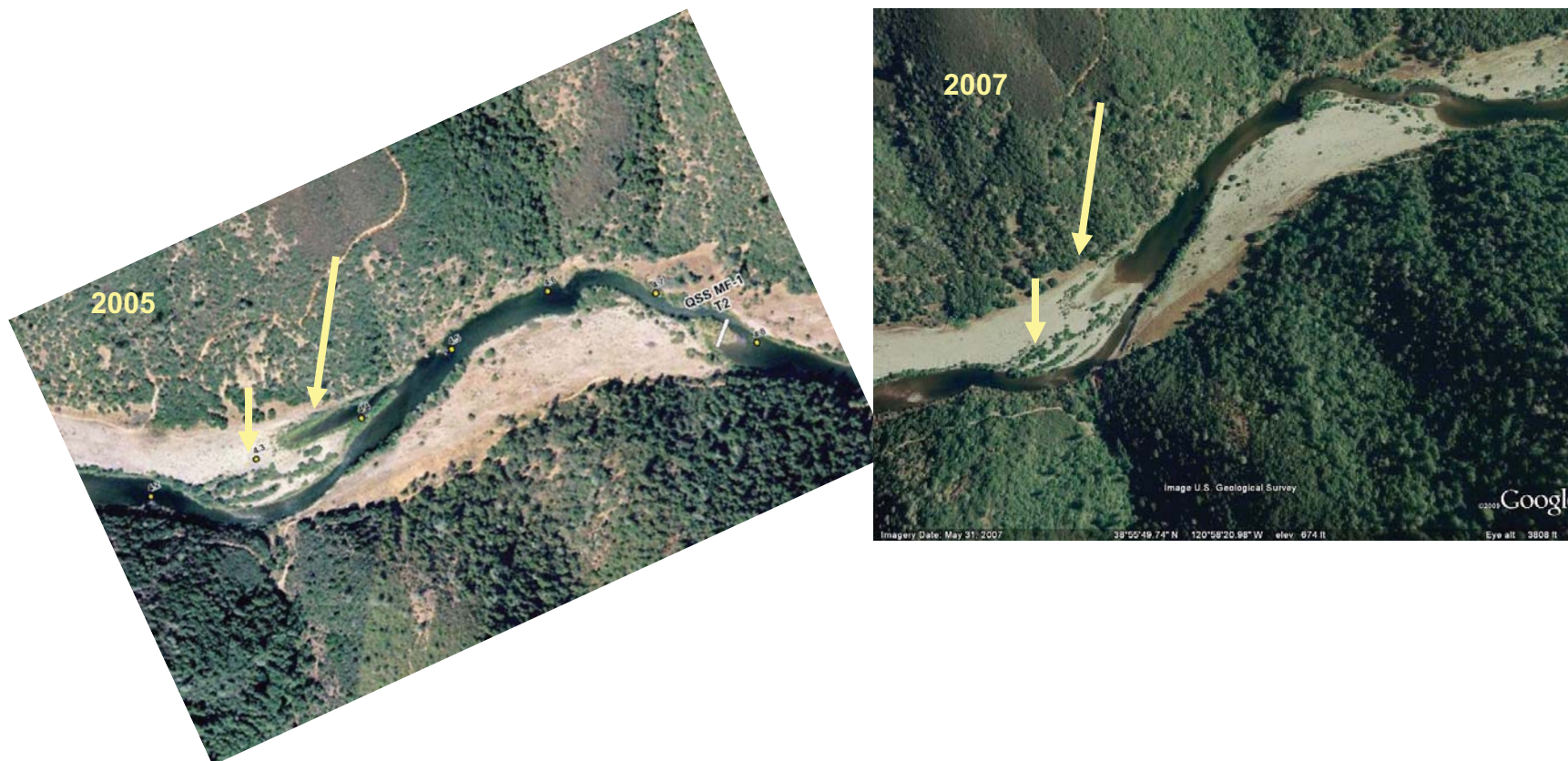
Figure AQ 10-4. Change in Riparian Vegetation Abundance Over Time at R3.5, R20.9, R25.7, MF4.8, and MF26.2 Following High Flow Events (continued).

Rubicon River – R25.7



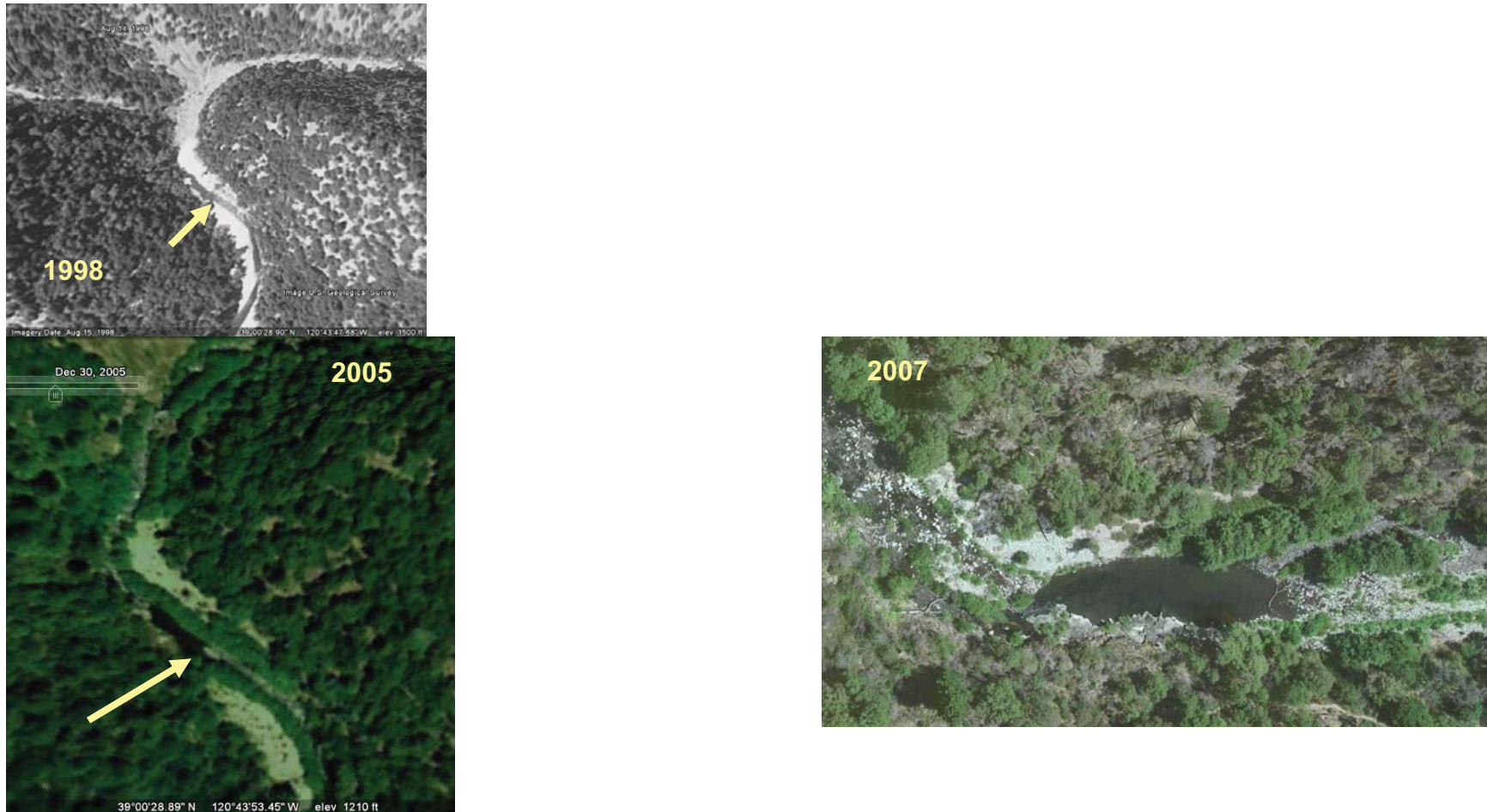
Rubicon River R25.7 in 1993 (top left), 1998 (top right) and 2007 (bottom left). Note change in vegetation abundance on the bars. All photographs from Google Earth.

**Figure AQ 10-4. Change in Riparian Vegetation Abundance Over Time at R3.5, R20.9, R25.7, MF4.8, and MF26.2 Following High Flow Events (continued).
Middle Fork American River – MF4.8**



Middle Fork American River MF4.8 in 2005 (left) and 2007 (right). Note change in vegetation abundance on the bar identified with arrows on the two aerial photographs. 2007 photograph from Google Earth.

**Figure AQ 10-4. Change in Riparian Vegetation Abundance Over Time at R3.5, R20.9, R25.7, MF4.8, and MF26.2 Following High Flow Events (continued).
Middle Fork American River – MF26.2**



Middle Fork American River MF26.2 in 1998 (top right), 2005 (bottom left) and 2007 (bottom right). The yellow arrow on the 1998 and 2005 photographs identify the pool that is shown on the 2007 photograph. 1998 and 2005 photographs from Google Earth.

MAPS

APPENDIX A

Hydrology Analyses at Selected Locations on the Bypass, Peaking, and Comparison Stream Reaches

Site-Specific Hydrology Calculation Method for North Fork American River (NF53.7)

Tables

Table A-1.	Summary of Recurrence Intervals for Each Study Site (Average Daily Flow).
Table A-2.	Middle Fork American River MF44.7: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).
Table A-3.	Middle Fork American River MF44.7: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.
Table A-4.	Middle Fork American River MF44.7: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.
Table A-5.	Middle Fork American River MF36.2: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).
Table A-6.	Middle Fork American River MF36.2: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.
Table A-7.	Middle Fork American River MF36.2: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.
Table A-8.	Middle Fork American River Below Middle Fork Interbay MF35.5: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).
Table A-9.	Middle Fork American River Below Middle Fork Interbay MF35.5: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.
Table A-10.	Middle Fork American River Below Middle Fork Interbay MF35.5: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.
Table A-11.	Middle Fork American River MF26.2: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).
Table A-12.	Middle Fork American River MF26.2: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.
Table A-13.	Middle Fork American River MF26.2: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.
Table A-14.	Middle Fork American River Below North Fork of the Middle Fork American River Confluence MF24.0: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

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Table A-15.	Middle Fork American River Below North Fork of the Middle Fork American River Confluence MF24.0: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.
Table A-16.	Middle Fork American River Below North Fork of the Middle Fork American River Confluence MF24.0: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.
Table A-17.	Middle Fork American River MF14.1: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).
Table A-18.	Middle Fork American River 14.1: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.
Table A-19.	Middle Fork American River 14.1: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.
Table A-20.	Middle Fork American River MF4.8: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).
Table A-21.	Middle Fork American River MF4.8: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.
Table A-22.	Middle Fork American River MF4.8: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.
Table A-23.	Rubicon River R25.7: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).
Table A-24.	Rubicon River R25.7: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.
Table A-25.	Rubicon River R25.7: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.
Table A-26.	Rubicon River R20.9: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).
Table A-27.	Rubicon River R20.9: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.
Table A-28.	Rubicon River R20.9: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.
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Site-Specific Hydrology Calculation Method for North Fork American River (NF53.7)

For the NF53.7 study site, a scaling approach was used to calculate the site-specific hydrology based on a comparison of empirical discharge measurements collected during the spring and summer 2008 at the site with 15-minute flow data from USGS gaging station 1427000 the gage at North Fork Dam (CDEC 2009). Based on this comparison and the large diel flow fluctuation patterns that occur on the North Fork American River during the spring snow melt period, two scaling factors were used, one for the snow melt period and one for the remainder of the year:

Field Survey Date	Measured Flow (cfs)	15-minute Flow at Gaging Station (cfs)	Scaling Factor
March 15 – June 15 Snowmelt – Scaling Factor:			0.96
4/29/2008	1,939.4	2,020	
June 16 – March 14 – Scaling Factor:			0.85
4/9/2008	581.7	718	0.81
4/10/2008	566.9	623	0.91
8/26/2008	25.8	31	0.83

The timing of the snow melt period was determined based on an evaluation of the period of time when large diel flow fluctuations occurred and the timing of the spring peak flows between 1975 and 2007. The scaling factor for the remainder of the year was calculated as the average of the ratios from the three days when field discharge measurements were collected.

Table A-1. Summary of Flows at Recurrence Intervals for Each Study Site (Average Daily Flow)¹.

Site	Q1.5		Q2		Q5		Q10		Q25	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Middle Fork American River Upstream of Middle Fork Interbay										
MF51.8	-	871	-	1,313	-	3,021	-	6,196	-	9,121
MF44.7	25	965	34	1,411	632	3,311	1,727	6,857	3,351	9,333
MF36.2	466	1,324	771	1,895	1,758	4,606	4,195	10,490	6,377	13,137
Middle Fork American River from Middle Fork Interbay to Ralston Afterbay										
MF26.2	369	1,938	584	2,915	2,970	6,733	6,148	15,671	10,680	21,108
Middle Fork American River Downstream of Ralston Afterbay										
MF17.0	3,318	6,410	7,239	11,039	19,465	27,075	37,771	68,656	54,918	86,209
MF14.1	3,383	6,483	7,332	11,171	19,789	27,412	34,436	69,434	55,859	87,238
MF4.8	3,476	6,590	7,467	11,369	20,241	27,879	35,373	70,543	57,127	88,636
Rubicon River										
R36.2	-	1,570	-	2,547	-	6,366	-	12,019	-	17,888
R25.7	87	2,012	173	3,594	1,922	8,494	5,970	14,856	12,901	20,894
R20.9	322	2,259	745	3,799	4,479	11,618	10,518	23,739	19,425	31,139
R3.5	1,168	3,234	2,415	6,338	11,341	14,479	22,542	36,239	37,364	47,346
South Fork Long Canyon Creek										
SFLC4.2	-	77	-	129	-	396	-	927	-	1,276
SFLC2.3	29	77	44	129	396	396	927	927	1,276	1,276
North Fork Long Canyon Creek										
NFLC3.8	-	50	-	65	-	225	-	528	-	727
NFLC1.9	19	50	32	65	225	225	528	528	727	727
Long Canyon Creek										
LC9.0	181	202	216	340	1,144	1,147	2,433	2,435	3,352	3,352
At Rubicon River Confluence	397	441	716	825	2,558	2,571	4,683	4,685	8,218	8,218
Duncan Creek										
D9.0	-	253	-	408	-	928	-	1,756	-	2,498
D8.3 and D6.3	90	253	164	408	774	928	1,650	1,756	2,274	2,498
At Middle Fork American River Confluence	216	350	421	564	1,025	1,153	2,496	2,717	3,175	3,275
Comparison River Reaches - North Fork of the Middle Fork American River and North Fork American River										
NFMF2.3	-	1,409	-	3,017	-	6,611	-	15,128	-	18,013
NF31.3	-	4,019	-	8,620	-	18,412	-	35,018	-	47,876
NF53.7	-	3,416	-	7,693	-	15,876	-	29,765	-	40,695

¹All flow data were developed by the Operations Model except for flows at NF53.7.

Table A-2. Middle Fork American River MF44.7: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5 Q1.5 = 965 cfs		Days Flows Exceed Q2 Q2 = 1411 cfs		Days Flows Exceed Q5 Q5 = 3311 cfs		Days Flows Exceed Q10 Q10 = 6857 cfs	
		Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1975	Above Normal	0	22	0	1	0	0	0	0
1976	Critical Dry	0	0	0	0	0	0	0	0
1977	Critical Dry	0	0	0	0	0	0	0	0
1978	Above Normal	0	1	0	0	0	0	0	0
1979	Below Normal	0	5	0	0	0	0	0	0
1980	Wet 0		9	0	6	0	2	0	1
1981	Dry	0	0	0	0	0	0	0	0
1982	Wet	1	25	0	11	0	2	0	0
1983	Wet	0	41	0	13	0	0	0	0
1984	Wet	0	13	0	5	0	0	0	0
1985	Below Normal	0	0	0	0	0	0	0	0
1986	Wet	5	13	4	7	0	4	0	1
1987	Critical Dry	0	0	0	0	0	0	0	0
1988	Critical Dry	0	0	0	0	0	0	0	0
1989	Below Normal	0	10	0	3	0	0	0	0
1990	Dry	0	0	0	0	0	0	0	0
1991	Dry	0	1	0	1	0	0	0	0
1992	Critical Dry	0	0	0	0	0	0	0	0
1993	Above Normal	0	12	0	1	0	0	0	0
1994	Critical Dry	0	0	0	0	0	0	0	0
1995	Wet	0	32	0	10	0	1	0	0
1996	Wet	3	12	3	6	1	0	0	0
1997	Wet	2	12	2	9	0	3	0	1
1998	Wet	0	13	0	1	0	0	0	0
1999	Above Normal	0	12	0	4	0	0	0	0
2000	Above Normal	0	4	0	1	0	0	0	0
2001	Dry	0	0	0	0	0	0	0	0
2002	Below Normal	0	1	0	0	0	0	0	0
2003	Below Normal	0	8	0	0	0	0	0	0
2004	Below Normal	0	0	0	0	0	0	0	0
2005	Above Normal	0	15	0	3	0	0	0	0
2006	Wet	0	35	0	11	0	2	0	0
2007	Dry	0	2	0	0	0	0	0	0
Total		11	298	9	93	1	14	0	3

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5		Average Number of Days per Year Flows Exceed Q2		Average Number of Days per Year Flows Exceed Q5		Average Number of Days per Year Flows Exceed Q10	
	Q1.5 = 965 cfs		Q2 = 1411 cfs		Q5 = 3311 cfs		Q10 = 6857 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Critical Dry	0	0	0	0	0.0	0.0	0.0	0.0
Dry	0	1	0	0	0.0	0.0	0.0	0.0
Below Normal	0	4	0	1	0.0	0.0	0.0	0.0
Above Normal	0	11	0	2	0.0	0.0	0.0	0.0
Wet	1	21	1	8	0.1	1.4	0.0	0.3

Table A-3. Middle Fork American River MF44.7: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 965 cfs		Percent of Years Flows Exceed Q2 Q2 = 1411 cfs		Percent of Years Flows Exceed Q5 Q5 = 3311 cfs		Percent of Years Flows Exceed Q10 Q10 = 6857 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	0%	100%	0%	83%	0%	0%	0%	0%
Wet	40%	100%	30%	100%	10%	60%	0%	30%

Table A-4. Middle Fork American River MF44.7: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 965 cfs		Q2 = 1411 cfs		Q5 = 3311 cfs		Q10 = 6857 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	0	11	0	2	0	0	0	0
Wet	3	21	3	8	1	2	0	1

Table A-5. Middle Fork American River MF36.2: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5		Days Flows Exceed Q2		Days Flows Exceed Q5		Days Flows Exceed Q10	
		Q1.5 = 1324 cfs		Q2 = 1895 cfs		Q5 = 4606 cfs		Q10 = 10490 cfs	
		Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1975	Above Normal	0	22	0	0	0	0	0	0
1976	Critical Dry	0	0	0	0	0	0	0	0
1977	Critical Dry	0	0	0	0	0	0	0	0
1978	Above Normal	0	2	0	0	0	0	0	0
1979	Below Normal	0	5	0	0	0	0	0	0
1980	Wet 3		11	3	8	1	2	0	1
1981	Dry	0	0	0	0	0	0	0	0
1982	Wet	4	34	1	11	0	2	0	0
1983	Wet	0	41	0	18	0	0	0	0
1984	Wet	0	15	0	10	0	0	0	0
1985	Below Normal	0	0	0	0	0	0	0	0
1986	Wet	11	15	8	10	1	4	0	1
1987	Critical Dry	0	0	0	0	0	0	0	0
1988	Critical Dry	0	0	0	0	0	0	0	0
1989	Below Normal	0	15	0	4	0	0	0	0
1990	Dry	0	0	0	0	0	0	0	0
1991	Dry	0	1	0	1	0	0	0	0
1992	Critical Dry	0	0	0	0	0	0	0	0
1993	Above Normal	0	19	0	3	0	0	0	0
1994	Critical Dry	0	0	0	0	0	0	0	0
1995	Wet	3	40	0	12	0	1	0	0
1996	Wet	4	14	3	9	0	0	0	0
1997	Wet	6	15	4	9	1	3	0	1
1998	Wet	0	18	0	6	0	0	0	0
1999	Above Normal	0	10	0	2	0	0	0	0
2000	Above Normal	0	5	0	1	0	0	0	0
2001	Dry	0	0	0	0	0	0	0	0
2002	Below Normal	0	2	0	0	0	0	0	0
2003	Below Normal	0	10	0	0	0	0	0	0
2004	Below Normal	0	0	0	0	0	0	0	0
2005	Above Normal	0	16	0	5	0	0	0	0
2006	Wet	1	39	1	15	0	2	0	0
2007	Dry	0	2	0	1	0	0	0	0
Total		32	351	20	125	3	14	0	3

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5		Average Number of Days per Year Flows Exceed Q2		Average Number of Days per Year Flows Exceed Q5		Average Number of Days per Year Flows Exceed Q10	
	Q1.5 = 1324 cfs		Q2 = 1895 cfs		Q5 = 4606 cfs		Q10 = 10490 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Critical Dry	0	0	0	0	0.0	0.0	0.0	0.0
Dry	0	1	0	0	0.0	0.0	0.0	0.0
Below Normal	0	5	0	1	0.0	0.0	0.0	0.0
Above Normal	0	12	0	2	0.0	0.0	0.0	0.0
Wet	3	24	2	11	0.3	1.4	0.0	0.3

Table A-6. Middle Fork American River MF36.2: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 1324 cfs		Percent of Years Flows Exceed Q2 Q2 = 1895 cfs		Percent of Years Flows Exceed Q5 Q5 = 4606 cfs		Percent of Years Flows Exceed Q10 Q10 = 10490 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	0%	100%	0%	67%	0%	0%	0%	0%
Wet	70%	100%	60%	100%	30%	60%	0%	30%

Table A-7. Middle Fork American River MF36.2: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 1324 cfs		Q2 = 1895 cfs		Q5 = 4606 cfs		Q10 = 10490 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	0	12	0	3	0	0	0	0
Wet	5	24	3	11	1	2	0	1

Table A-8. Middle Fork American River Below Middle Fork Interbay MF35.5: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5		Days Flows Exceed Q2		Days Flows Exceed Q5		Days Flows Exceed Q10	
		Q1.5 = 1689 cfs		Q2 = 2569 cfs		Q5 = 5849 cfs		Q10 = 13727 cfs	
		Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1975	Above Normal	0	22	0	0	0	0	0	0
1976	Critical Dry	0	0	0	0	0	0	0	0
1977	Critical Dry	0	0	0	0	0	0	0	0
1978	Above Normal	0	3	0	0	0	0	0	0
1979	Below Normal	0	3	0	0	0	0	0	0
1980	Wet 3		12	2	8	0	3	0	1
1981	Dry	0	0	0	0	0	0	0	0
1982	Wet	1	37	1	10	0	3	0	0
1983	Wet	0	40	0	13	0	0	0	0
1984	Wet	0	15	0	9	0	0	0	0
1985	Below Normal	0	0	0	0	0	0	0	0
1986	Wet	14	16	4	11	0	4	0	1
1987	Critical Dry	0	0	0	0	0	0	0	0
1988	Critical Dry	0	0	0	0	0	0	0	0
1989	Below Normal	0	17	0	3	0	0	0	0
1990	Dry	0	0	0	0	0	0	0	0
1991	Dry	0	1	0	1	0	0	0	0
1992	Critical Dry	0	0	0	0	0	0	0	0
1993	Above Normal	0	17	0	3	0	0	0	0
1994	Critical Dry	0	0	0	0	0	0	0	0
1995	Wet	1	44	0	12	0	1	0	0
1996	Wet	3	16	1	9	0	0	0	0
1997	Wet	6	16	2	9	1	3	0	1
1998	Wet	0	20	0	4	0	0	0	0
1999	Above Normal	0	9	0	1	0	0	0	0
2000	Above Normal	0	5	0	1	0	0	0	0
2001	Dry	0	0	0	0	0	0	0	0
2002	Below Normal	0	2	0	0	0	0	0	0
2003	Below Normal	0	8	0	0	0	0	0	0
2004	Below Normal	0	0	0	0	0	0	0	0
2005	Above Normal	0	16	0	3	0	0	0	0
2006	Wet	1	41	1	15	0	2	0	0
2007	Dry	0	2	0	1	0	0	0	0
Total		29	362	11	113	1	16	0	3

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5		Average Number of Days per Year Flows Exceed Q2		Average Number of Days per Year Flows Exceed Q5		Average Number of Days per Year Flows Exceed Q10	
	Q1.5 = 1689 cfs		Q2 = 2569 cfs		Q5 = 5849 cfs		Q10 = 13727 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Critical Dry	0	0	0	0	0.0	0.0	0.0	0.0
Dry	0	1	0	0	0.0	0.0	0.0	0.0
Below Normal	0	5	0	1	0.0	0.0	0.0	0.0
Above Normal	0	12	0	1	0.0	0.0	0.0	0.0
Wet	3	26	1	10	0.1	1.6	0.0	0.3

Table A-9. Middle Fork American River Below Middle Fork Interbay MF35.5: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 1689 cfs		Percent of Years Flows Exceed Q2 Q2 = 2569 cfs		Percent of Years Flows Exceed Q5 Q5 = 5849 cfs		Percent of Years Flows Exceed Q10 Q10 = 13727 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	0%	100%	0%	67%	0%	0%	0%	0%
Wet	70%	100%	60%	100%	10%	60%	0%	30%

Table A-10. Middle Fork American River Below Middle Fork Interbay MF35.5: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 1689 cfs		Q2 = 2569 cfs		Q5 = 5849 cfs		Q10 = 13727 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	0	12	0	2	0	0	0	0
Wet	4	26	2	10	1	3	0	1

Table A-11. Middle Fork American River MF26.2: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5		Days Flows Exceed Q2		Days Flows Exceed Q5		Days Flows Exceed Q10	
		Q1.5 = 1938 cfs		Q2 = 2915 cfs		Q5 = 6733 cfs		Q10 = 15671 cfs	
		Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1975	Above Normal	0	16	0	0	0	0	0	0
1976	Critical Dry	0	0	0	0	0	0	0	0
1977	Critical Dry	0	0	0	0	0	0	0	0
1978	Above Normal	0	1	0	0	0	0	0	0
1979	Below Normal	0	1	0	0	0	0	0	0
1980	Wet 3		12	2	8	0	2	0	1
1981	Dry	0	0	0	0	0	0	0	0
1982	Wet	8	52	2	13	0	3	0	0
1983	Wet	1	40	0	11	0	0	0	0
1984	Wet	3	15	0	8	0	0	0	0
1985	Below Normal	0	0	0	0	0	0	0	0
1986	Wet	13	17	6	11	3	4	0	2
1987	Critical Dry	0	1	0	0	0	0	0	0
1988	Critical Dry	0	0	0	0	0	0	0	0
1989	Below Normal	0	14	0	3	0	0	0	0
1990	Dry	0	0	0	0	0	0	0	0
1991	Dry	0	1	0	1	0	0	0	0
1992	Critical Dry	0	0	0	0	0	0	0	0
1993	Above Normal	0	12	0	2	0	0	0	0
1994	Critical Dry	0	0	0	0	0	0	0	0
1995	Wet	2	36	0	12	0	1	0	0
1996	Wet	3	13	1	7	0	0	0	0
1997	Wet	8	19	6	11	2	4	0	1
1998	Wet	0	12	0	3	0	0	0	0
1999	Above Normal	0	8	0	1	0	0	0	0
2000	Above Normal	0	5	0	1	0	0	0	0
2001	Dry	0	0	0	0	0	0	0	0
2002	Below Normal	0	0	0	0	0	0	0	0
2003	Below Normal	0	4	0	0	0	0	0	0
2004	Below Normal	0	0	0	0	0	0	0	0
2005	Above Normal	0	14	0	3	0	0	0	0
2006	Wet	4	47	1	16	0	1	0	0
2007	Dry	0	2	0	2	0	0	0	0
Total		45	342	18	113	5	15	0	4

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5		Average Number of Days per Year Flows Exceed Q2		Average Number of Days per Year Flows Exceed Q5		Average Number of Days per Year Flows Exceed Q10	
	Q1.5 = 1938 cfs		Q2 = 2915 cfs		Q5 = 6733 cfs		Q10 = 15671 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Critical Dry	0	0	0	0	0.0	0.0	0.0	0.0
Dry	0	1	0	1	0.0	0.0	0.0	0.0
Below Normal	0	3	0	1	0.0	0.0	0.0	0.0
Above Normal	0	9	0	1	0.0	0.0	0.0	0.0
Wet	5	26	2	10	0.5	1.5	0.0	0.4

Table A-12. Middle Fork American River MF26.2: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 1938 cfs		Percent of Years Flows Exceed Q2 Q2 = 2915 cfs		Percent of Years Flows Exceed Q5 Q5 = 6733 cfs		Percent of Years Flows Exceed Q10 Q10 = 15671 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	0%	100%	0%	67%	0%	0%	0%	0%
Wet	90%	100%	60%	100%	20%	60%	0%	30%

Table A-13. Middle Fork American River MF26.2: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 1938 cfs		Q2 = 2915 cfs		Q5 = 6733 cfs		Q10 = 15671 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	0	9	0	2	0	0	0	0
Wet	5	26	3	10	3	3	0	1

Table A-14. Middle Fork American River Below North Fork of the Middle Fork American River Confluence MF24.0: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5		Days Flows Exceed Q2		Days Flows Exceed Q5		Days Flows Exceed Q10	
		Q1.5 = 6410 cfs		Q2 = 11039 cfs		Q5 = 27075 cfs		Q10 = 68656 cfs	
		Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1975	Above Normal	1	7	0	0	0	0	0	0
1976	Critical Dry	0	0	0	0	0	0	0	0
1977	Critical Dry	0	0	0	0	0	0	0	0
1978	Above Normal	2	3	0	0	0	0	0	0
1979	Below Normal	0	1	0	1	0	0	0	0
1980	Wet 14		13	7	10	1	3	0	0
1981	Dry	0	0	0	0	0	0	0	0
1982	Wet	17	42	9	12	2	4	0	0
1983	Wet	10	42	1	4	0	0	0	0
1984	Wet	8	14	4	6	0	0	0	0
1985	Below Normal	0	0	0	0	0	0	0	0
1986	Wet	13	17	8	9	3	4	0	1
1987	Critical Dry	0	1	0	0	0	0	0	0
1988	Critical Dry	0	0	0	0	0	0	0	0
1989	Below Normal	1	10	0	3	0	0	0	0
1990	Dry	0	0	0	0	0	0	0	0
1991	Dry	1	1	0	1	0	0	0	0
1992	Critical Dry	0	1	0	0	0	0	0	0
1993	Above Normal	2	10	0	1	0	0	0	0
1994	Critical Dry	0	0	0	0	0	0	0	0
1995	Wet	11	34	5	10	0	1	0	0
1996	Wet	7	12	4	6	0	0	0	0
1997	Wet	16	19	7	10	2	4	0	1
1998	Wet	1	11	0	1	0	0	0	0
1999	Above Normal	2	9	1	1	0	0	0	0
2000	Above Normal	1	5	1	1	0	0	0	0
2001	Dry	0	0	0	0	0	0	0	0
2002	Below Normal	0	0	0	0	0	0	0	0
2003	Below Normal	0	0	0	0	0	0	0	0
2004	Below Normal	0	0	0	0	0	0	0	0
2005	Above Normal	1	15	0	3	0	0	0	0
2006	Wet	14	46	2	13	1	1	0	1
2007	Dry	0	1	0	0	0	0	0	0
Total		122	314	49	92	9	17	0	3

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5		Average Number of Days per Year Flows Exceed Q2		Average Number of Days per Year Flows Exceed Q5		Average Number of Days per Year Flows Exceed Q10	
	Q1.5 = 6410 cfs		Q2 = 11039 cfs		Q5 = 27075 cfs		Q10 = 68656 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Critical Dry	0	0	0	0	0.0	0.0	0.0	0.0
Dry	0	0	0	0	0.0	0.0	0.0	0.0
Below Normal	0	2	0	1	0.0	0.0	0.0	0.0
Above Normal	2	8	0	1	0.0	0.0	0.0	0.0
Wet	11	25	5	8	0.9	1.7	0.0	0.3

**Table A-15. Middle Fork American River Below North Fork of the Middle Fork American River Confluence
MF24.0: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10
Flows.**

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 6410 cfs		Percent of Years Flows Exceed Q2 Q2 = 11039 cfs		Percent of Years Flows Exceed Q5 Q5 = 27075 cfs		Percent of Years Flows Exceed Q10 Q10 = 68656 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	100%	100%	33%	67%	0%	0%	0%	0%
Wet	100%	100%	90%	100%	50%	60%	0%	30%

**Table A-16. Middle Fork American River Below North Fork of the Middle Fork American River Confluence
MF24.0: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2,
Q5, and Q10 Flow.**

Water Year Type	Q1.5 = 6410 cfs		Q2 = 11039 cfs		Q5 = 27075 cfs		Q10 = 68656 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	2	8	1	2	0	0	0	0
Wet	11	25	5	8	2	3	0	1

Table A-17. Middle Fork American River MF14.1: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5		Days Flows Exceed Q2		Days Flows Exceed Q5		Days Flows Exceed Q10	
		Q1.5 = 6483 cfs		Q2 = 11171 cfs		Q5 = 27412 cfs		Q10 = 69434 cfs	
		Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1975	Above Normal	1	7	0	0	0	0	0	0
1976	Critical Dry	0	0	0	0	0	0	0	0
1977	Critical Dry	0	0	0	0	0	0	0	0
1978	Above Normal	2	3	0	0	0	0	0	0
1979	Below Normal	0	1	0	1	0	0	0	0
1980	Wet 14		13	7	10	2	3	0	0
1981	Dry	0	0	0	0	0	0	0	0
1982	Wet	17	43	9	12	2	4	0	0
1983	Wet	10	42	1	4	0	0	0	0
1984	Wet	8	14	4	6	0	0	0	0
1985	Below Normal	0	0	0	0	0	0	0	0
1986	Wet	13	17	8	9	3	4	0	1
1987	Critical Dry	0	1	0	0	0	0	0	0
1988	Critical Dry	0	0	0	0	0	0	0	0
1989	Below Normal	1	10	0	3	0	0	0	0
1990	Dry	0	0	0	0	0	0	0	0
1991	Dry	1	1	0	1	0	0	0	0
1992	Critical Dry	0	1	0	0	0	0	0	0
1993	Above Normal	2	10	0	1	0	0	0	0
1994	Critical Dry	0	0	0	0	0	0	0	0
1995	Wet	11	34	5	10	0	1	0	0
1996	Wet	7	12	4	6	0	0	0	0
1997	Wet	16	19	7	10	2	4	0	1
1998	Wet	1	11	0	1	0	0	0	0
1999	Above Normal	2	9	1	1	0	0	0	0
2000	Above Normal	1	5	1	1	0	0	0	0
2001	Dry	0	0	0	0	0	0	0	0
2002	Below Normal	0	0	0	0	0	0	0	0
2003	Below Normal	0	0	0	0	0	0	0	0
2004	Below Normal	0	0	0	0	0	0	0	0
2005	Above Normal	1	15	0	3	0	0	0	0
2006	Wet	14	46	2	13	1	1	0	1
2007	Dry	0	1	0	0	0	0	0	0
Total		122	315	49	92	10	17	0	3

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5		Average Number of Days per Year Flows Exceed Q2		Average Number of Days per Year Flows Exceed Q5		Average Number of Days per Year Flows Exceed Q10	
	Q1.5 = 6483 cfs		Q2 = 11171 cfs		Q5 = 27412 cfs		Q10 = 69434 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Critical Dry	0	0	0	0	0.0	0.0	0.0	0.0
Dry	0	0	0	0	0.0	0.0	0.0	0.0
Below Normal	0	2	0	1	0.0	0.0	0.0	0.0
Above Normal	2	8	0	1	0.0	0.0	0.0	0.0
Wet	11	25	5	8	1.0	1.7	0.0	0.3

Table A-18. Middle Fork American River 14.1: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 6483 cfs		Percent of Years Flows Exceed Q2 Q2 = 11171 cfs		Percent of Years Flows Exceed Q5 Q5 = 27412 cfs		Percent of Years Flows Exceed Q10 Q10 = 69434 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	100%	100%	33%	67%	0%	0%	0%	0%
Wet	100%	100%	90%	100%	50%	60%	0%	30%

Table A-19. Middle Fork American River 14.1: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 6483 cfs		Q2 = 11171 cfs		Q5 = 27412 cfs		Q10 = 69434 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	2	8	1	2	0	0	0	0
Wet	11	25	5	8	2	3	0	1

Table A-20. Middle Fork American River MF4.8: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5		Days Flows Exceed Q2		Days Flows Exceed Q5		Days Flows Exceed Q10	
		Q1.5 = 6590 cfs		Q2 = 11360 cfs		Q5 = 27879 cfs		Q10 = 70543 cfs	
		Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1975	Above Normal	1	7	0	0	0	0	0	0
1976	Critical Dry	0	0	0	0	0	0	0	0
1977	Critical Dry	0	0	0	0	0	0	0	0
1978	Above Normal	2	3	0	0	0	0	0	0
1979	Below Normal	0	1	0	1	0	0	0	0
1980	Wet 14		13	7	10	2	3	0	0
1981	Dry	0	0	0	0	0	0	0	0
1982	Wet	17	43	9	12	2	4	0	0
1983	Wet	10	42	1	4	0	0	0	0
1984	Wet	10	14	4	6	0	0	0	0
1985	Below Normal	0	0	0	0	0	0	0	0
1986	Wet	13	17	8	9	3	4	0	1
1987	Critical Dry	0	1	0	0	0	0	0	0
1988	Critical Dry	0	0	0	0	0	0	0	0
1989	Below Normal	1	10	0	3	0	0	0	0
1990	Dry	0	0	0	0	0	0	0	0
1991	Dry	1	1	0	1	0	0	0	0
1992	Critical Dry	0	1	0	0	0	0	0	0
1993	Above Normal	2	10	0	1	0	0	0	0
1994	Critical Dry	0	0	0	0	0	0	0	0
1995	Wet	11	34	5	10	0	1	0	0
1996	Wet	7	12	4	6	0	0	0	0
1997	Wet	16	19	7	10	2	4	0	1
1998	Wet	1	11	0	1	0	0	0	0
1999	Above Normal	2	9	1	1	0	0	0	0
2000	Above Normal	1	5	1	1	0	0	0	0
2001	Dry	0	0	0	0	0	0	0	0
2002	Below Normal	0	0	0	0	0	0	0	0
2003	Below Normal	0	0	0	0	0	0	0	0
2004	Below Normal	0	0	0	0	0	0	0	0
2005	Above Normal	1	15	0	3	0	0	0	0
2006	Wet	15	46	2	13	1	1	0	1
2007	Dry	0	1	0	0	0	0	0	0
Total		125	315	49	92	10	17	0	3

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5		Average Number of Days per Year Flows Exceed Q2		Average Number of Days per Year Flows Exceed Q5		Average Number of Days per Year Flows Exceed Q10	
	Q1.5 = 6590 cfs		Q2 = 11360 cfs		Q5 = 27879 cfs		Q10 = 70543 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Critical Dry	0	0	0	0	0.0	0.0	0.0	0.0
Dry	0	0	0	0	0.0	0.0	0.0	0.0
Below Normal	0	2	0	1	0.0	0.0	0.0	0.0
Above Normal	2	8	0	1	0.0	0.0	0.0	0.0
Wet	11	25	5	8	1.0	1.7	0.0	0.3

Table A-21. Middle Fork American River MF4.8: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 6590 cfs		Percent of Years Flows Exceed Q2 Q2 = 11360 cfs		Percent of Years Flows Exceed Q5 Q5 = 27879 cfs		Percent of Years Flows Exceed Q10 Q10 = 70543 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	100%	100%	33%	67%	0%	0%	0%	0%
Wet	100%	100%	90%	100%	50%	60%	0%	30%

Table A-22. Middle Fork American River MF4.8: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 6590 cfs		Q2 = 11360 cfs		Q5 = 27879 cfs		Q10 = 70543 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	2	8	1	2	0	0	0	0
Wet	11	25	5	8	2	3	0	1

Table A-23. Rubicon River R25.7: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5		Days Flows Exceed Q2		Days Flows Exceed Q5		Days Flows Exceed Q10	
		Q1.5 = 2012 cfs		Q2 = 3594 cfs		Q5 = 8494 cfs		Q10 = 14856 cfs	
		Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1975	Above Normal	0	28	0	1	0	0	0	0
1976	Critical Dry	0	1	0	0	0	0	0	0
1977	Critical Dry	0	0	0	0	0	0	0	0
1978	Above Normal	0	15	0	0	0	0	0	0
1979	Below Normal	0	12	0	1	0	0	0	0
1980	Wet 0		17	0	3	0	1	0	1
1981	Dry	0	0	0	0	0	0	0	0
1982	Wet	2	27	1	10	0	2	0	0
1983	Wet	1	53	0	10	0	0	0	0
1984	Wet	0	17	0	3	0	0	0	0
1985	Below Normal	0	0	0	0	0	0	0	0
1986	Wet	2	16	1	5	0	3	0	0
1987	Critical Dry	0	1	0	0	0	0	0	0
1988	Critical Dry	0	0	0	0	0	0	0	0
1989	Below Normal	0	9	0	3	0	0	0	0
1990	Dry	0	0	0	0	0	0	0	0
1991	Dry	0	1	0	1	0	0	0	0
1992	Critical Dry	0	0	0	0	0	0	0	0
1993	Above Normal	0	24	0	0	0	0	0	0
1994	Critical Dry	0	0	0	0	0	0	0	0
1995	Wet	0	49	0	7	0	0	0	0
1996	Wet	4	19	3	7	1	1	0	0
1997	Wet	4	18	2	9	1	3	1	2
1998	Wet	0	39	0	1	0	0	0	0
1999	Above Normal	0	14	0	2	0	0	0	0
2000	Above Normal	0	4	0	1	0	0	0	0
2001	Dry	0	0	0	0	0	0	0	0
2002	Below Normal	0	0	0	0	0	0	0	0
2003	Below Normal	0	17	0	0	0	0	0	0
2004	Below Normal	0	0	0	0	0	0	0	0
2005	Above Normal	0	22	0	3	0	0	0	0
2006	Wet	0	44	0	8	0	1	0	1
2007	Dry	0	0	0	0	0	0	0	0
Total		13	447	7	75	2	11	1	4

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5		Average Number of Days per Year Flows Exceed Q2		Average Number of Days per Year Flows Exceed Q5		Average Number of Days per Year Flows Exceed Q10	
	Q1.5 = 2012 cfs		Q2 = 3594 cfs		Q5 = 8494 cfs		Q10 = 14856 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Critical Dry	0	0	0	0	0.0	0.0	0.0	0.0
Dry	0	0	0	0	0.0	0.0	0.0	0.0
Below Normal	0	6	0	1	0.0	0.0	0.0	0.0
Above Normal	0	18	0	1	0.0	0.0	0.0	0.0
Wet	1	30	1	6	0.2	1.1	0.1	0.4

Table A-24. Rubicon River R25.7: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 2012 cfs		Percent of Years Flows Exceed Q2 Q2 = 3594 cfs		Percent of Years Flows Exceed Q5 Q5 = 8494 cfs		Percent of Years Flows Exceed Q10 Q10 = 14856 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	0%	100%	0%	67%	0%	0%	0%	0%
Wet	50%	100%	40%	100%	20%	60%	10%	30%

Table A-25. Rubicon River R25.7: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 2012 cfs		Q2 = 3594 cfs		Q5 = 8494 cfs		Q10 = 14856 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	0	18	0	2	0	0	0	0
Wet	3	30	2	6	1	2	1	1

Table A-26. Rubicon River R20.9: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5		Days Flows Exceed Q2		Days Flows Exceed Q5		Days Flows Exceed Q10	
		Q1.5 = 2259 cfs		Q2 = 3799 cfs		Q5 = 11618 cfs		Q10 = 23739 cfs	
		Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1975	Above Normal	0	24	0	0	0	0	0	0
1976	Critical Dry	0	1	0	0	0	0	0	0
1977	Critical Dry	0	0	0	0	0	0	0	0
1978	Above Normal	0	9	0	0	0	0	0	0
1979	Below Normal	0	9	0	1	0	0	0	0
1980	Wet 3		13	3	7	0	2	0	1
1981	Dry	0	0	0	0	0	0	0	0
1982	Wet	6	28	2	11	0	2	0	0
1983	Wet	2	53	0	13	0	0	0	0
1984	Wet	4	16	0	6	0	0	0	0
1985	Below Normal	0	0	0	0	0	0	0	0
1986	Wet	6	15	4	6	0	4	0	1
1987	Critical Dry	0	1	0	0	0	0	0	0
1988	Critical Dry	0	0	0	0	0	0	0	0
1989	Below Normal	0	7	0	3	0	0	0	0
1990	Dry	0	0	0	0	0	0	0	0
1991	Dry	0	1	0	1	0	0	0	0
1992	Critical Dry	0	0	0	0	0	0	0	0
1993	Above Normal	0	18	0	1	0	0	0	0
1994	Critical Dry	0	0	0	0	0	0	0	0
1995	Wet	3	45	0	11	0	0	0	0
1996	Wet	6	16	4	8	1	1	0	0
1997	Wet	7	17	3	9	2	3	1	2
1998	Wet	1	30	0	1	0	0	0	0
1999	Above Normal	0	13	0	1	0	0	0	0
2000	Above Normal	0	4	0	1	0	0	0	0
2001	Dry	0	0	0	0	0	0	0	0
2002	Below Normal	0	0	0	0	0	0	0	0
2003	Below Normal	0	15	0	0	0	0	0	0
2004	Below Normal	0	0	0	0	0	0	0	0
2005	Above Normal	0	19	0	3	0	0	0	0
2006	Wet	2	40	1	10	0	1	0	0
2007	Dry	0	0	0	0	0	0	0	0
Total		40	394	17	93	3	13	1	4

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5		Average Number of Days per Year Flows Exceed Q2		Average Number of Days per Year Flows Exceed Q5		Average Number of Days per Year Flows Exceed Q10	
	Q1.5 = 2259 cfs		Q2 = 3799 cfs		Q5 = 11618 cfs		Q10 = 23739 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Critical Dry	0	0	0	0	0.0	0.0	0.0	0.0
Dry	0	0	0	0	0.0	0.0	0.0	0.0
Below Normal	0	5	0	1	0.0	0.0	0.0	0.0
Above Normal	0	15	0	1	0.0	0.0	0.0	0.0
Wet	4	27	2	8	0.3	1.3	0.1	0.4

Table A-27. Rubicon River R20.9: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 2259 cfs		Percent of Years Flows Exceed Q2 Q2 = 3799 cfs		Percent of Years Flows Exceed Q5 Q5 = 11618 cfs		Percent of Years Flows Exceed Q10 Q10 = 23739 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	0%	100%	0%	67%	0%	0%	0%	0%
Wet	100%	100%	60%	100%	20%	60%	10%	30%

Table A-28. Rubicon River R20.9: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 2259 cfs		Q2 = 3799 cfs		Q5 = 11618 cfs		Q10 = 23739 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	0	15	0	2	0	0	0	0
Wet	4	27	3	8	2	2	1	1

Table A-29. Rubicon River R3.5: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5		Days Flows Exceed Q2		Days Flows Exceed Q5		Days Flows Exceed Q10	
		Q1.5 = 3234 cfs		Q2 = 6338 cfs		Q5 = 14479 cfs		Q10 = 36239 cfs	
		Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1975	Above Normal	0	17	0	0	0	0	0	0
1976	Critical Dry	0	1	0	0	0	0	0	0
1977	Critical Dry	0	0	0	0	0	0	0	0
1978	Above Normal	0	1	0	0	0	0	0	0
1979	Below Normal	0	1	0	1	0	0	0	0
1980	Wet 11		13	5	7	1	3	0	0
1981	Dry	0	0	0	0	0	0	0	0
1982	Wet	10	35	5	10	1	4	0	0
1983	Wet	5	52	1	2	0	0	0	0
1984	Wet	5	14	3	5	0	0	0	0
1985	Below Normal	0	0	0	0	0	0	0	0
1986	Wet	10	15	6	7	4	4	0	1
1987	Critical Dry	0	1	0	0	0	0	0	0
1988	Critical Dry	0	0	0	0	0	0	0	0
1989	Below Normal	0	9	0	1	0	0	0	0
1990	Dry	0	0	0	0	0	0	0	0
1991	Dry	0	1	0	1	0	0	0	0
1992	Critical Dry	0	0	0	0	0	0	0	0
1993	Above Normal	1	11	0	1	0	0	0	0
1994	Critical Dry	0	0	0	0	0	0	0	0
1995	Wet	11	35	4	10	0	1	0	0
1996	Wet	8	12	4	6	0	0	0	0
1997	Wet	11	17	7	9	2	4	1	1
1998	Wet	1	23	1	1	0	0	0	0
1999	Above Normal	3	9	0	1	0	0	0	0
2000	Above Normal	1	5	0	1	0	0	0	0
2001	Dry	0	0	0	0	0	0	0	0
2002	Below Normal	0	0	0	0	0	0	0	0
2003	Below Normal	0	5	0	0	0	0	0	0
2004	Below Normal	0	0	0	0	0	0	0	0
2005	Above Normal	0	14	0	2	0	0	0	0
2006	Wet	16	44	1	9	1	1	0	1
2007	Dry	0	0	0	0	0	0	0	0
Total		93	335	37	74	9	17	1	3

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5		Average Number of Days per Year Flows Exceed Q2		Average Number of Days per Year Flows Exceed Q5		Average Number of Days per Year Flows Exceed Q10	
	Q1.5 = 3234 cfs		Q2 = 6338 cfs		Q5 = 14479 cfs		Q10 = 36239 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Critical Dry	0	0	0	0	0.0	0.0	0.0	0.0
Dry	0	0	0	0	0.0	0.0	0.0	0.0
Below Normal	0	3	0	0	0.0	0.0	0.0	0.0
Above Normal	1	10	0	1	0.0	0.0	0.0	0.0
Wet	9	26	4	7	0.9	1.7	0.1	0.3

Table A-30. Rubicon River R3.5: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 3234 cfs		Percent of Years Flows Exceed Q2 Q2 = 6338 cfs		Percent of Years Flows Exceed Q5 Q5 = 14479 cfs		Percent of Years Flows Exceed Q10 Q10 = 36239 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	50%	100%	0%	67%	0%	0%	0%	0%
Wet	100%	100%	100%	100%	50%	60%	10%	30%

Table A-31. Rubicon River R3.5: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 3234 cfs		Q2 = 6338 cfs		Q5 = 14479 cfs		Q10 = 36239 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	2	10	0	1	0	0	0	0
Wet	9	26	4	7	2	3	1	1

Table A-32. South Fork Long Canyon Creek SFLC2.3: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5		Days Flows Exceed Q2		Days Flows Exceed Q5		Days Flows Exceed Q10	
		Q1.5 = 77 cfs		Q2 = 129 cfs		Q5 = 396 cfs		Q10 = 927 cfs	
		Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1975	Above Normal	0	24	0	2	0	0	0	0
1976	Critical Dry	0	0	0	0	0	0	0	0
1977	Critical Dry	0	0	0	0	0	0	0	0
1978	Above Normal	0	13	0	1	0	0	0	0
1979	Below Normal	0	3	0	0	0	0	0	0
1980	Wet 15		31	10	20	2	2	0	0
1981	Dry	0	4	0	1	0	0	0	0
1982	Wet	59	64	16	19	3	3	0	0
1983	Wet	38	64	9	19	1	1	0	0
1984	Wet	12	19	8	10	0	0	0	0
1985	Below Normal	0	0	0	0	0	0	0	0
1986	Wet	22	24	13	13	3	3	1	1
1987	Critical Dry	0	0	0	0	0	0	0	0
1988	Critical Dry	0	0	0	0	0	0	0	0
1989	Below Normal	0	28	0	4	0	0	0	0
1990	Dry	0	0	0	0	0	0	0	0
1991	Dry	0	0	0	0	0	0	0	0
1992	Critical Dry	0	0	0	0	0	0	0	0
1993	Above Normal	0	24	0	1	0	0	0	0
1994	Critical Dry	0	0	0	0	0	0	0	0
1995	Wet	12	33	7	8	0	0	0	0
1996	Wet	8	32	1	5	0	0	0	0
1997	Wet	23	24	14	14	6	6	2	2
1998	Wet	0	41	0	6	0	0	0	0
1999	Above Normal	0	12	0	2	0	0	0	0
2000	Above Normal	0	4	0	0	0	0	0	0
2001	Dry	0	0	0	0	0	0	0	0
2002	Below Normal	0	2	0	0	0	0	0	0
2003	Below Normal	0	4	0	0	0	0	0	0
2004	Below Normal	0	0	0	0	0	0	0	0
2005	Above Normal	0	17	0	2	0	0	0	0
2006	Wet	53	53	28	28	1	1	1	1
2007	Dry	1	1	0	0	0	0	0	0
Total		243	521	106	155	16	16	4	4

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5		Average Number of Days per Year Flows Exceed Q2		Average Number of Days per Year Flows Exceed Q5		Average Number of Days per Year Flows Exceed Q10	
	Q1.5 = 77 cfs		Q2 = 129 cfs		Q5 = 396 cfs		Q10 = 927 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Critical Dry	0	0	0	0	0.0	0.0	0.0	0.0
Dry	0	1	0	0	0.0	0.0	0.0	0.0
Below Normal	0	6	0	1	0.0	0.0	0.0	0.0
Above Normal	0	16	0	1	0.0	0.0	0.0	0.0
Wet	24	39	11	14	1.6	1.6	0.4	0.4

Table A-33. South Fork Long Canyon Creek SFLC2.3: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 77 cfs		Percent of Years Flows Exceed Q2 Q2 = 129 cfs		Percent of Years Flows Exceed Q5 Q5 = 396 cfs		Percent of Years Flows Exceed Q10 Q10 = 927 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	0%	100%	0%	83%	0%	0%	0%	0%
Wet	90%	100%	90%	100%	60%	60%	30%	30%

Table A-34. South Fork Long Canyon Creek SFLC2.3: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 77 cfs		Q2 = 129 cfs		Q5 = 396 cfs		Q10 = 927 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	0	16	0	2	0	0	0	0
Wet	27	39	12	14	3	3	1	1

Table A-35. North Fork Long Canyon Creek NFLC1.9: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5		Days Flows Exceed Q2		Days Flows Exceed Q5		Days Flows Exceed Q10	
		Q1.5 = 50 cfs		Q2 = 65 cfs		Q5 = 225 cfs		Q10 = 528 cfs	
		Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1975	Above Normal	0	7	0	1	0	0	0	0
1976	Critical Dry	0	0	0	0	0	0	0	0
1977	Critical Dry	0	0	0	0	0	0	0	0
1978	Above Normal	0	9	0	1	0	0	0	0
1979	Below Normal	0	1	0	0	0	0	0	0
1980	Wet 13		15	10	12	2	2	0	0
1981	Dry	0	1	0	0	0	0	0	0
1982	Wet	55	57	23	25	3	3	0	0
1983	Wet	29	54	12	24	1	1	0	0
1984	Wet	12	17	9	11	0	0	0	0
1985	Below Normal	0	0	0	0	0	0	0	0
1986	Wet	18	20	13	15	3	3	1	1
1987	Critical Dry	0	0	0	0	0	0	0	0
1988	Critical Dry	0	0	0	0	0	0	0	0
1989	Below Normal	0	14	0	2	0	0	0	0
1990	Dry	0	0	0	0	0	0	0	0
1991	Dry	0	0	0	0	0	0	0	0
1992	Critical Dry	0	0	0	0	0	0	0	0
1993	Above Normal	0	11	0	2	0	0	0	0
1994	Critical Dry	0	0	0	0	0	0	0	0
1995	Wet	10	16	8	8	0	0	0	0
1996	Wet	5	14	2	6	0	0	0	0
1997	Wet	22	24	15	17	6	6	2	2
1998	Wet	0	29	0	14	0	0	0	0
1999	Above Normal	0	10	0	7	0	0	0	0
2000	Above Normal	0	1	0	0	0	0	0	0
2001	Dry	0	0	0	0	0	0	0	0
2002	Below Normal	0	4	0	0	0	0	0	0
2003	Below Normal	0	6	0	1	0	0	0	0
2004	Below Normal	0	4	0	0	0	0	0	0
2005	Above Normal	0	10	0	1	0	0	0	0
2006	Wet	46	46	36	36	1	1	1	1
2007	Dry	0	0	0	0	0	0	0	0
Total		210	370	128	183	16	16	4	4

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5		Average Number of Days per Year Flows Exceed Q2		Average Number of Days per Year Flows Exceed Q5		Average Number of Days per Year Flows Exceed Q10	
	Q1.5 = 50 cfs		Q2 = 65 cfs		Q5 = 225 cfs		Q10 = 528 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Critical Dry	0	0	0	0	0.0	0.0	0.0	0.0
Dry	0	0	0	0	0.0	0.0	0.0	0.0
Below Normal	0	5	0	1	0.0	0.0	0.0	0.0
Above Normal	0	8	0	2	0.0	0.0	0.0	0.0
Wet	21	29	13	17	1.6	1.6	0.4	0.4

Table A-36. North Fork Long Canyon Creek NFLC1.9: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 50 cfs		Percent of Years Flows Exceed Q2 Q2 = 65 cfs		Percent of Years Flows Exceed Q5 Q5 = 225 cfs		Percent of Years Flows Exceed Q10 Q10 = 528 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	0%	100%	0%	83%	0%	0%	0%	0%
Wet	90%	100%	90%	100%	60%	60%	30%	30%

Table A-37. North Fork Long Canyon Creek NFLC1.9: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 50 cfs		Q2 = 65 cfs		Q5 = 225 cfs		Q10 = 528 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	0	8	0	2	0	0	0	0
Wet	23	29	14	17	3	3	1	1

Table A-38. Long Canyon Creek LC9.0: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5		Days Flows Exceed Q2		Days Flows Exceed Q5		Days Flows Exceed Q10	
		Q1.5 = 202 cfs		Q2 = 340 cfs		Q5 = 1147 cfs		Q10 = 2435 cfs	
		Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1975	Above Normal	0	10	0	0	0	0	0	0
1976	Critical Dry	0	0	0	0	0	0	0	0
1977	Critical Dry	0	0	0	0	0	0	0	0
1978	Above Normal	0	9	0	1	0	0	0	0
1979	Below Normal	0	1	0	0	0	0	0	0
1980	Wet 14		20	11	12	2	2	0	0
1981	Dry	0	2	0	0	0	0	0	0
1982	Wet	62	64	17	19	3	3	0	0
1983	Wet	39	56	9	9	0	0	0	0
1984	Wet	14	17	8	9	0	0	0	0
1985	Below Normal	0	0	0	0	0	0	0	0
1986	Wet	22	23	13	13	3	3	1	1
1987	Critical Dry	0	0	0	0	0	0	0	0
1988	Critical Dry	0	0	0	0	0	0	0	0
1989	Below Normal	4	18	1	5	0	0	0	0
1990	Dry	0	0	0	0	0	0	0	0
1991	Dry	1	1	1	1	0	0	0	0
1992	Critical Dry	0	0	0	0	0	0	0	0
1993	Above Normal	3	20	0	2	0	0	0	0
1994	Critical Dry	0	0	0	0	0	0	0	0
1995	Wet	30	47	16	24	1	1	0	0
1996	Wet	12	19	4	7	0	0	0	0
1997	Wet	26	27	16	17	5	5	2	2
1998	Wet	3	19	1	4	0	0	0	0
1999	Above Normal	3	10	1	3	0	0	0	0
2000	Above Normal	3	5	1	2	0	0	0	0
2001	Dry	0	0	0	0	0	0	0	0
2002	Below Normal	0	0	0	0	0	0	0	0
2003	Below Normal	0	5	0	0	0	0	0	0
2004	Below Normal	0	0	0	0	0	0	0	0
2005	Above Normal	9	25	4	5	0	0	0	0
2006	Wet	53	53	28	28	1	1	1	1
2007	Dry	1	1	0	0	0	0	0	0
Total		299	452	131	161	15	15	4	4

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5		Average Number of Days per Year Flows Exceed Q2		Average Number of Days per Year Flows Exceed Q5		Average Number of Days per Year Flows Exceed Q10	
	Q1.5 = 202 cfs		Q2 = 340 cfs		Q5 = 1147 cfs		Q10 = 2435 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Critical Dry	0	0	0	0	0.0	0.0	0.0	0.0
Dry	0	1	0	0	0.0	0.0	0.0	0.0
Below Normal	1	4	0	1	0.0	0.0	0.0	0.0
Above Normal	3	13	1	2	0.0	0.0	0.0	0.0
Wet	28	35	12	14	1.5	1.5	0.4	0.4

Table A-39. Long Canyon Creek LC9.0: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 202 cfs		Percent of Years Flows Exceed Q2 Q2 = 340 cfs		Percent of Years Flows Exceed Q5 Q5 = 1147 cfs		Percent of Years Flows Exceed Q10 Q10 = 2435 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	67%	100%	50%	83%	0%	0%	0%	0%
Wet	100%	100%	100%	100%	60%	60%	30%	30%

Table A-40. Long Canyon Creek LC9.0: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 202 cfs		Q2 = 340 cfs		Q5 = 1147 cfs		Q10 = 2435 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	5	13	2	3	0	0	0	0
Wet	28	35	12	14	3	3	1	1

Table A-41. Long Canyon Creek at Rubicon River Confluence LC0.0: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5 Q1.5 = 441 cfs		Days Flows Exceed Q2 Q2 = 825 cfs		Days Flows Exceed Q5 Q5 = 2571 cfs		Days Flows Exceed Q10 Q10 = 4685 cfs	
		Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1975	Above Normal	1	2	0	1	0	0	0	0
1976	Critical Dry	0	0	0	0	0	0	0	0
1977	Critical Dry	0	0	0	0	0	0	0	0
1978	Above Normal	5	10	0	1	0	0	0	0
1979	Below Normal	0	0	0	0	0	0	0	0
1980	Wet 18		18	13	13	3	3	0	0
1981	Dry	0	0	0	0	0	0	0	0
1982	Wet	66	66	14	16	3	3	0	0
1983	Wet	49	60	11	11	1	1	0	0
1984	Wet	15	18	6	7	0	0	0	0
1985	Below Normal	0	0	0	0	0	0	0	0
1986	Wet	22	22	11	12	4	4	3	3
1987	Critical Dry	1	1	0	0	0	0	0	0
1988	Critical Dry	0	0	0	0	0	0	0	0
1989	Below Normal	10	17	1	3	0	0	0	0
1990	Dry	0	0	0	0	0	0	0	0
1991	Dry	1	1	0	0	0	0	0	0
1992	Critical Dry	0	1	0	0	0	0	0	0
1993	Above Normal	10	24	3	3	0	0	0	0
1994	Critical Dry	0	0	0	0	0	0	0	0
1995	Wet	41	47	18	20	0	0	0	0
1996	Wet	12	18	3	5	0	0	0	0
1997	Wet	23	23	14	15	3	3	2	2
1998	Wet	13	22	1	4	0	0	0	0
1999	Above Normal	5	12	3	4	0	0	0	0
2000	Above Normal	5	8	2	2	0	0	0	0
2001	Dry	0	0	0	0	0	0	0	0
2002	Below Normal	0	1	0	0	0	0	0	0
2003	Below Normal	0	4	0	0	0	0	0	0
2004	Below Normal	0	0	0	0	0	0	0	0
2005	Above Normal	8	15	3	4	0	0	0	0
2006	Wet	54	54	26	26	1	1	1	1
2007	Dry	0	0	0	0	0	0	0	0
Total		359	444	129	147	15	15	6	6

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5 Q1.5 = 441 cfs		Average Number of Days per Year Flows Exceed Q2 Q2 = 825 cfs		Average Number of Days per Year Flows Exceed Q5 Q5 = 2571 cfs		Average Number of Days per Year Flows Exceed Q10 Q10 = 4685 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Critical Dry	0	0	0	0	0.0	0.0	0.0	0.0
Dry	0	0	0	0	0.0	0.0	0.0	0.0
Below Normal	2	4	0	1	0.0	0.0	0.0	0.0
Above Normal	6	12	2	3	0.0	0.0	0.0	0.0
Wet	31	35	12	13	1.5	1.5	0.6	0.6

Table A-42. Long Canyon Creek at Rubicon River Confluence LC0.0: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 441 cfs		Percent of Years Flows Exceed Q2 Q2 = 825 cfs		Percent of Years Flows Exceed Q5 Q5 = 2571 cfs		Percent of Years Flows Exceed Q10 Q10 = 4685 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	100%	100%	67%	100%	0%	0%	0%	0%
Wet	100%	100%	100%	100%	60%	60%	30%	30%

Table A-43. Long Canyon Creek at Rubicon River Confluence LC0.0: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 441 cfs		Q2 = 825 cfs		Q5 = 2571 cfs		Q10 = 4685 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	6	12	3	3	0	0	0	0
Wet	31	35	12	13	3	3	2	2

Table A-44. Duncan Creek D8.3 and D6.3: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5		Days Flows Exceed Q2		Days Flows Exceed Q5		Days Flows Exceed Q10	
		Q1.5 = 253 cfs		Q2 = 408 cfs		Q5 = 928 cfs		Q10 = 1756 cfs	
		Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1975	Above Normal	0	7	0	0	0	0	0	0
1976	Critical Dry	0	0	0	0	0	0	0	0
1977	Critical Dry	0	0	0	0	0	0	0	0
1978	Above Normal	0	1	0	0	0	0	0	0
1979	Below Normal	0	1	0	0	0	0	0	0
1980	Wet	6	8	3	3	1	1	0	0
1981	Dry	0	0	0	0	0	0	0	0
1982	Wet	10	19	6	8	2	2	0	0
1983	Wet	2	41	1	9	0	0	0	0
1984	Wet	3	14	1	4	0	0	0	0
1985	Below Normal	0	0	0	0	0	0	0	0
1986	Wet	7	11	4	5	4	4	1	1
1987	Critical Dry	0	1	0	0	0	0	0	0
1988	Critical Dry	0	0	0	0	0	0	0	0
1989	Below Normal	0	7	0	1	0	0	0	0
1990	Dry	0	0	0	0	0	0	0	0
1991	Dry	1	1	0	1	0	0	0	0
1992	Critical Dry	0	0	0	0	0	0	0	0
1993	Above Normal	0	18	0	1	0	0	0	0
1994	Critical Dry	0	0	0	0	0	0	0	0
1995	Wet	7	27	4	8	0	0	0	0
1996	Wet	6	10	5	6	0	0	0	0
1997	Wet	8	10	6	9	2	3	1	1
1998	Wet	1	22	1	1	0	0	0	0
1999	Above Normal	0	10	0	1	0	0	0	0
2000	Above Normal	0	4	0	1	0	0	0	0
2001	Dry	0	0	0	0	0	0	0	0
2002	Below Normal	0	0	0	0	0	0	0	0
2003	Below Normal	0	7	0	0	0	0	0	0
2004	Below Normal	0	0	0	0	0	0	0	0
2005	Above Normal	4	16	1	4	0	1	0	0
2006	Wet	10	33	4	9	1	2	0	1
2007	Dry	1	2	0	2	0	0	0	0
Total		66	270	36	73	10	13	2	3

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5		Average Number of Days per Year Flows Exceed Q2		Average Number of Days per Year Flows Exceed Q5		Average Number of Days per Year Flows Exceed Q10	
	Q1.5 = 253 cfs		Q2 = 408 cfs		Q5 = 928 cfs		Q10 = 1756 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Critical Dry	0	0	0	0	0.0	0.0	0.0	0.0
Dry	0	1	0	1	0.0	0.0	0.0	0.0
Below Normal	0	3	0	0	0.0	0.0	0.0	0.0
Above Normal	1	9	0	1	0.0	0.2	0.0	0.0
Wet	6	20	4	6	1.0	1.2	0.2	0.3

Table A-45. Duncan Creek D8.23 and D6.3: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 253 cfs		Percent of Years Flows Exceed Q2 Q2 = 408 cfs		Percent of Years Flows Exceed Q5 Q5 = 928 cfs		Percent of Years Flows Exceed Q10 Q10 = 1756 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	17%	100%	17%	67%	0%	17%	0%	0%
Wet	100%	100%	100%	100%	50%	50%	20%	30%

Table A-46. Duncan Creek D8.23 and D6.3: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 253 cfs		Q2 = 408 cfs		Q5 = 928 cfs		Q10 = 1756 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	4	9	1	2	0	1	0	0
Wet	6	20	4	6	2	2	1	1

Table A-47. Duncan Creek at Middle Fork American River Confluence D0.0: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5		Days Flows Exceed Q2		Days Flows Exceed Q5		Days Flows Exceed Q10	
		Q1.5 = 350 cfs		Q2 = 564 cfs		Q5 = 1153 cfs		Q10 = 2717 cfs	
		Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1975	Above Normal	0	7	0	0	0	0	0	0
1976	Critical Dry	0	0	0	0	0	0	0	0
1977	Critical Dry	0	0	0	0	0	0	0	0
1978	Above Normal	0	1	0	0	0	0	0	0
1979	Below Normal	0	1	0	0	0	0	0	0
1980	Wet 9		12	6	8	3	3	1	1
1981	Dry	0	0	0	0	0	0	0	0
1982	Wet	11	33	8	9	2	3	0	0
1983	Wet	11	39	1	11	0	0	0	0
1984	Wet	7	16	1	8	0	0	0	0
1985	Below Normal	0	0	0	0	0	0	0	0
1986	Wet	15	18	8	10	4	4	1	1
1987	Critical Dry	0	1	0	0	0	0	0	0
1988	Critical Dry	0	0	0	0	0	0	0	0
1989	Below Normal	2	16	0	3	0	0	0	0
1990	Dry	0	0	0	0	0	0	0	0
1991	Dry	1	1	0	1	0	0	0	0
1992	Critical Dry	0	0	0	0	0	0	0	0
1993	Above Normal	3	15	0	3	0	0	0	0
1994	Critical Dry	0	0	0	0	0	0	0	0
1995	Wet	15	44	8	14	0	1	0	0
1996	Wet	9	16	5	8	0	0	0	0
1997	Wet	14	17	8	10	3	4	1	1
1998	Wet	4	15	1	4	0	0	0	0
1999	Above Normal	1	7	0	1	0	0	0	0
2000	Above Normal	1	4	0	1	0	0	0	0
2001	Dry	0	0	0	0	0	0	0	0
2002	Below Normal	0	0	0	0	0	0	0	0
2003	Below Normal	0	5	0	0	0	0	0	0
2004	Below Normal	0	0	0	0	0	0	0	0
2005	Above Normal	4	15	1	3	0	0	0	0
2006	Wet	20	44	8	13	1	2	0	0
2007	Dry	1	2	0	2	0	0	0	0
Total		128	329	55	109	13	17	3	3

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5		Average Number of Days per Year Flows Exceed Q2		Average Number of Days per Year Flows Exceed Q5		Average Number of Days per Year Flows Exceed Q10	
	Q1.5 = 350 cfs		Q2 = 564 cfs		Q5 = 1153 cfs		Q10 = 2717 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Critical Dry	0	0	0	0	0.0	0.0	0.0	0.0
Dry	0	1	0	1	0.0	0.0	0.0	0.0
Below Normal	0	4	0	1	0.0	0.0	0.0	0.0
Above Normal	2	8	0	1	0.0	0.0	0.0	0.0
Wet	12	25	5	10	1.3	1.7	0.3	0.3

Table A-48. Duncan Creek at Middle Fork American River Confluence D0.0: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 350 cfs		Percent of Years Flows Exceed Q2 Q2 = 564 cfs		Percent of Years Flows Exceed Q5 Q5 = 1153 cfs		Percent of Years Flows Exceed Q10 Q10 = 2717 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	67%	100%	17%	67%	0%	0%	0%	0%
Wet	100%	100%	100%	100%	50%	60%	30%	30%

Table A-49. Duncan Creek at Middle Fork American River Confluence D0.0: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 350 cfs		Q2 = 564 cfs		Q5 = 1153 cfs		Q10 = 2717 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal	2	8	1	2	0	0	0	0
Wet	12	25	5	10	3	3	1	1

Table A-50. North Fork of the Middle Fork American River NFMF2.3: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5 Q1.5 = 1409 cfs		Days Flows Exceed Q2 Q2 = 3017 cfs		Days Flows Exceed Q5 Q5 = 6611 cfs		Days Flows Exceed Q10 Q10 = 15128 cfs	
			Unimpaired		Unimpaired		Unimpaired		Unimpaired
1975	Above Normal		2		1		0		0
1976	Critical Dry		0		0		0		0
1977	Critical Dry		0		0		0		0
1978	Above Normal		8		0		0		0
1979	Below Normal		1		0		0		0
1980	Wet 15				8		3		1
1981	Dry		2		0		0		0
1982	Wet		30		10		3		0
1983	Wet		19		4		1		0
1984	Wet		16		5		0		0
1985	Below Normal		0		0		0		0
1986	Wet		18		8		4		2
1987	Critical Dry		0		0		0		0
1988	Critical Dry		0		0		0		0
1989	Below Normal		8		1		0		0
1990	Dry		0		0		0		0
1991	Dry		2		1		0		0
1992	Critical Dry		1		0		0		0
1993	Above Normal		8		1		0		0
1994	Critical Dry		0		0		0		0
1995	Wet		33		9		0		0
1996	Wet		14		2		0		0
1997	Wet		25		11		3		2
1998	Wet		13		2		0		0
1999	Above Normal		8		1		0		0
2000	Above Normal		7		1		0		0
2001	Dry		0		0		0		0
2002	Below Normal		0		0		0		0
2003	Below Normal		0		0		0		0
2004	Below Normal		1		0		0		0
2005	Above Normal		10		3		0		0
2006	Wet		33		9		1		0
2007	Dry		0		0		0		0
Total			274		77		15		5

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5 Q1.5 = 1409 cfs		Average Number of Days per Year Flows Exceed Q2 Q2 = 3017 cfs		Average Number of Days per Year Flows Exceed Q5 Q5 = 6611 cfs		Average Number of Days per Year Flows Exceed Q10 Q10 = 15128 cfs	
		Unimpaired		Unimpaired		Unimpaired		Unimpaired
Critical Dry		0		0		0.0		0.0
Dry		1		0		0.0		0.0
Below Normal		2		0		0.0		0.0
Above Normal		7		1		0.0		0.0
Wet		22		7		1.5		0.5

Table A-51. North Fork of the Middle Fork American River NFMF2.3: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 1409 cfs		Percent of Years Flows Exceed Q2 Q2 = 3017 cfs		Percent of Years Flows Exceed Q5 Q5 = 6611 cfs		Percent of Years Flows Exceed Q10 Q10 = 15128 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal		100%		83%		0%		0%
Wet		100%		100%		60%		30%

Table A-52. North Fork of the Middle Fork American River NFMF2.3: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 1409 cfs		Q2 = 3017 cfs		Q5 = 6611 cfs		Q10 = 15128 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal		7		1		0		0
Wet		22		7		3		2

Table A-53. North Fork American River NF31.3: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5 Q1.5 = 4019 cfs		Days Flows Exceed Q2 Q2 = 8620 cfs		Days Flows Exceed Q5 Q5 = 18412 cfs		Days Flows Exceed Q10 Q10 = 35018 cfs	
			Unimpaired		Unimpaired		Unimpaired		Unimpaired
1975	Above Normal		2		1		0		0
1976	Critical Dry		0		0		0		0
1977	Critical Dry		0		0		0		0
1978	Above Normal		10		0		0		0
1979	Below Normal		1		0		0		0
1980	Wet 14				6		3		0
1981	Dry		0		0		0		0
1982	Wet		30		8		3		0
1983	Wet		34		4		1		0
1984	Wet		16		4		0		0
1985	Below Normal		0		0		0		0
1986	Wet		19		8		4		3
1987	Critical Dry		0		0		0		0
1988	Critical Dry		0		0		0		0
1989	Below Normal		8		1		0		0
1990	Dry		0		0		0		0
1991	Dry		2		1		0		0
1992	Critical Dry		1		0		0		0
1993	Above Normal		9		1		0		0
1994	Critical Dry		0		0		0		0
1995	Wet		33		10		0		0
1996	Wet		14		3		0		0
1997	Wet		25		11		3		2
1998	Wet		14		2		0		0
1999	Above Normal		8		1		0		0
2000	Above Normal		7		1		0		0
2001	Dry		0		0		0		0
2002	Below Normal		0		0		0		0
2003	Below Normal		0		0		0		0
2004	Below Normal		1		0		0		0
2005	Above Normal		14		3		0		0
2006	Wet		34		8		1		1
2007	Dry		1		0		0		0
Total			297		73		15		6

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5 Q1.5 = 4019 cfs		Average Number of Days per Year Flows Exceed Q2 Q2 = 8620 cfs		Average Number of Days per Year Flows Exceed Q5 Q5 = 18412 cfs		Average Number of Days per Year Flows Exceed Q10 Q10 = 35018 cfs	
		Unimpaired		Unimpaired		Unimpaired		Unimpaired
Critical Dry		0		0		0.0		0.0
Dry		1		0		0.0		0.0
Below Normal		2		0		0.0		0.0
Above Normal		8		1		0.0		0.0
Wet		23		6		1.5		0.6

Table A-54. North Fork American River NF31.3: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 4019 cfs		Percent of Years Flows Exceed Q2 Q2 = 8620 cfs		Percent of Years Flows Exceed Q5 Q5 = 18412 cfs		Percent of Years Flows Exceed Q10 Q10 = 35018 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal		100%		83%		0%		0%
Wet		100%		100%		60%		30%

Table A-55. North Fork American River NF31.3: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 4019 cfs		Q2 = 8620 cfs		Q5 = 18412 cfs		Q10 = 35018 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal		8		1		0		0
Wet		23		6		3		2

Table A-56. North Fork American River NF53.7: Frequency of High Flow Events by Year and Water Year Type (1975 - 2007).

Water Year	Water Year Type	Days Flows Exceed Q1.5 Q1.5 = 3416 cfs		Days Flows Exceed Q2 Q2 = 7693 cfs		Days Flows Exceed Q5 Q5 = 15876 cfs		Days Flows Exceed Q10 Q10 = 29765 cfs	
			Unimpaired		Unimpaired		Unimpaired		Unimpaired
1975	Above Normal		4		1		0		0
1976	Critical Dry		0		0		0		0
1977	Critical Dry		0		0		0		0
1978	Above Normal		10		0		0		0
1979	Below Normal		1		0		0		0
1980	Wet 14				6		3		0
1981	Dry		0		0		0		0
1982	Wet		33		8		3		0
1983	Wet		41		4		1		0
1984	Wet		16		4		0		0
1985	Below Normal		0		0		0		0
1986	Wet		19		8		4		3
1987	Critical Dry		0		0		0		0
1988	Critical Dry		0		0		0		0
1989	Below Normal		9		1		0		0
1990	Dry		0		0		0		0
1991	Dry		2		1		0		0
1992	Critical Dry		1		0		0		0
1993	Above Normal		10		1		0		0
1994	Critical Dry		0		0		0		0
1995	Wet		35		9		0		0
1996	Wet		15		4		0		0
1997	Wet		25		8		3		2
1998	Wet		16		2		0		0
1999	Above Normal		8		1		0		0
2000	Above Normal		7		1		0		0
2001	Dry		0		0		0		0
2002	Below Normal		0		0		0		0
2003	Below Normal		0		0		0		0
2004	Below Normal		1		0		0		0
2005	Above Normal		18		3		0		0
2006	Wet		39		9		1		1
2007	Dry		1		0		0		0
Total			325		71		15		6

Water Year Type	Average Number of Days per Year Flows Exceed Q1.5 Q1.5 = 3416 cfs		Average Number of Days per Year Flows Exceed Q2 Q2 = 7693 cfs		Average Number of Days per Year Flows Exceed Q5 Q5 = 15876 cfs		Average Number of Days per Year Flows Exceed Q10 Q10 = 29765 cfs	
		Unimpaired		Unimpaired		Unimpaired		Unimpaired
Critical Dry		0		0		0.0		0.0
Dry		1		0		0.0		0.0
Below Normal		2		0		0.0		0.0
Above Normal		10		1		0.0		0.0
Wet		25		6		1.5		0.6

Table A-57. North Fork American River 53.7: Percent of Wet and Above Normal Water Years with Flows that Exceeded the Q1.5, Q2, Q5, and Q10 Flows.

Water Year Type	Percent of Years Flows Exceed Q1.5 Q1.5 = 3416 cfs		Percent of Years Flows Exceed Q2 Q2 = 7693 cfs		Percent of Years Flows Exceed Q5 Q5 = 15876 cfs		Percent of Years Flows Exceed Q10 Q10 = 29765 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal		100%		83%		0%		0%
Wet		100%		100%		60%		30%

Table A-58. North Fork American River 53.7: Average Number of Days per Wet and Above Normal Water Year when Flows Exceeded the Q1.5, Q2, Q5, and Q10 Flow.

Water Year Type	Q1.5 = 3416 cfs		Q2 = 7693 cfs		Q5 = 15876 cfs		Q10 = 29765 cfs	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Above Normal		10		1		0		0
Wet		25		6		3		2

FIGURES

Figure A-1. Middle Fork American River MF44.7: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).

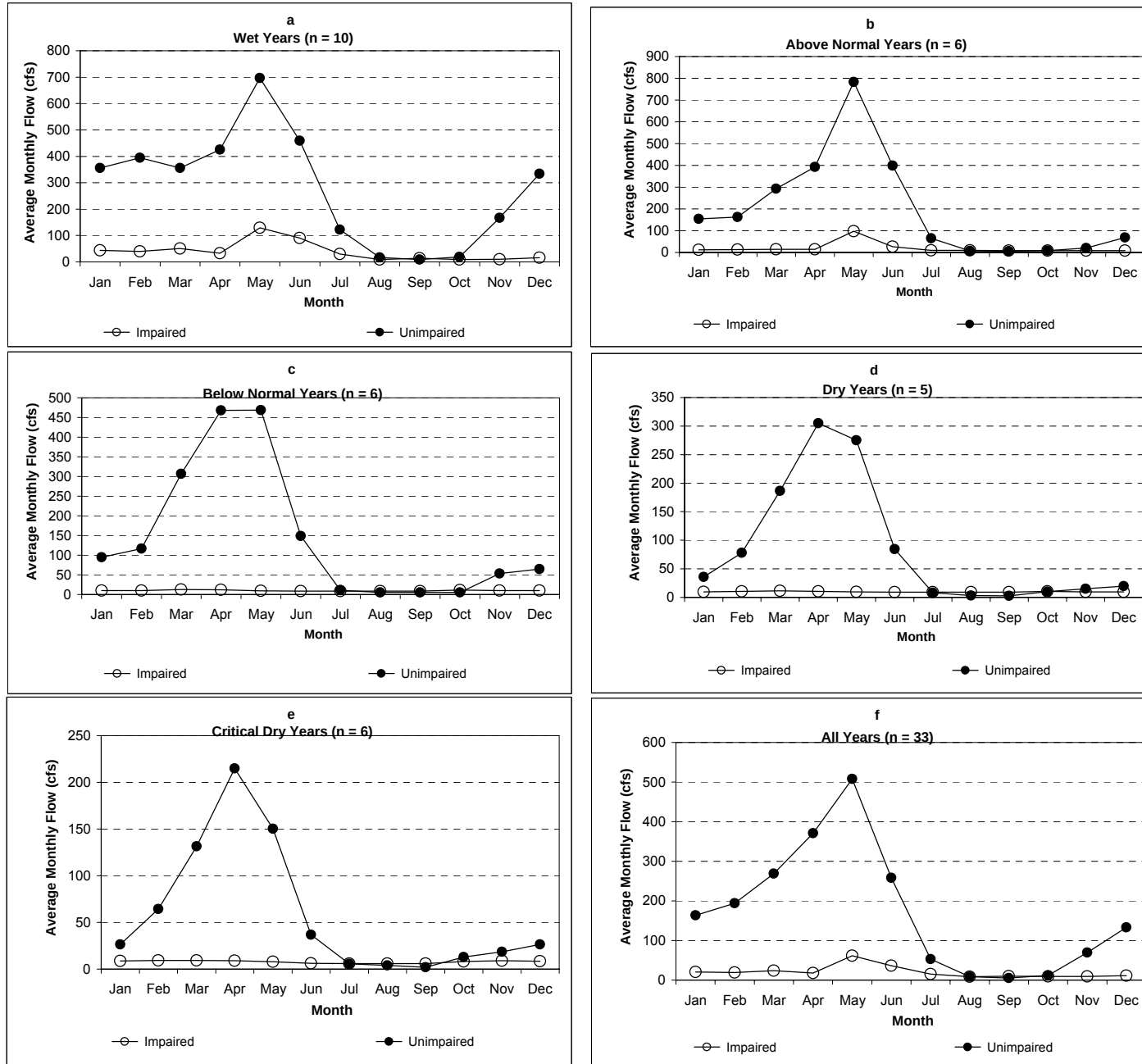
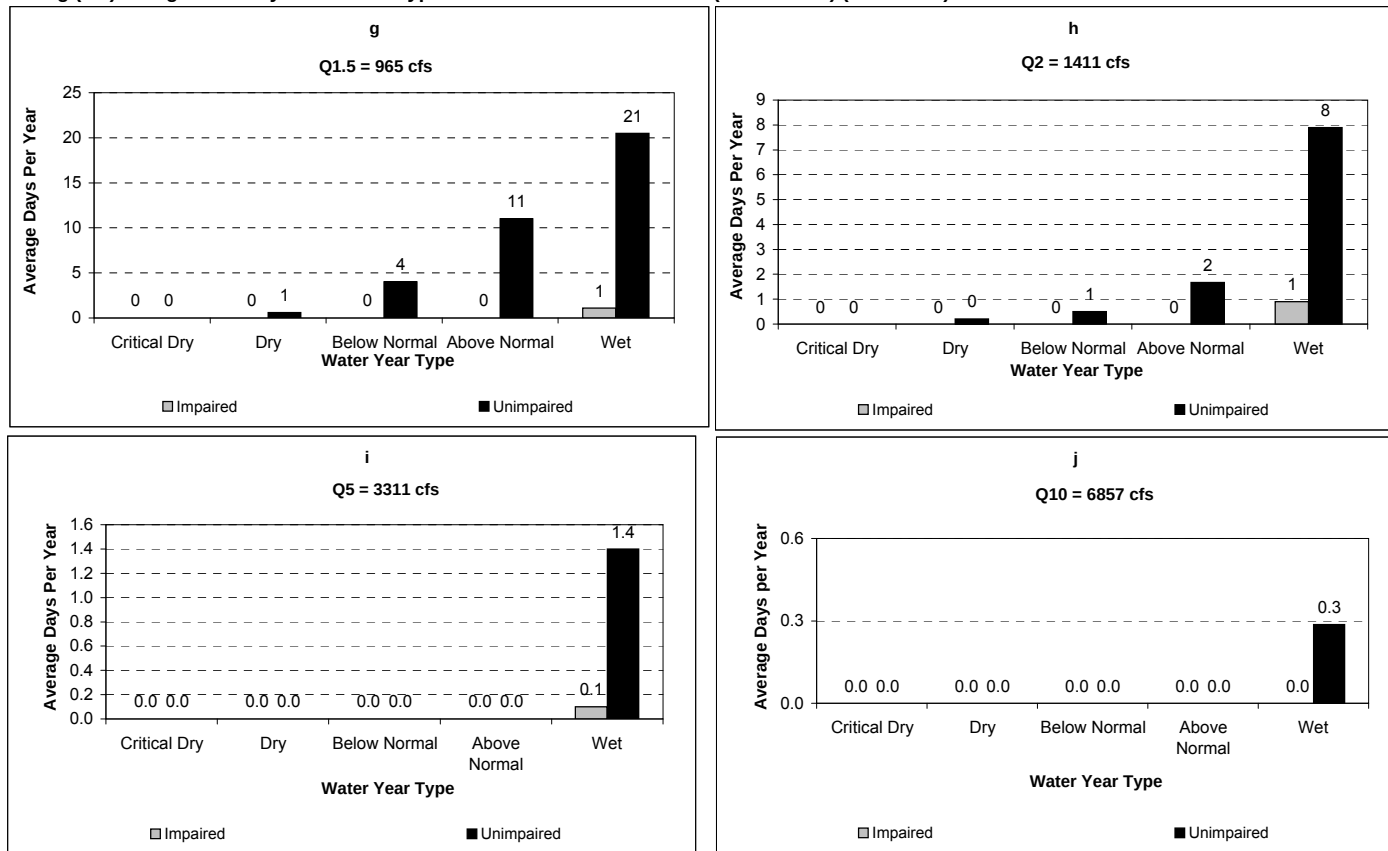
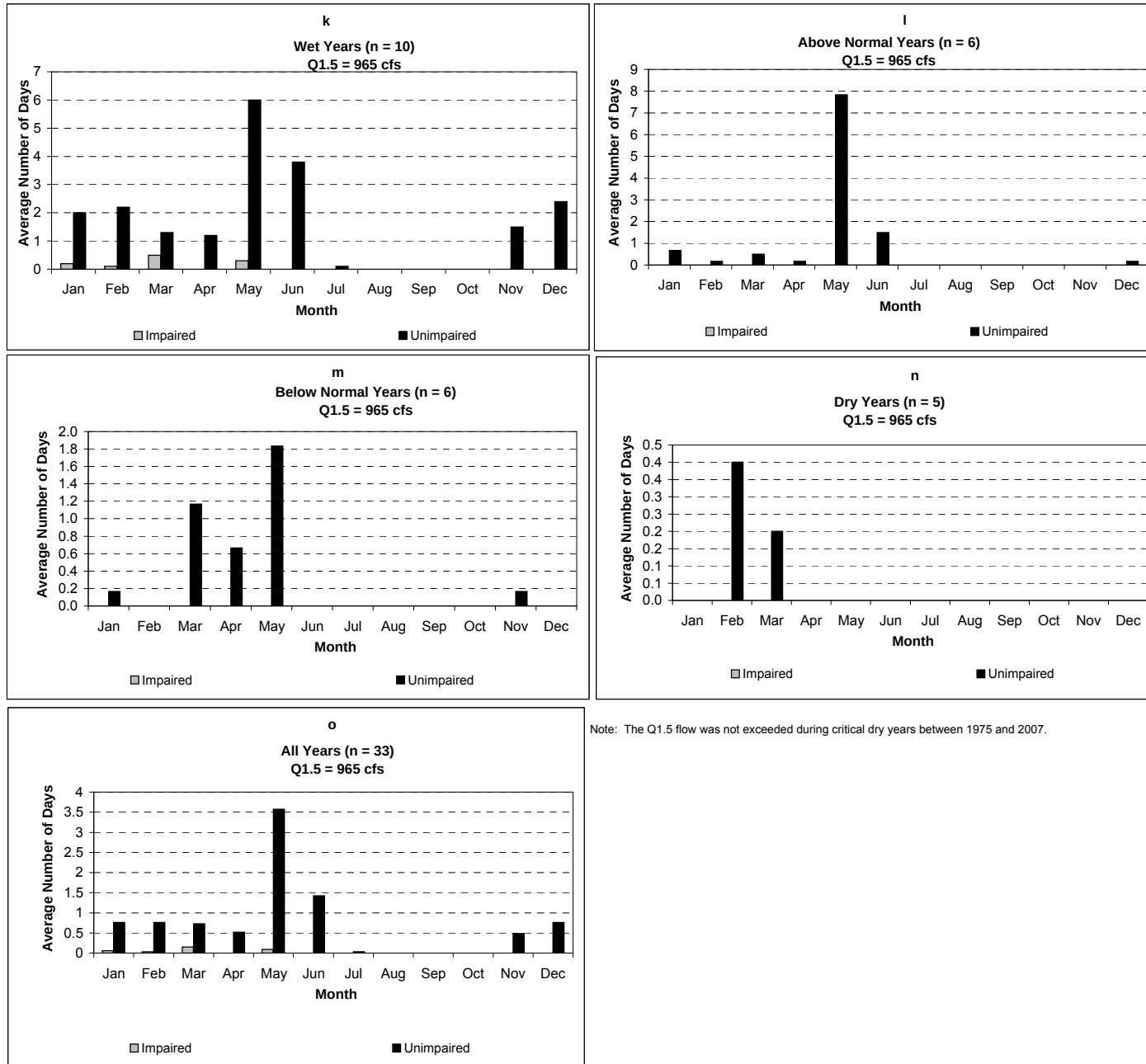


Figure A-1. Middle Fork American River MF44.7: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



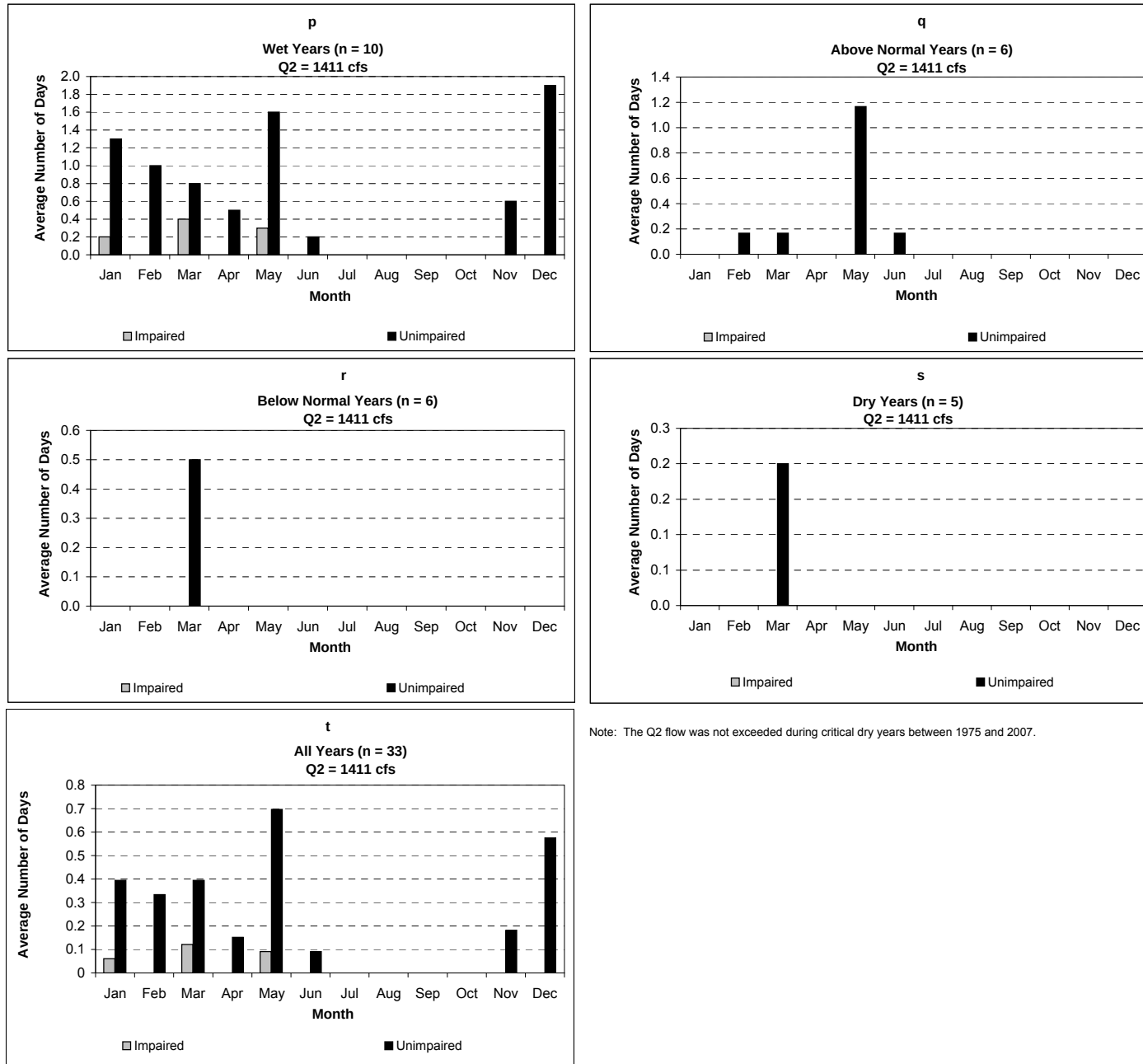
Water Year Type	Number of Years in Record (1975 - 2007)
Wet	10
Above Normal	6
Below Normal	6
Dry 5	
Critical Dry	6
Total	33

Figure A-1. Middle Fork American River MF44.7: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



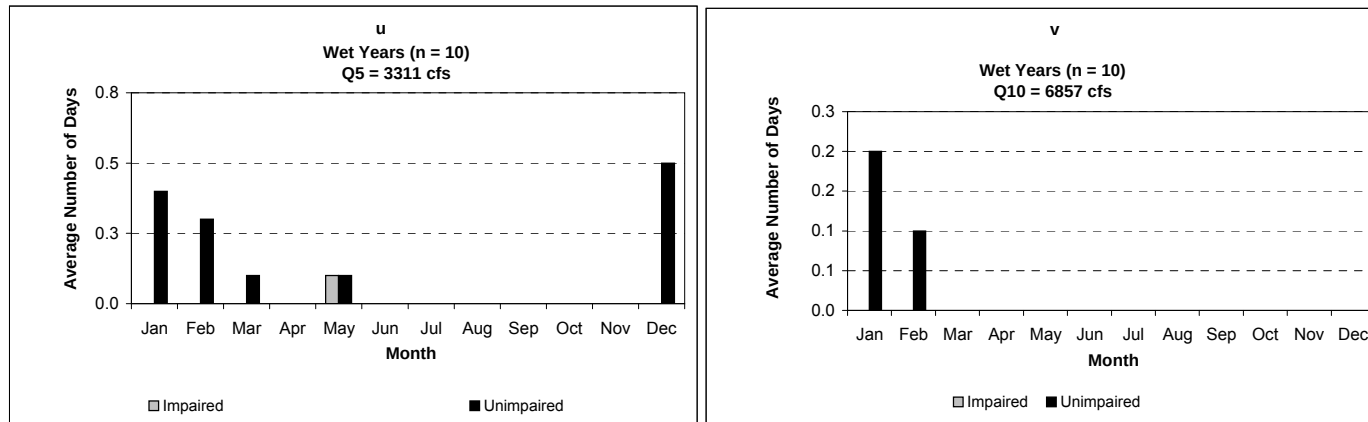
Note: The Q1.5 flow was not exceeded during critical dry years between 1975 and 2007.

Figure A-1. Middle Fork American River MF44.7: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q2 flow was not exceeded during critical dry years between 1975 and 2007.

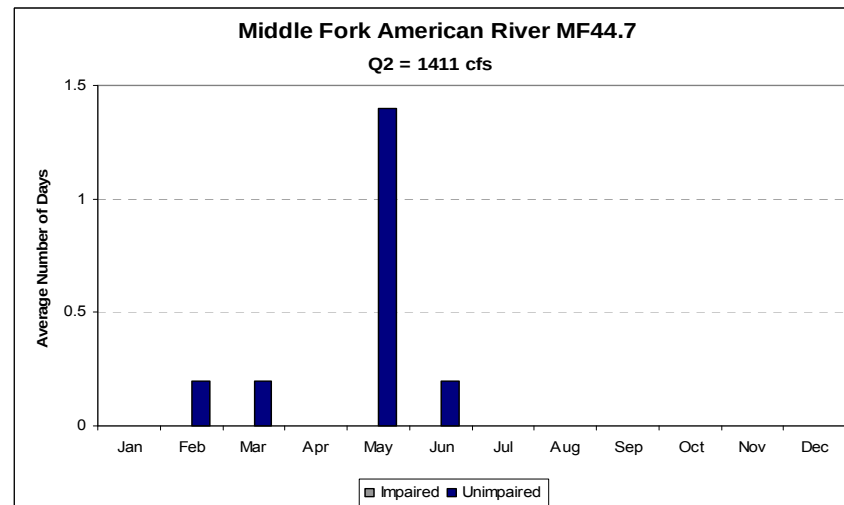
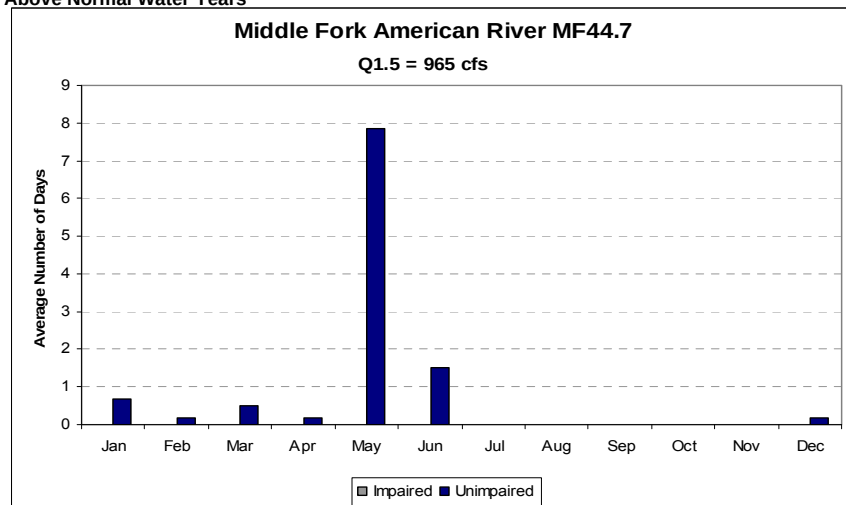
Figure A-1. Middle Fork American River MF44.7: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-2. Middle Fork American River MF44.7: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow

Above Normal Water Years



Wet Water Years

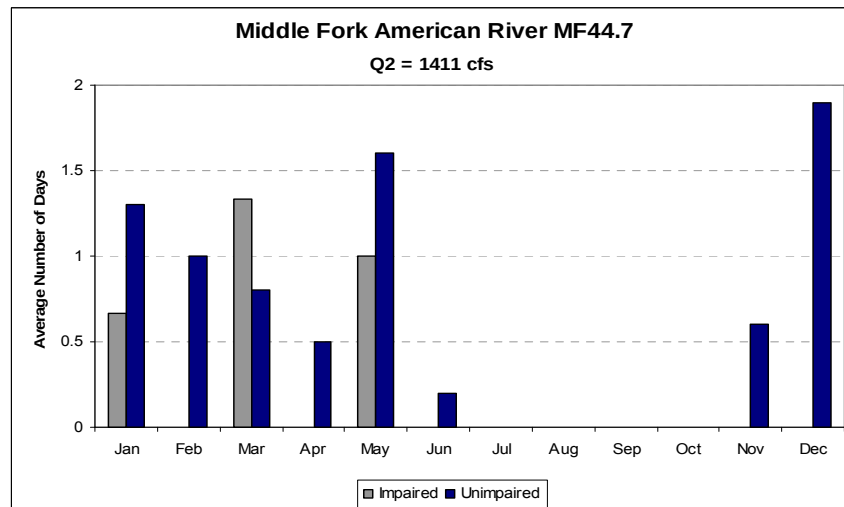
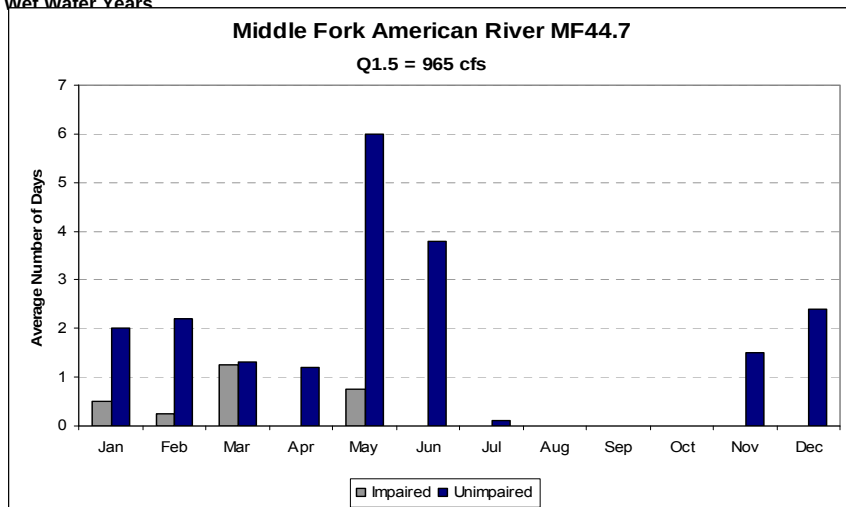


Figure A-3. Middle Fork American River MF36.2: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).

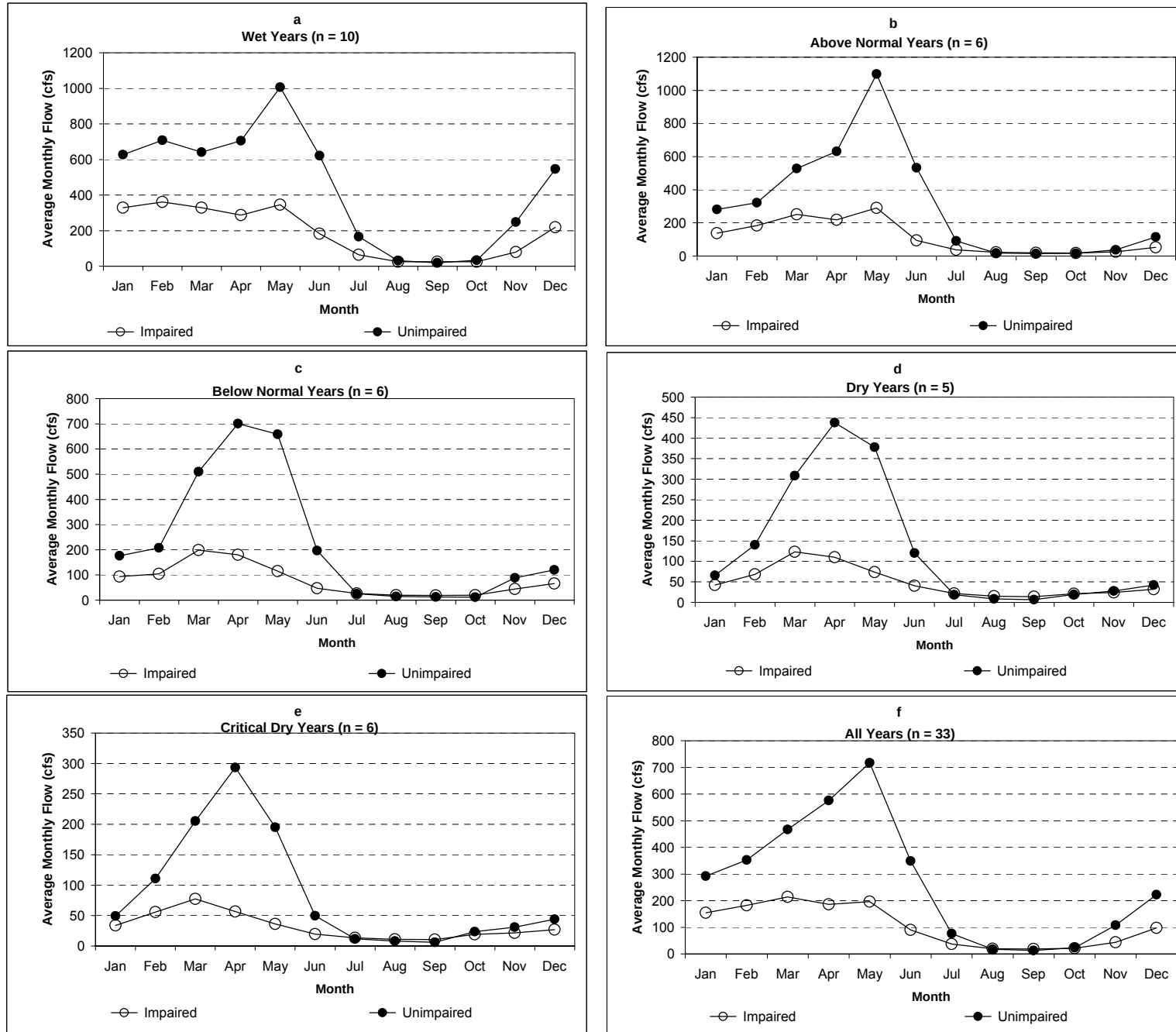
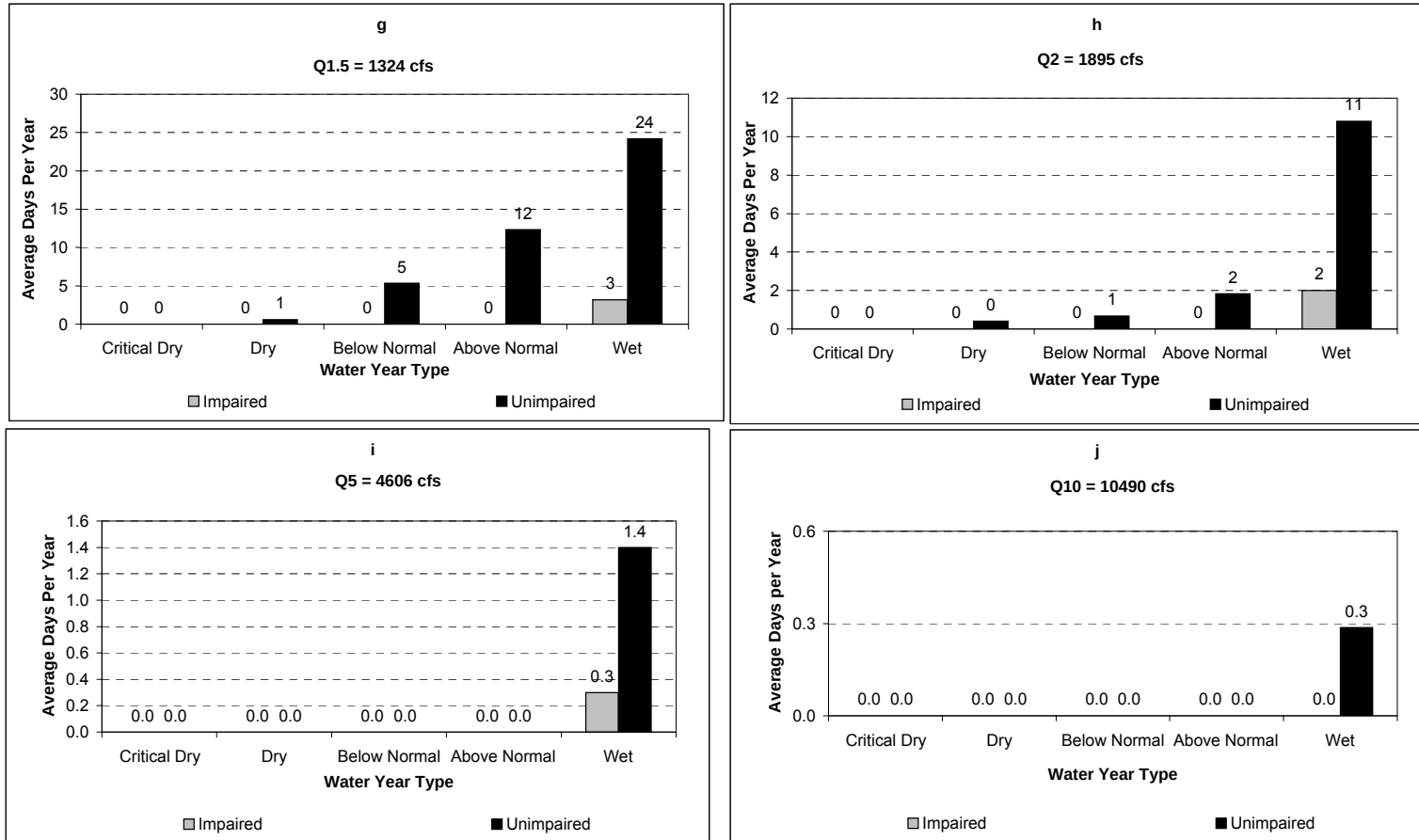


Figure A-3. Middle Fork American River MF36.2: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Water Year Type	Number of Years in Record (1975 - 2007)
Wet	10
Above Normal	6
Below Normal	6
Dry	5
Critical Dry	6
Total	33

Figure A-3. Middle Fork American River MF36.2: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

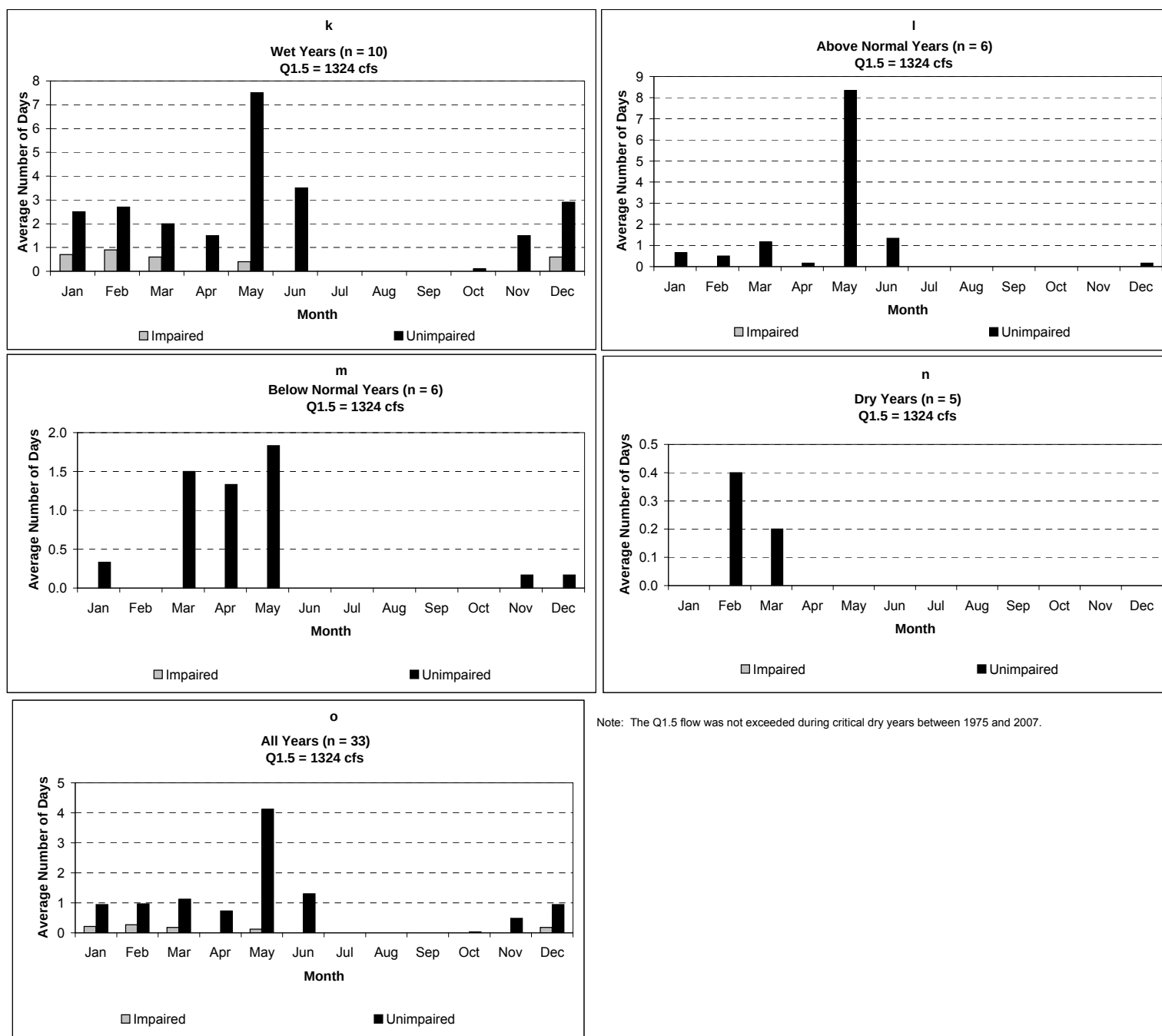
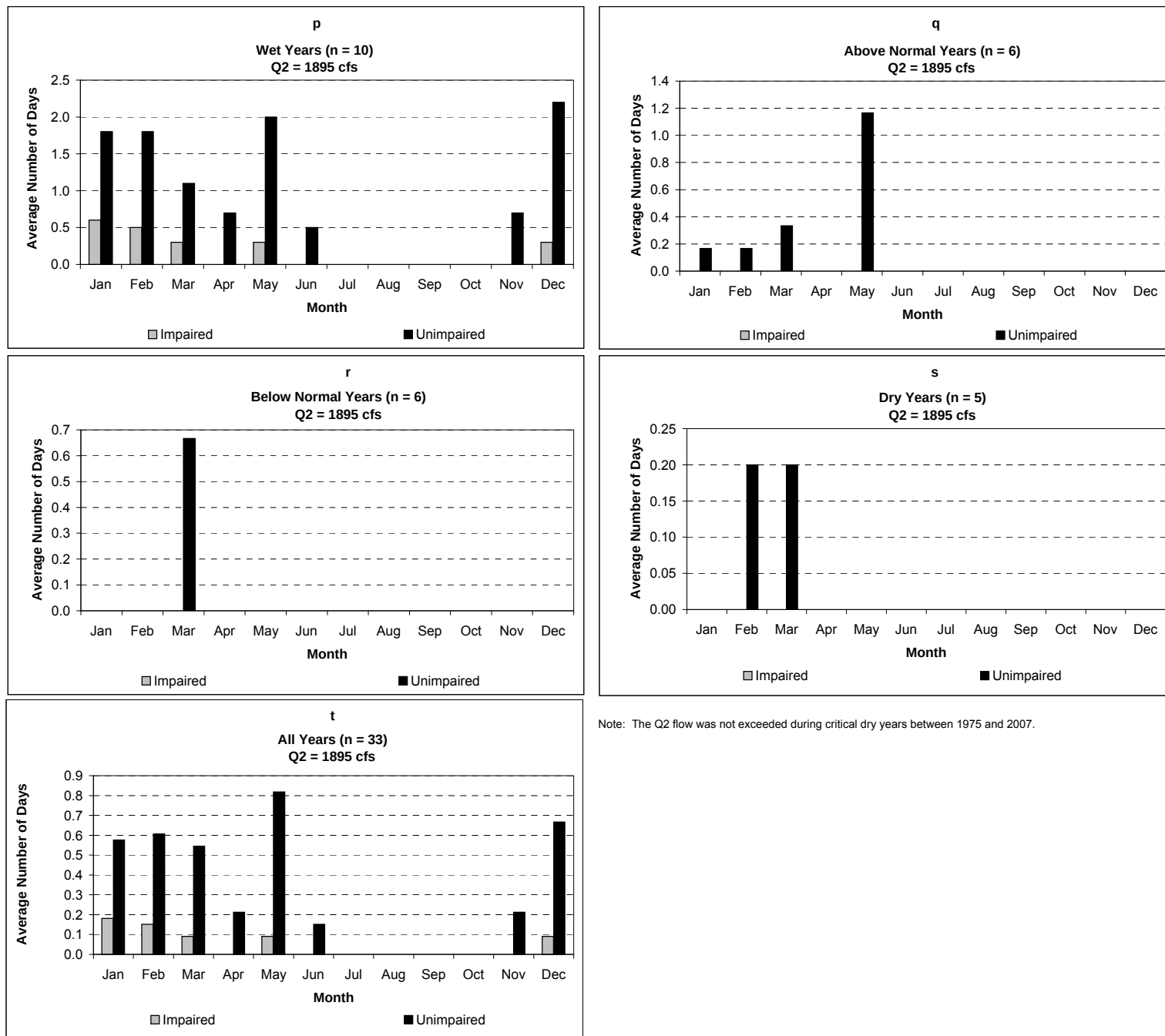
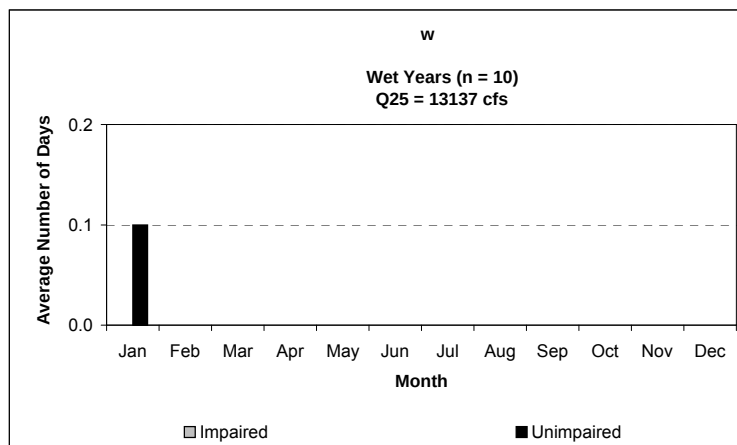
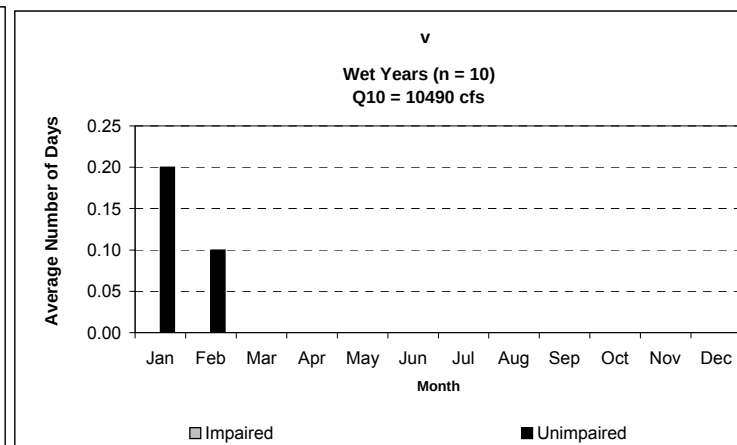
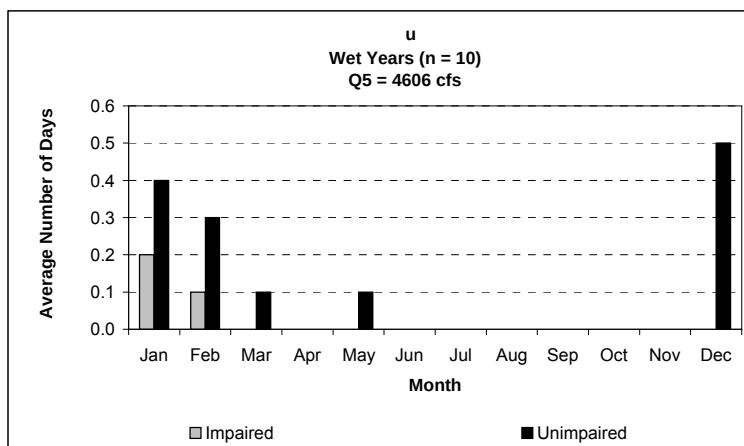


Figure A-3. Middle Fork American River MF36.2: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q2 flow was not exceeded during critical dry years between 1975 and 2007.

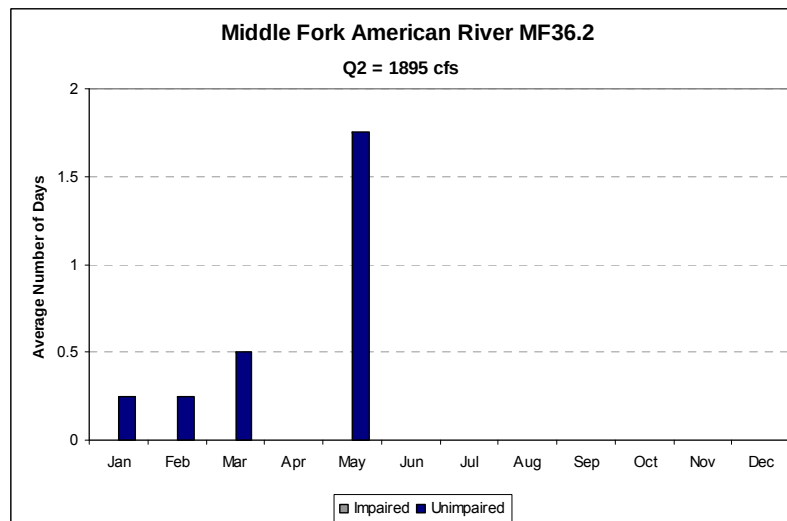
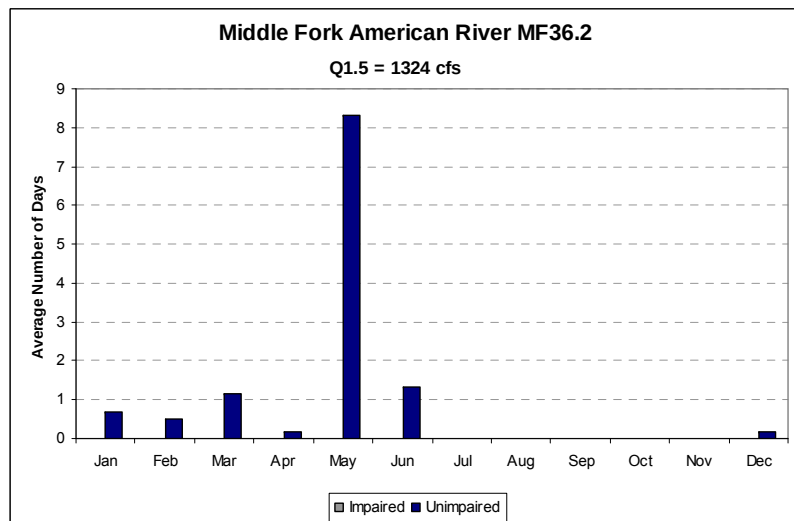
Figure A-3. Middle Fork American River MF36.2: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-4. Middle Fork American River MF36.2: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

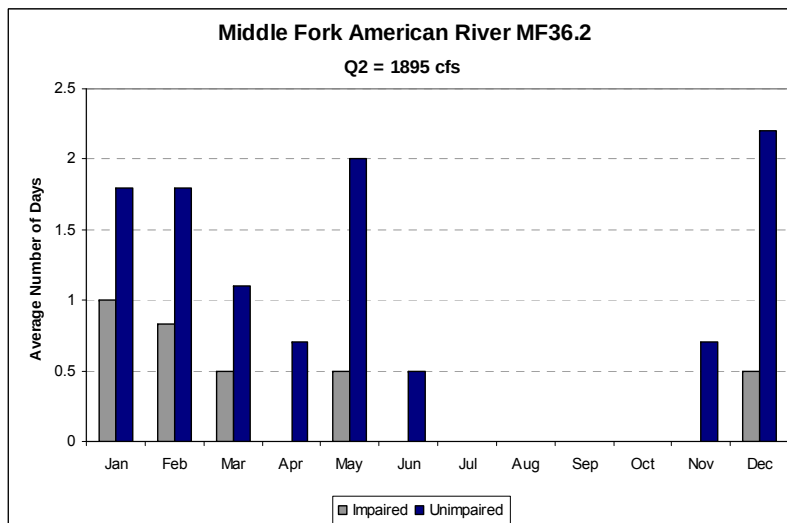
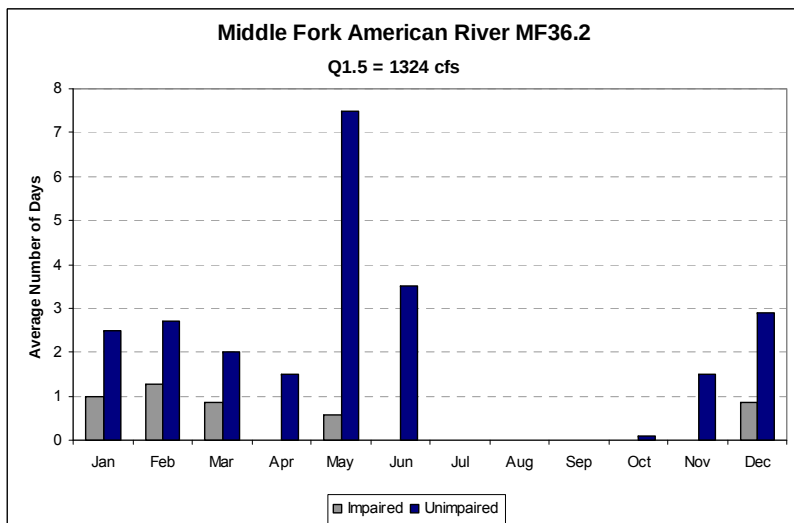


Figure A-5. Middle Fork American River Below Middle Fork Interbay MF35.5: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).

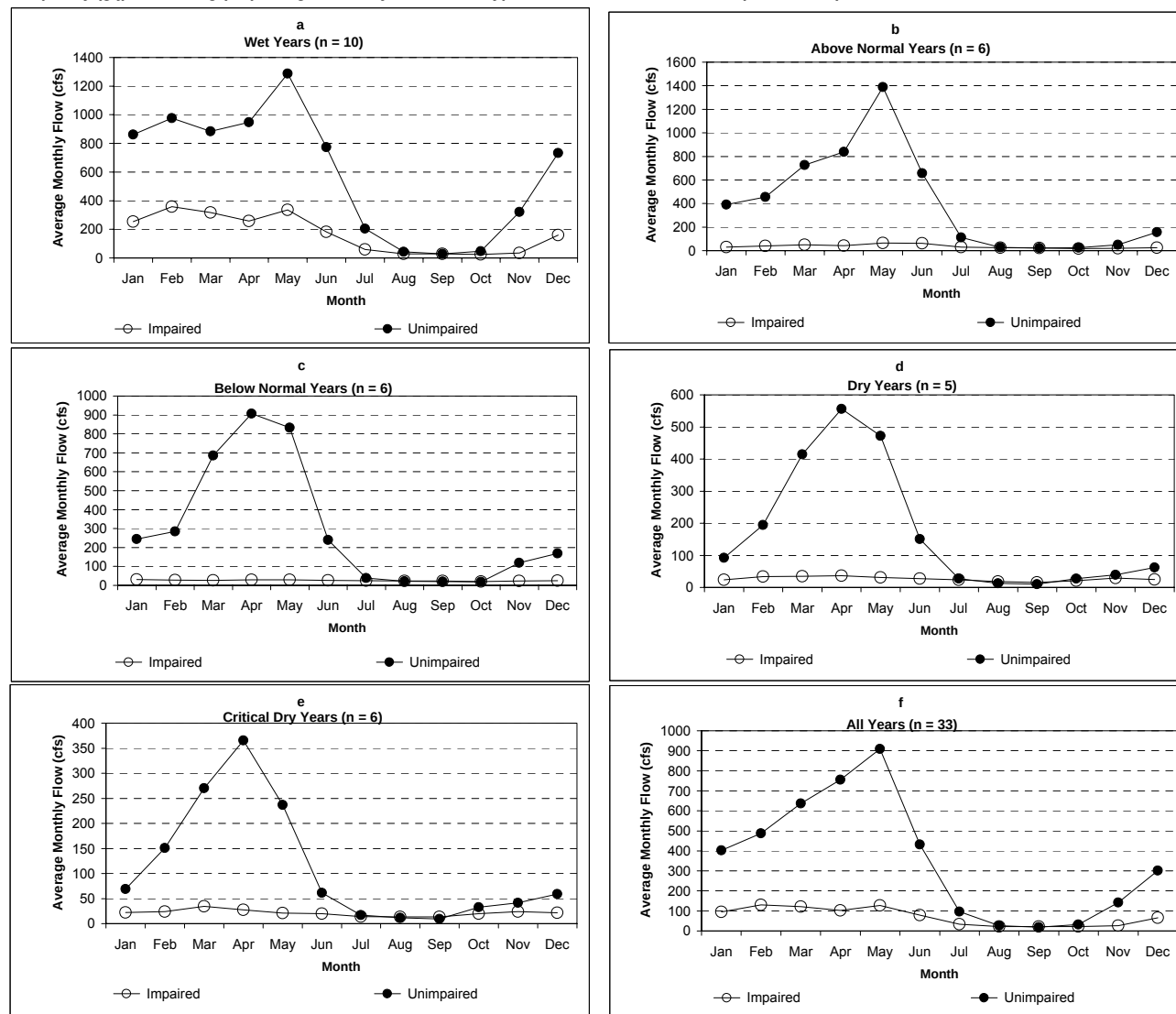


Figure A-5. Middle Fork American River Below Middle Fork Interbay MF35.5: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

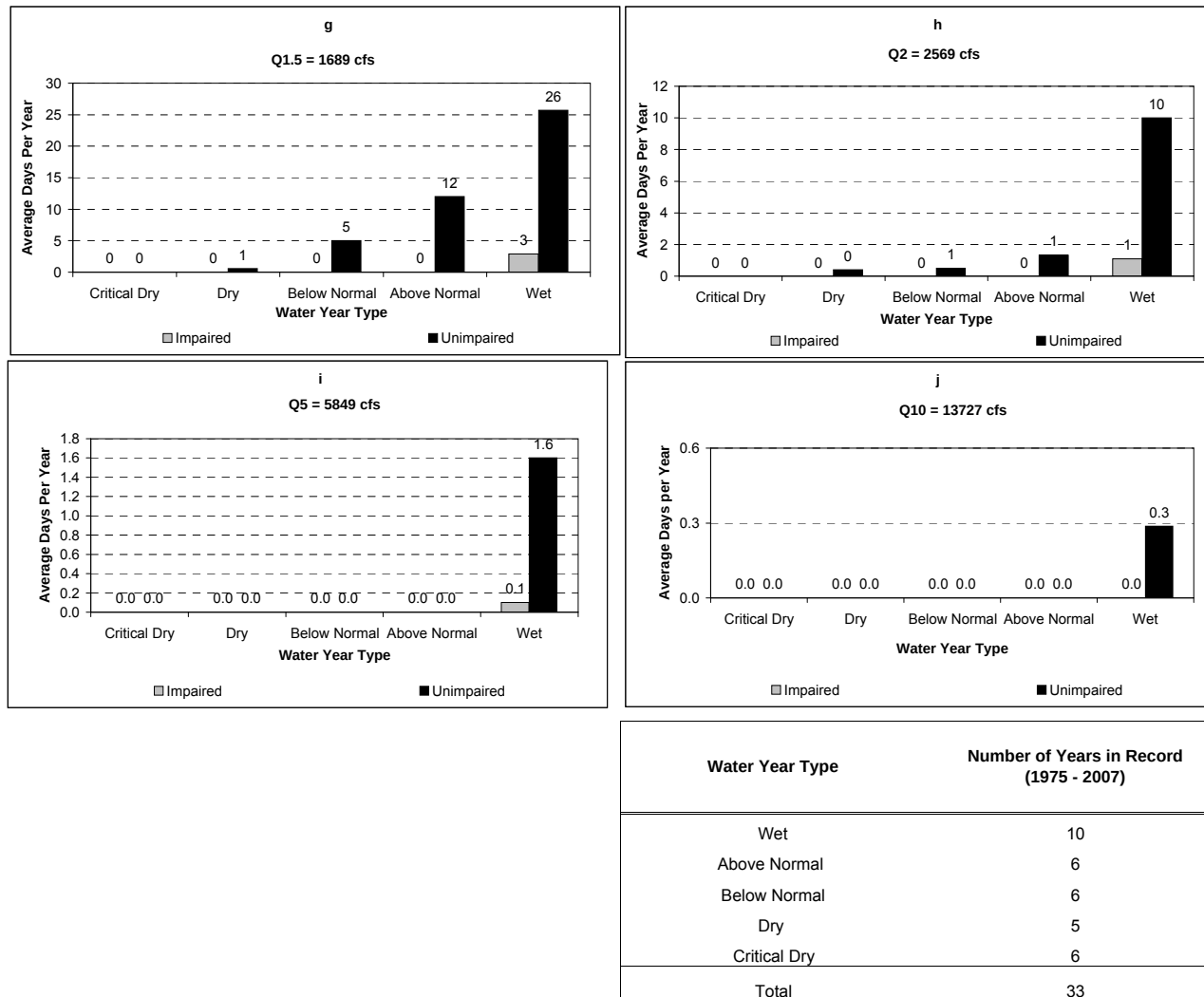
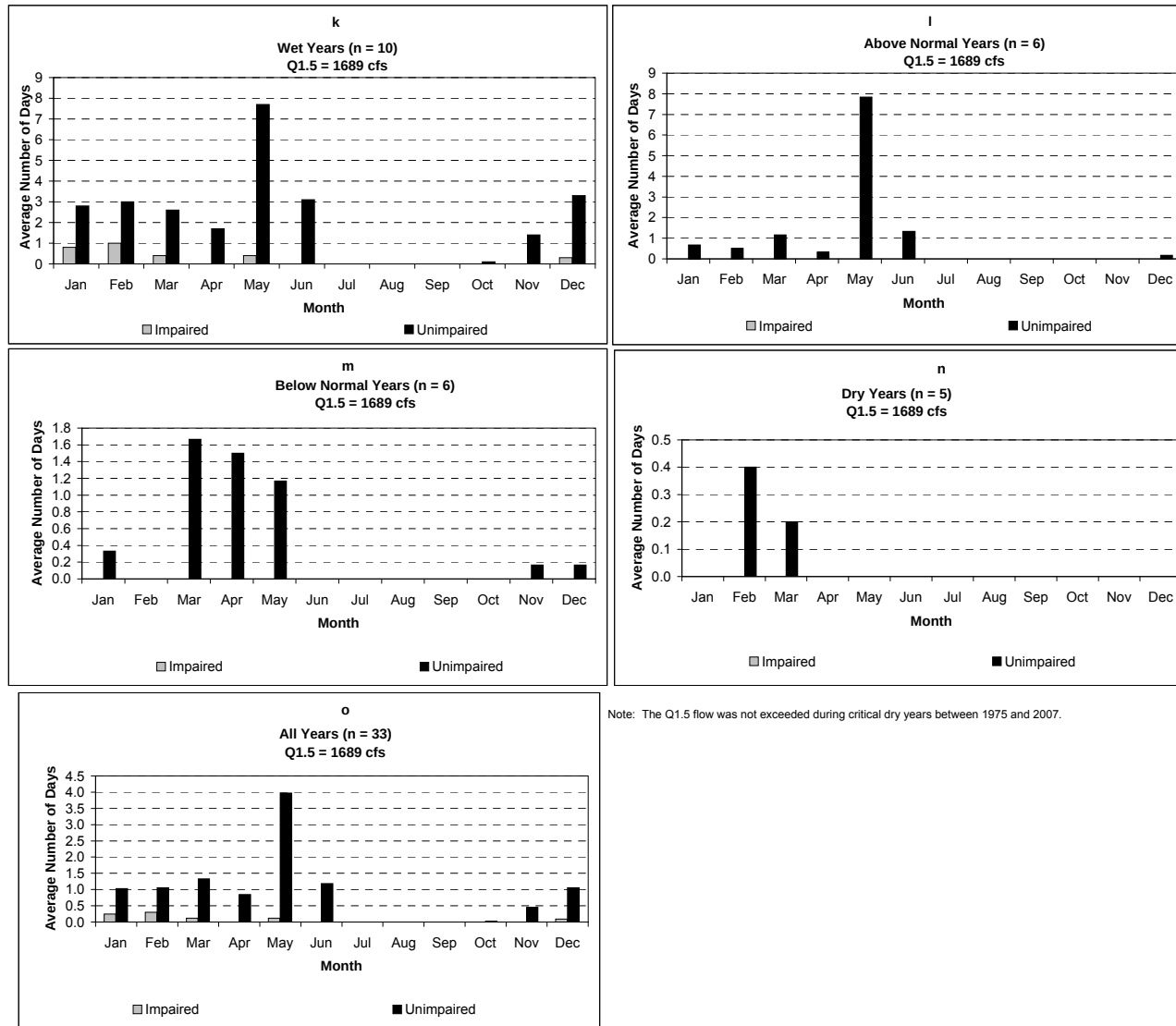
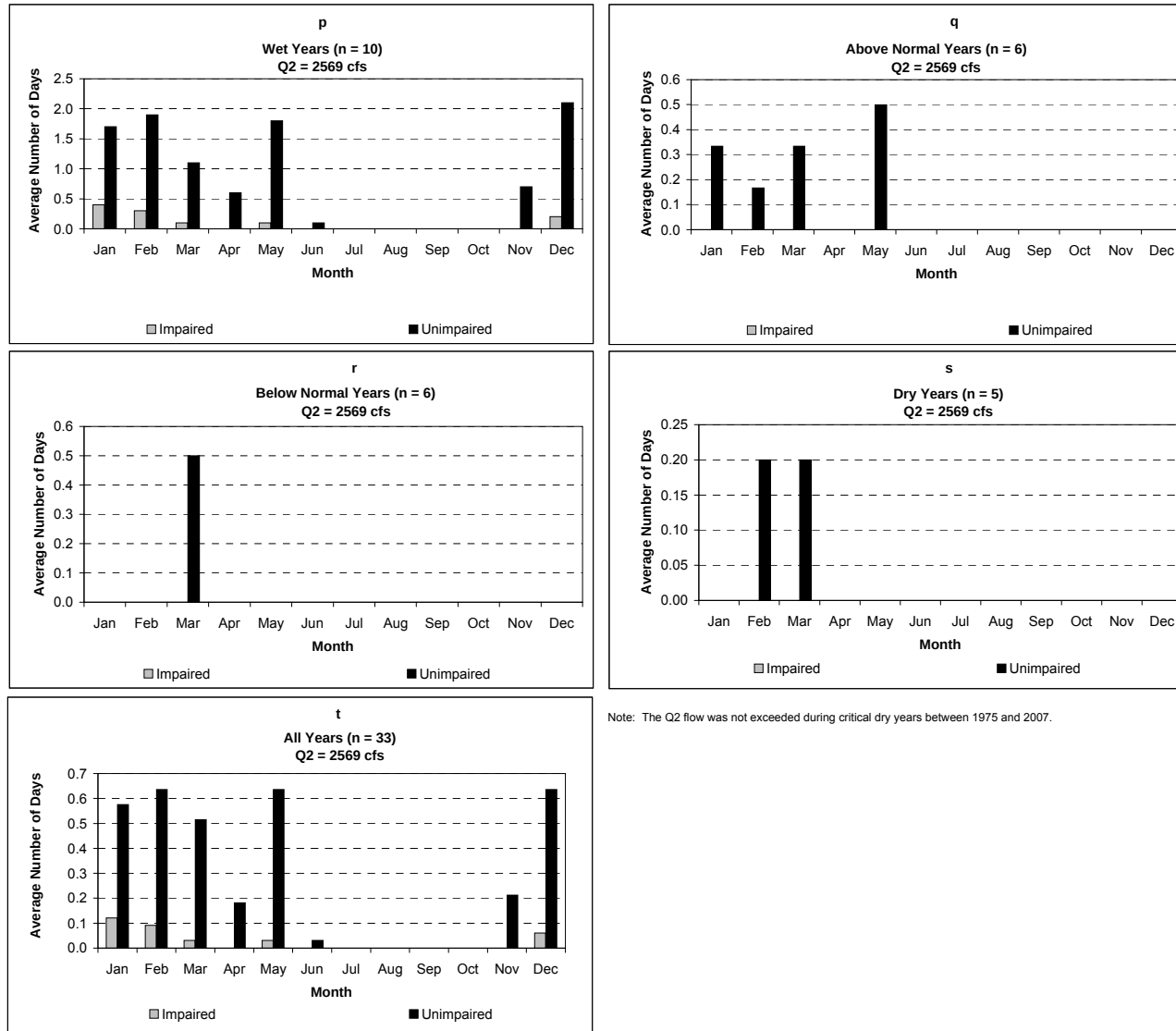


Figure A-5. Middle Fork American River Below Middle Fork Interbay MF35.5: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



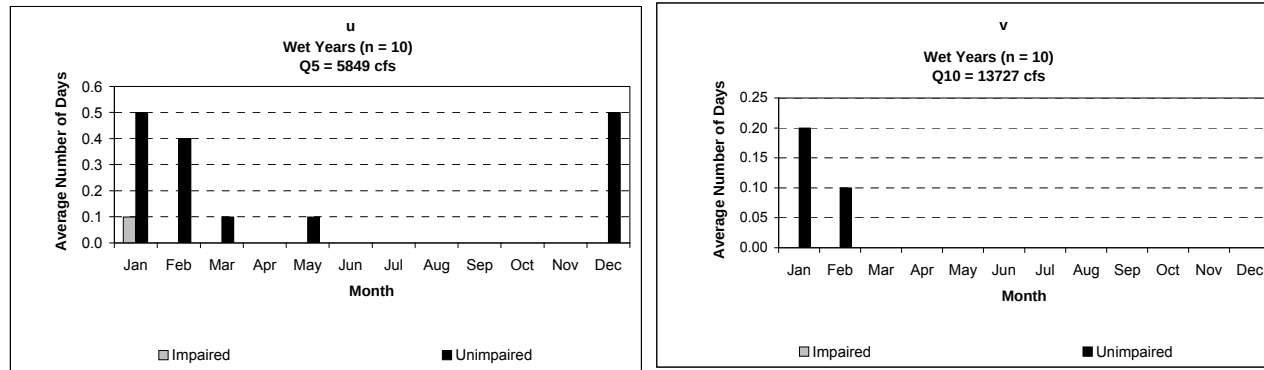
Note: The Q1.5 flow was not exceeded during critical dry years between 1975 and 2007.

Figure A-5. Middle Fork American River Below Middle Fork Interbay MF35.5: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q2 flow was not exceeded during critical dry years between 1975 and 2007.

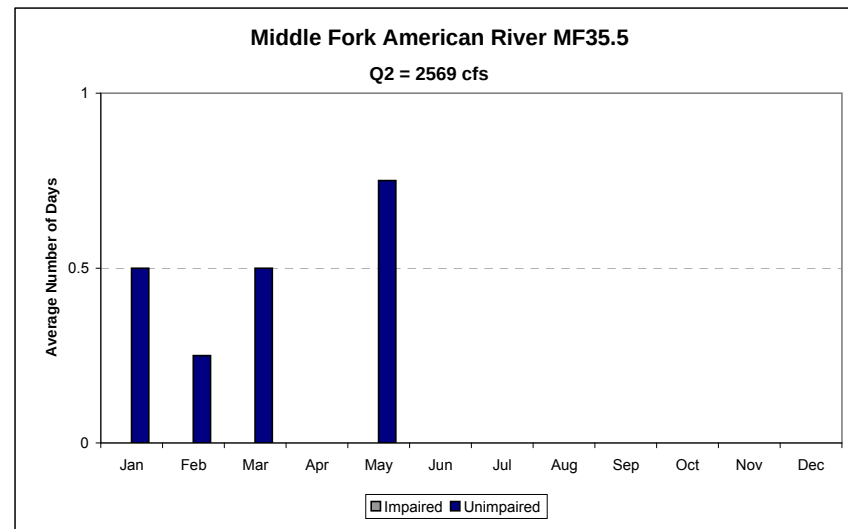
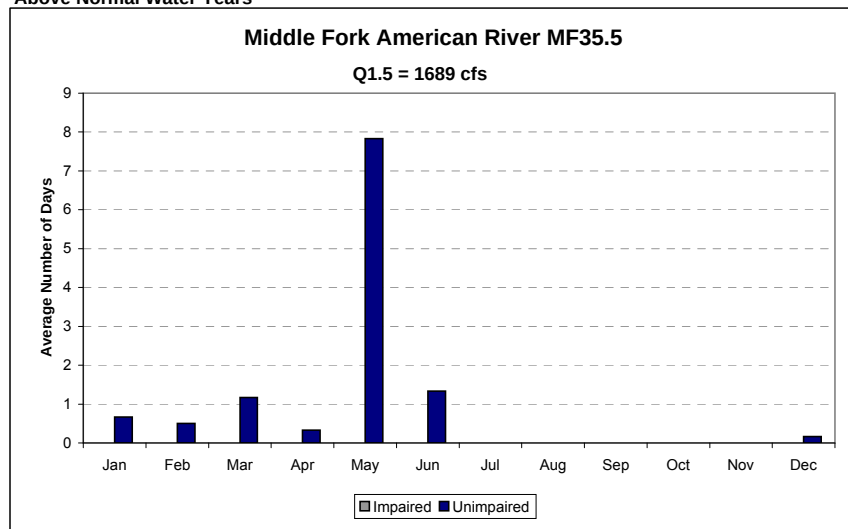
Figure A-5. Middle Fork American River Below Middle Fork Interbay MF35.5: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q.5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-6. Middle Fork American River Below Middle Fork Interbay MF35.5: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

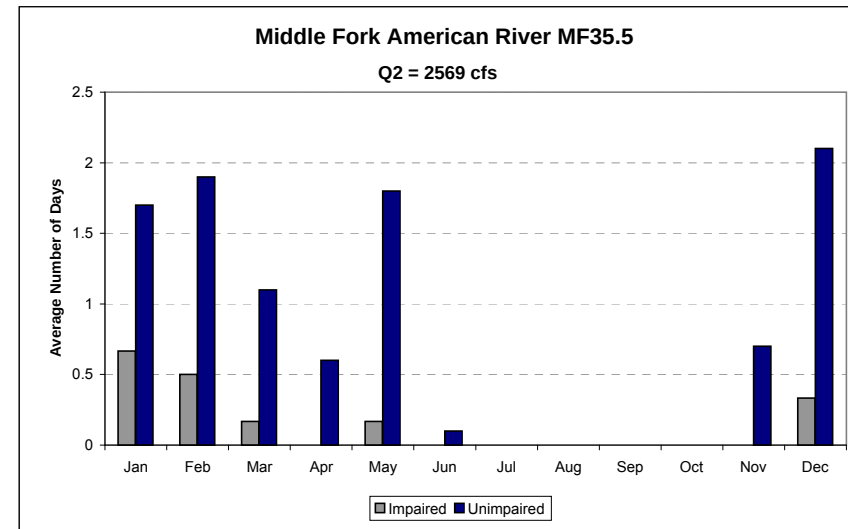
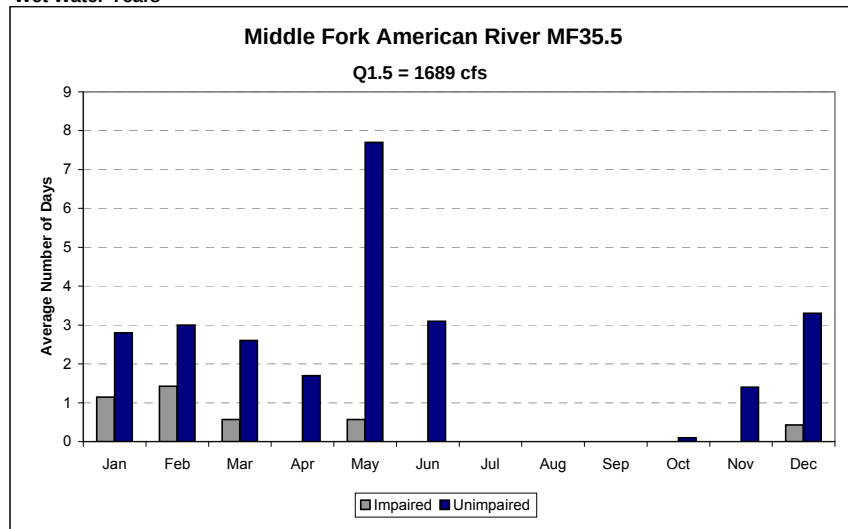


Figure A-7. Middle Fork American River MF26.2: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).

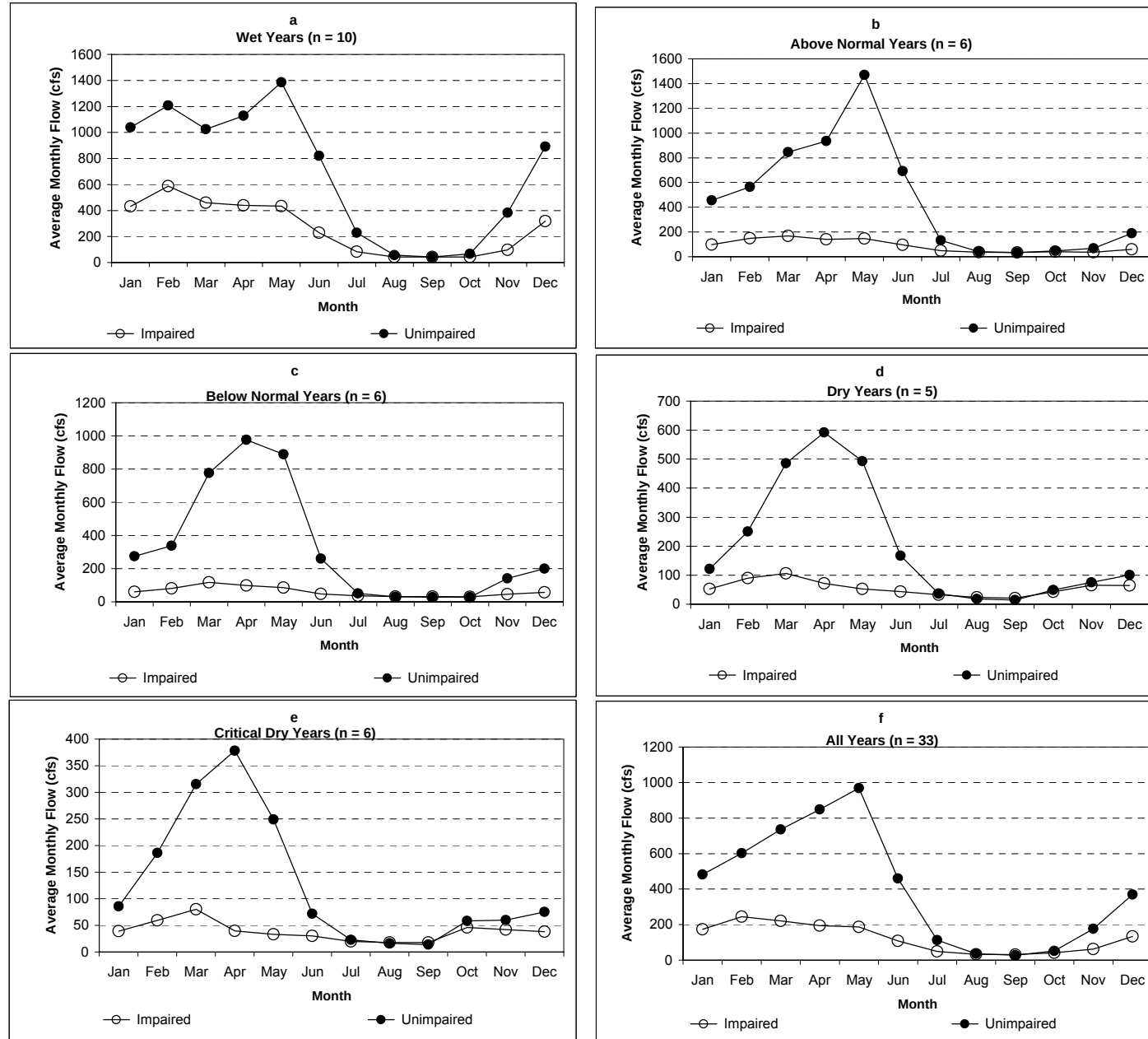
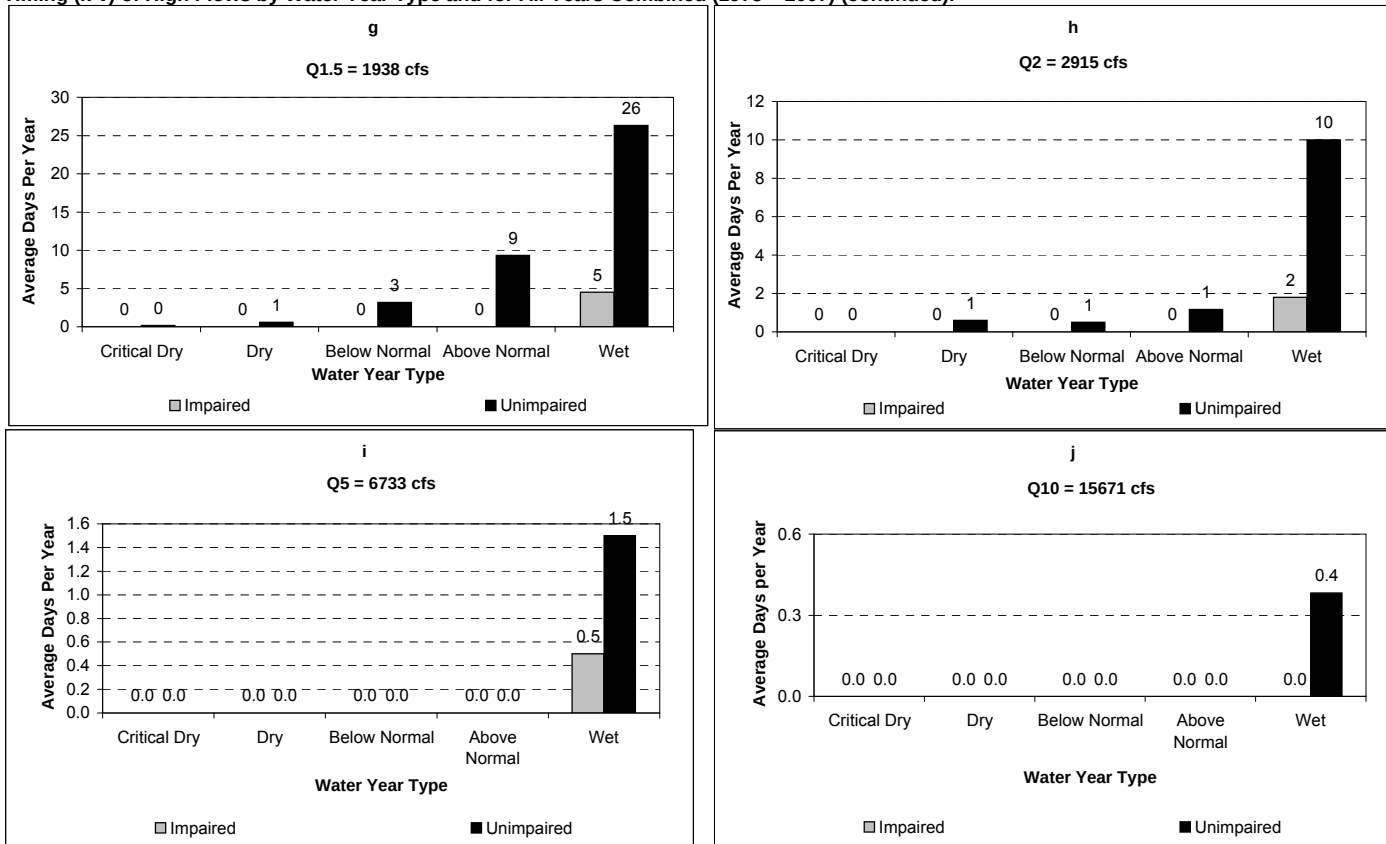


Figure A-7. Middle Fork American River MF26.2: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Water Year Type	Number of Years in Record (1975 - 2007)
Wet	10
Above Normal	6
Below Normal	6
Dry	5
Critical Dry	6
Total	33

Figure A-7. Middle Fork American River MF26.2: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

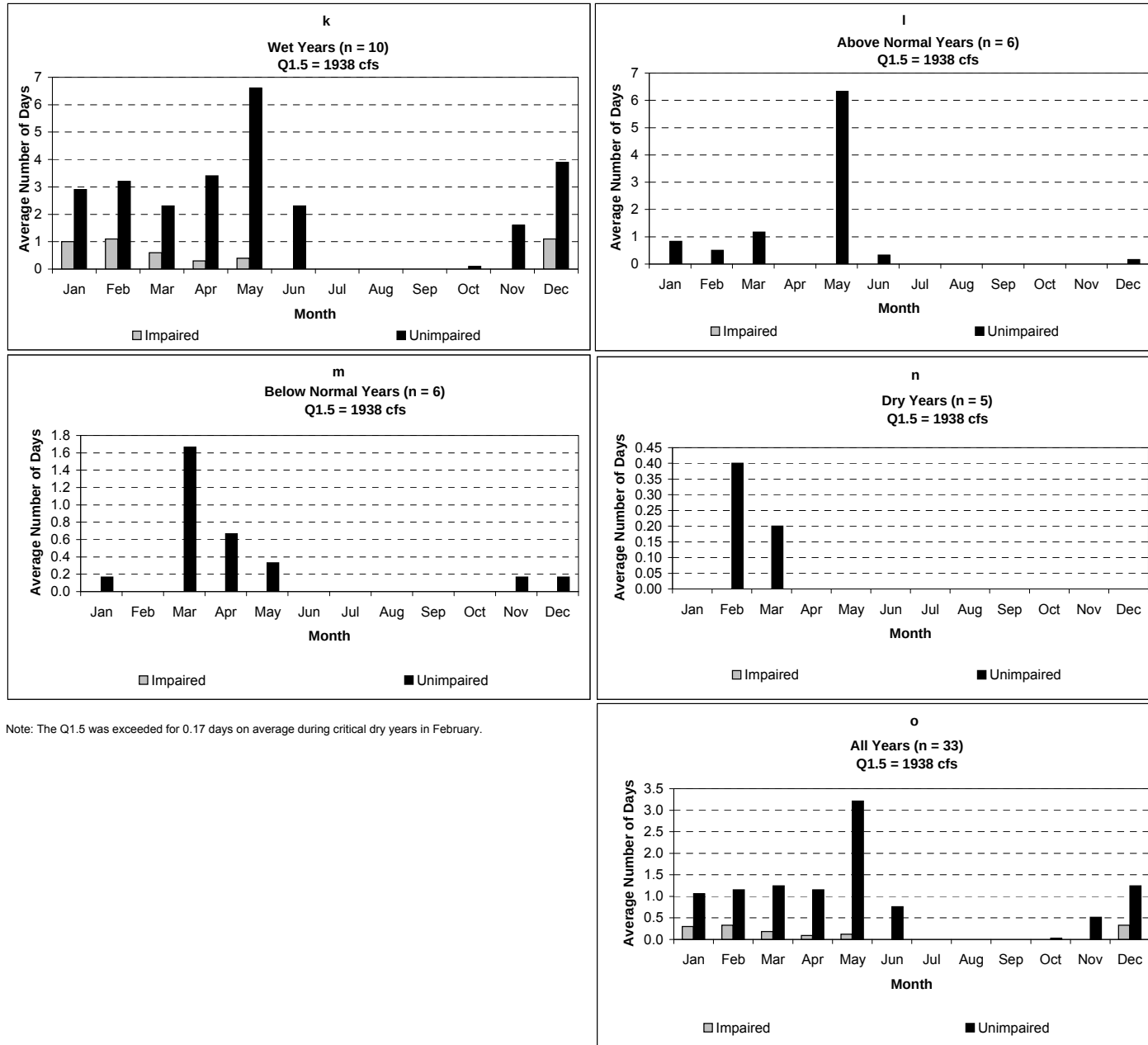


Figure A-7. Middle Fork American River MF26.2: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

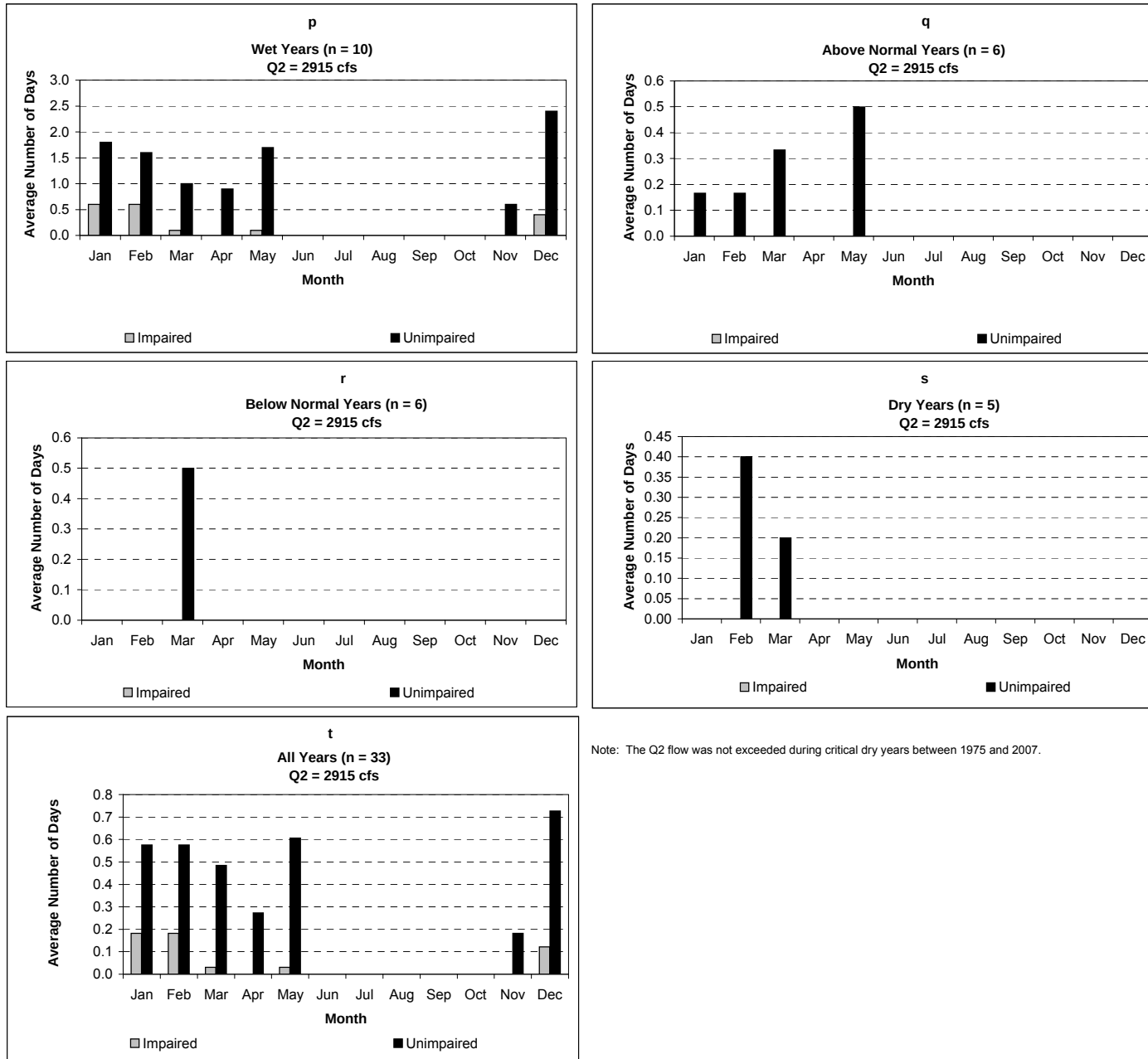
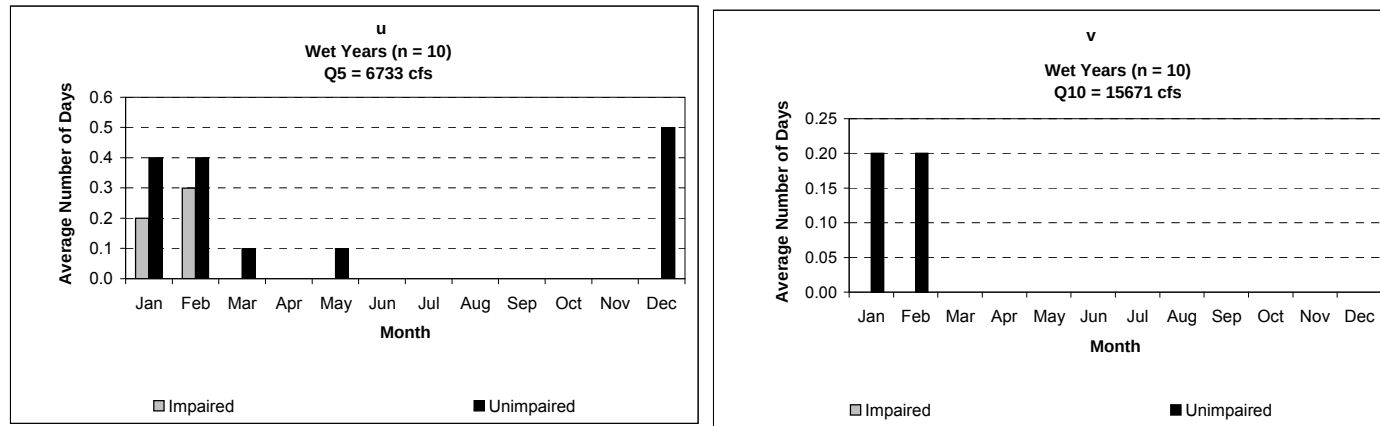


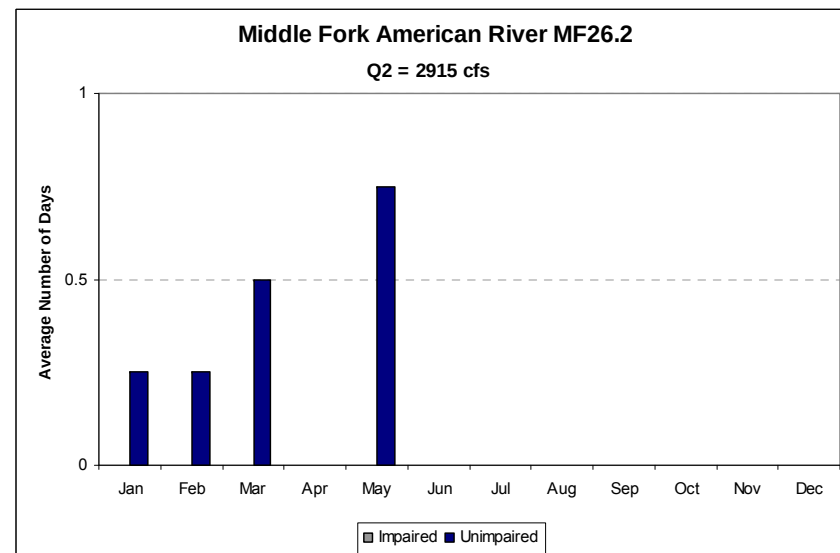
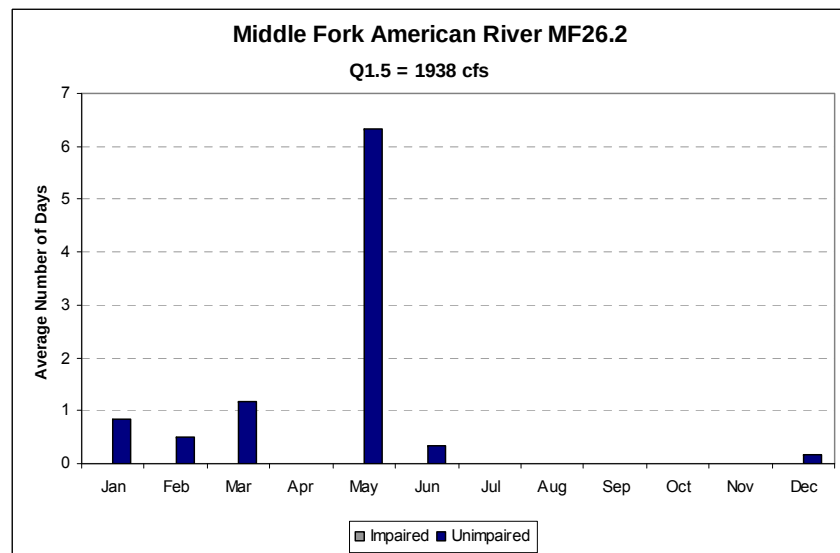
Figure A-7. Middle Fork American River MF26.2: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-8. Middle Fork American River MF26.2: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

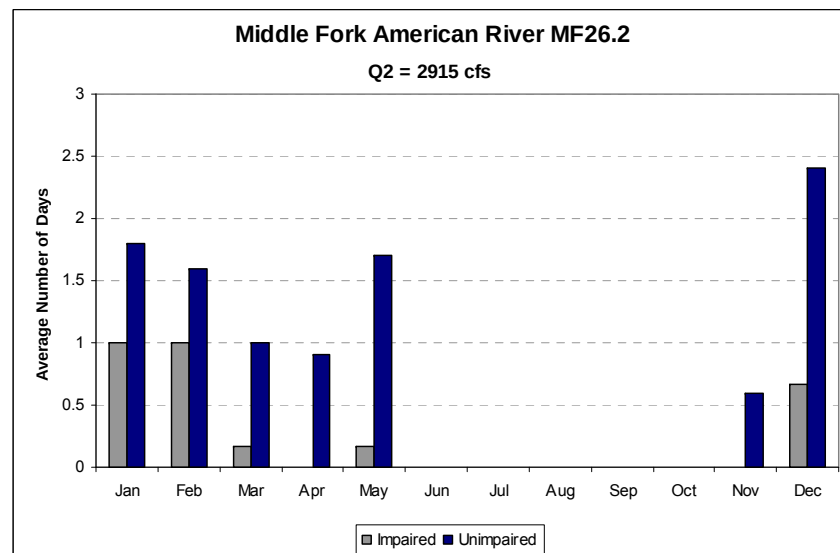
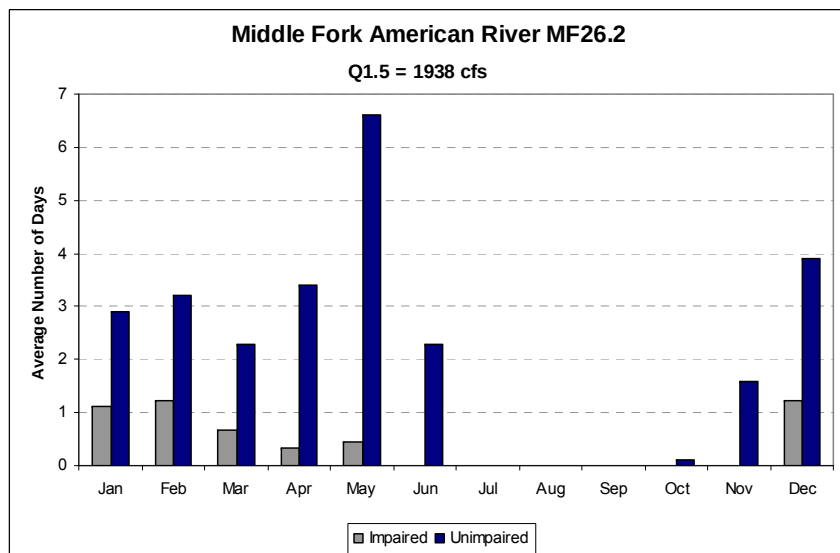


Figure A-9. Middle Fork American River Below North Fork of the Middle Fork American River Confluence MF24.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).

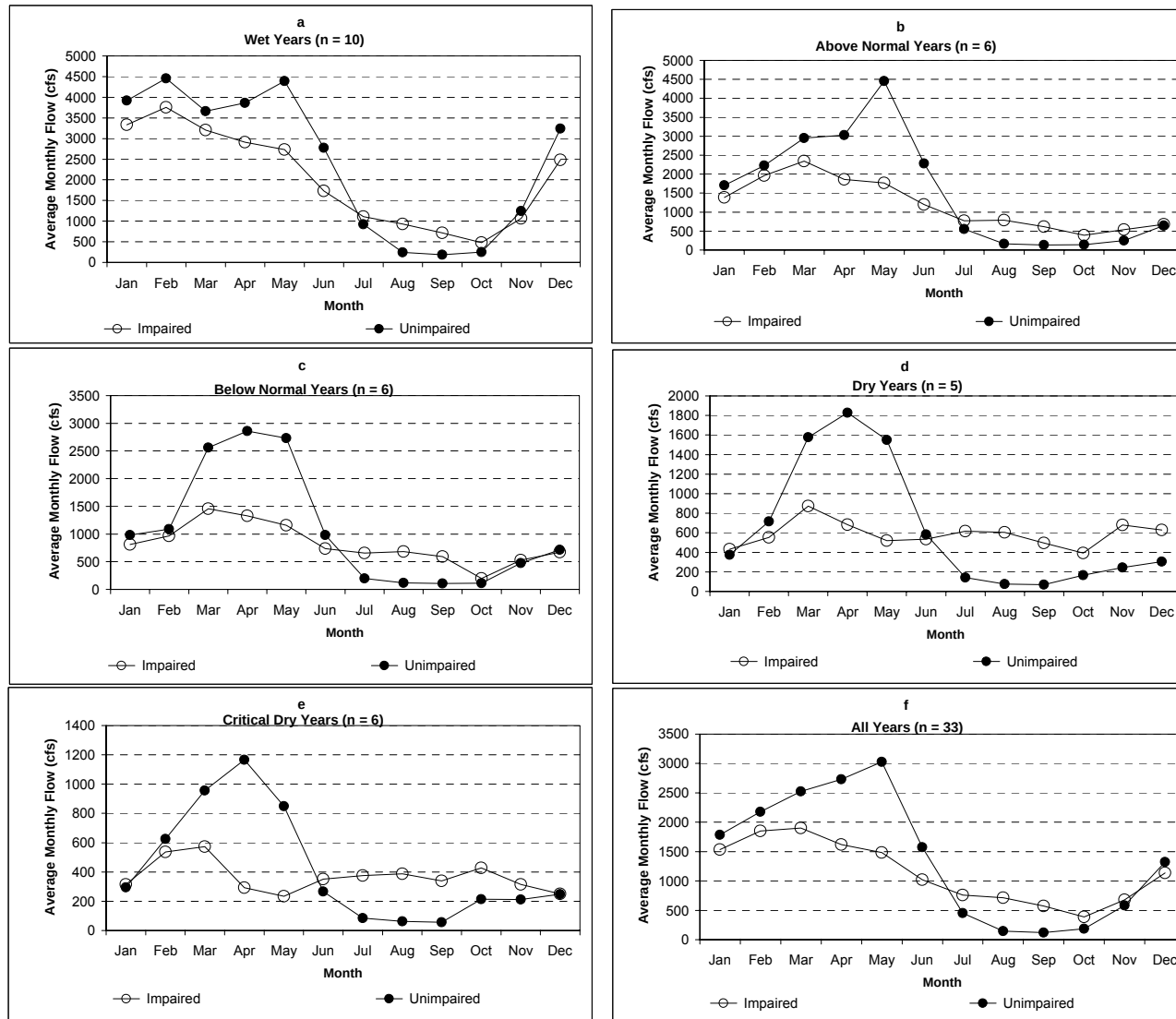


Figure A-9. Middle Fork American River Below North Fork of the Middle Fork American River Confluence MF24.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

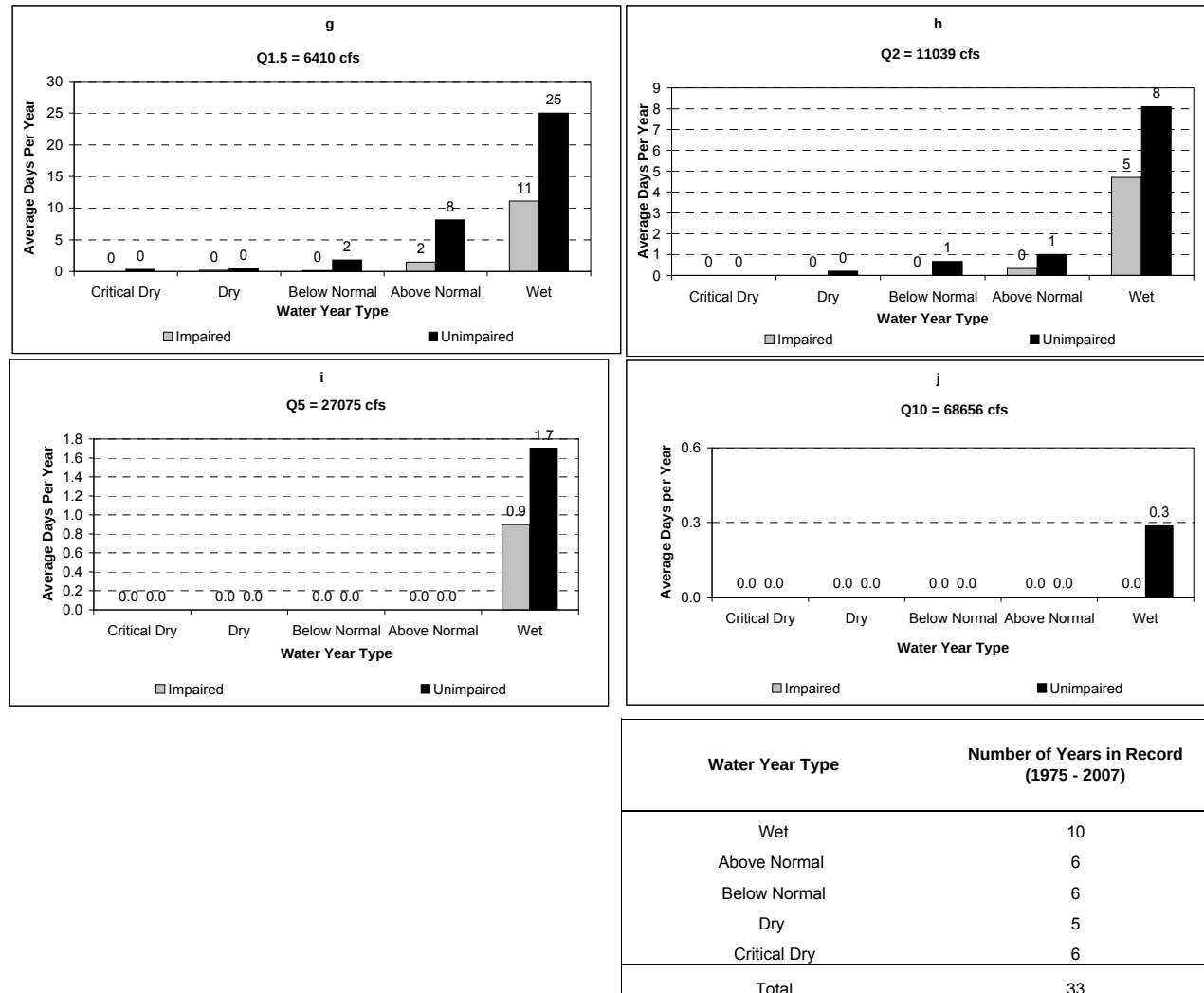


Figure A-9. Middle Fork American River Below North Fork of the Middle Fork American River Confluence MF24.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

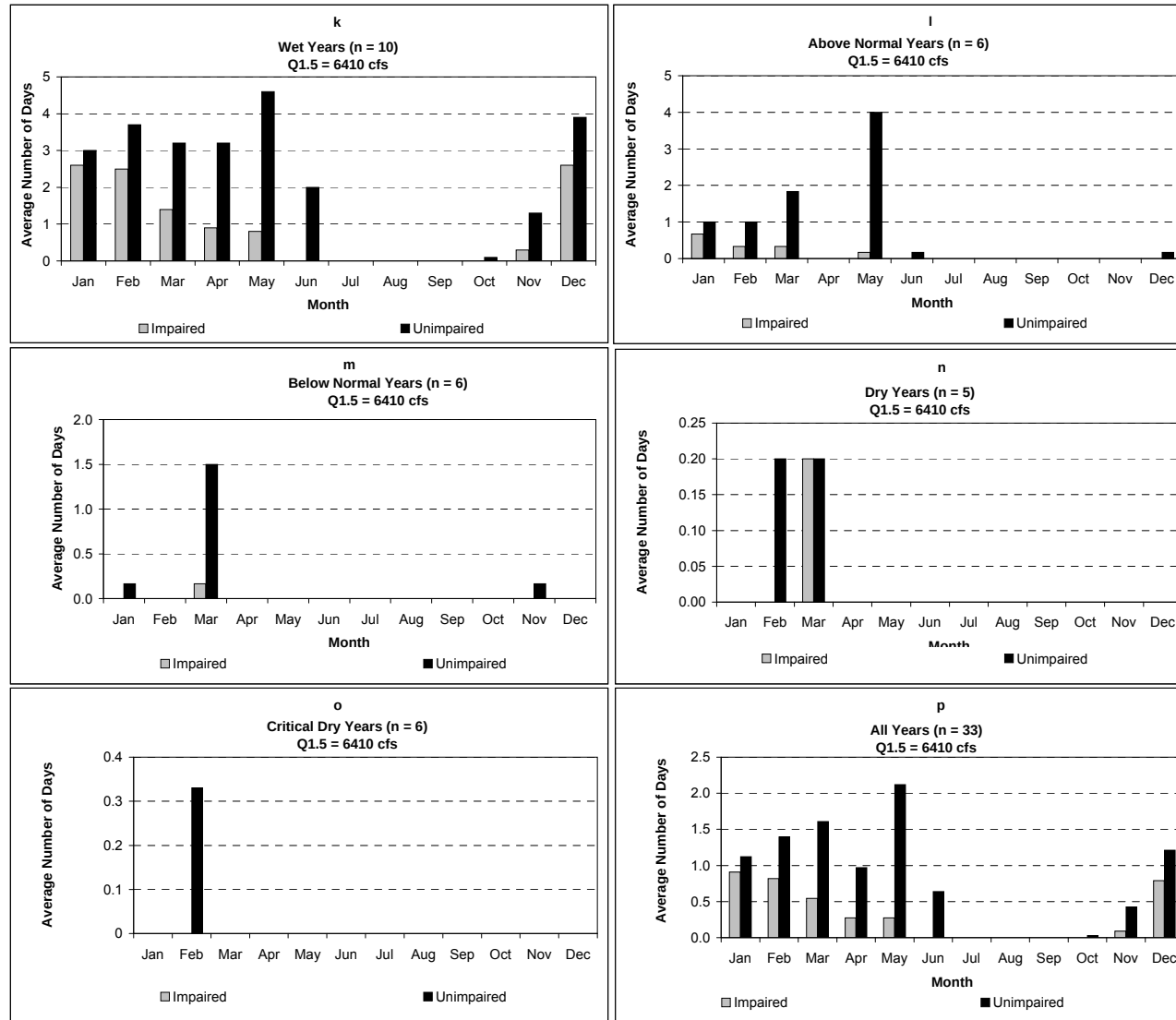


Figure A-9. Middle Fork American River Below North Fork of the Middle Fork American River Confluence MF24.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

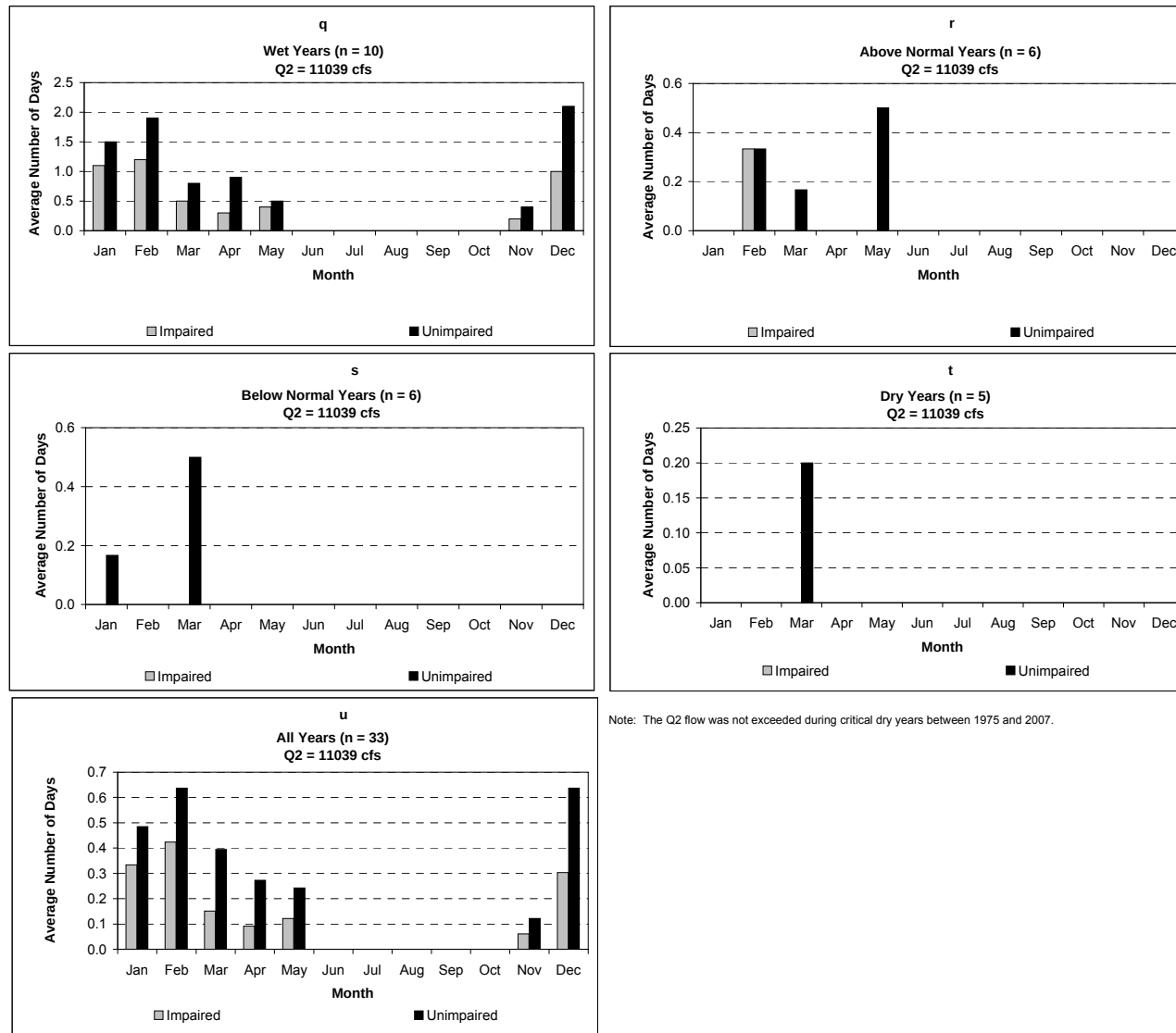
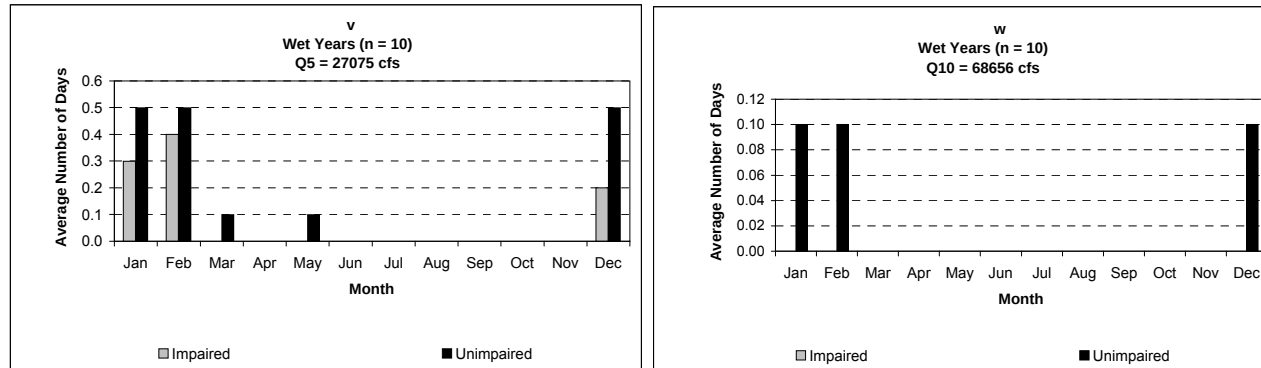


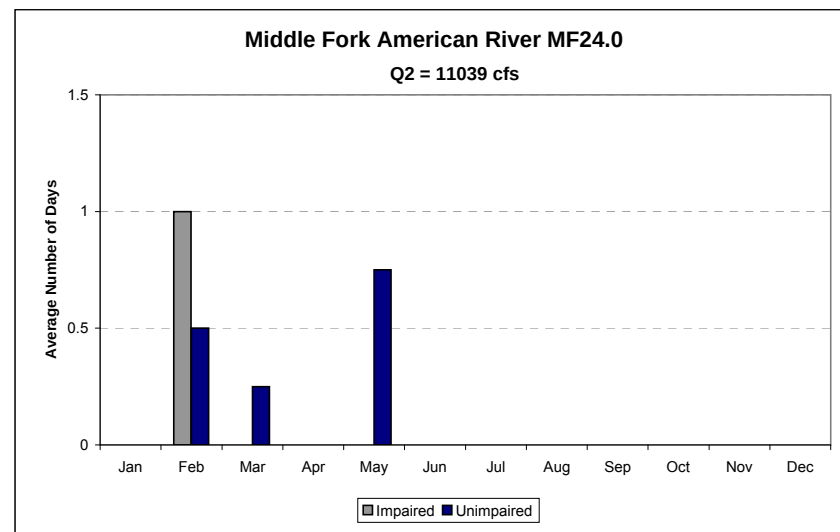
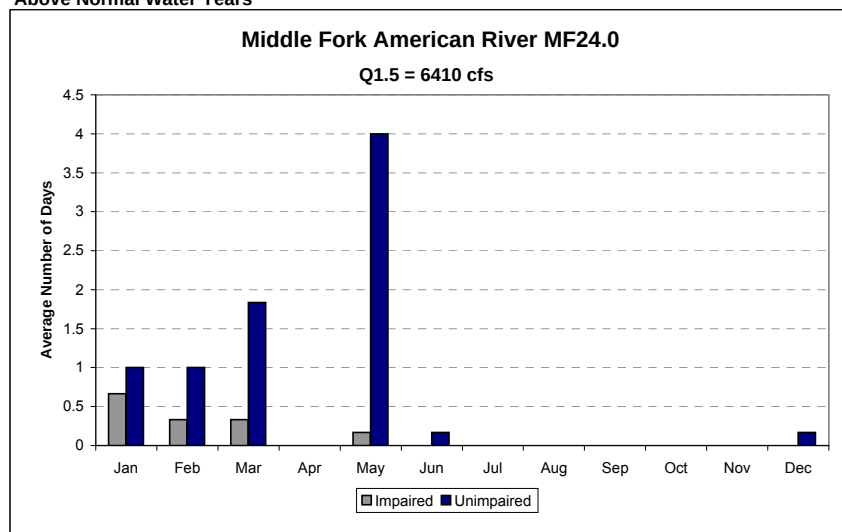
Figure A-9. Middle Fork American River Below North Fork of the Middle Fork American River Confluence MF24.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q.5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-10. Middle Fork American River Below North Fork of the Middle Fork American River Confluence MF24.0: Average Number of Days per Month per Wet and Above Normal Water Year when Flow Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

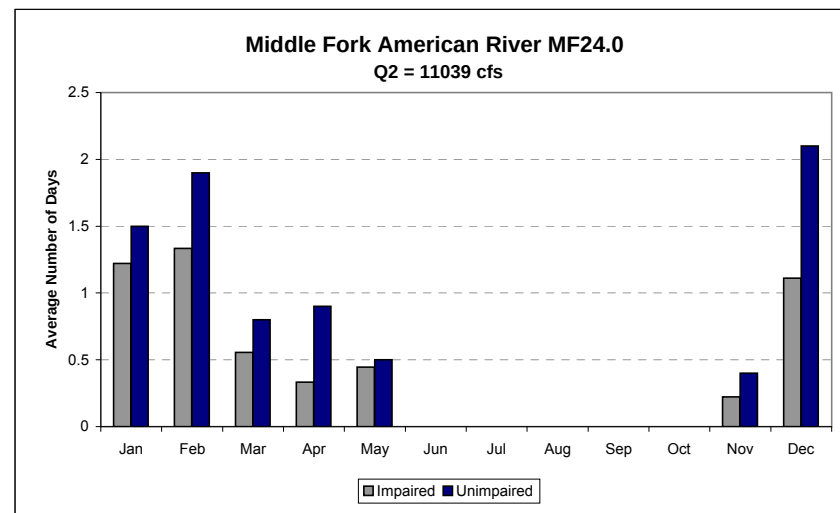
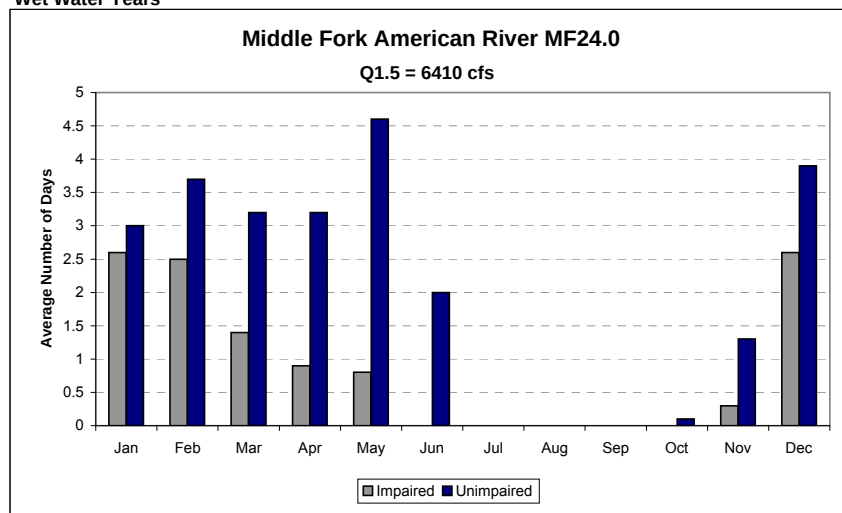


Figure A-11. Middle Fork American River MF14.1: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).

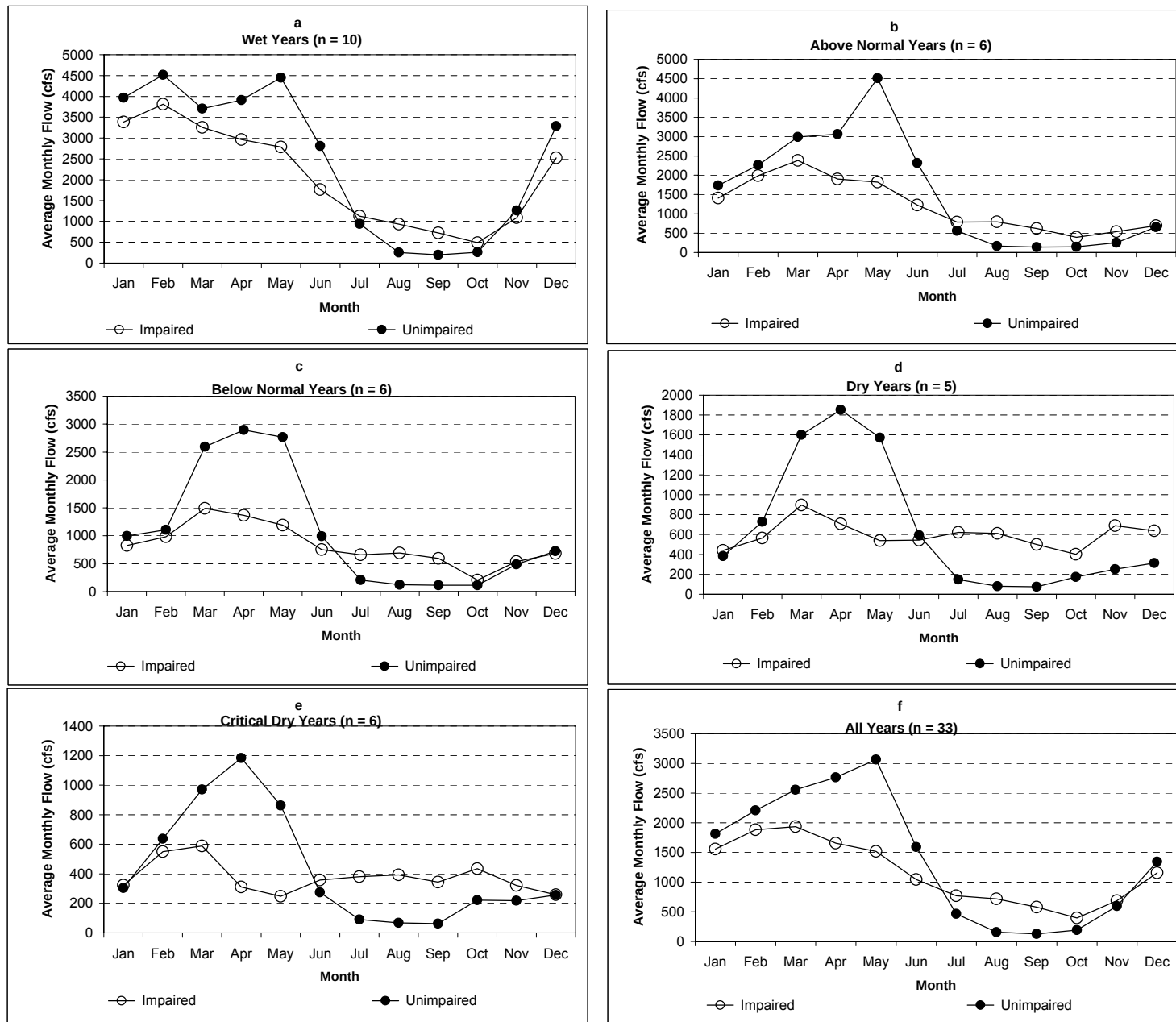


Figure A-11. Middle Fork American River MF14.1: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

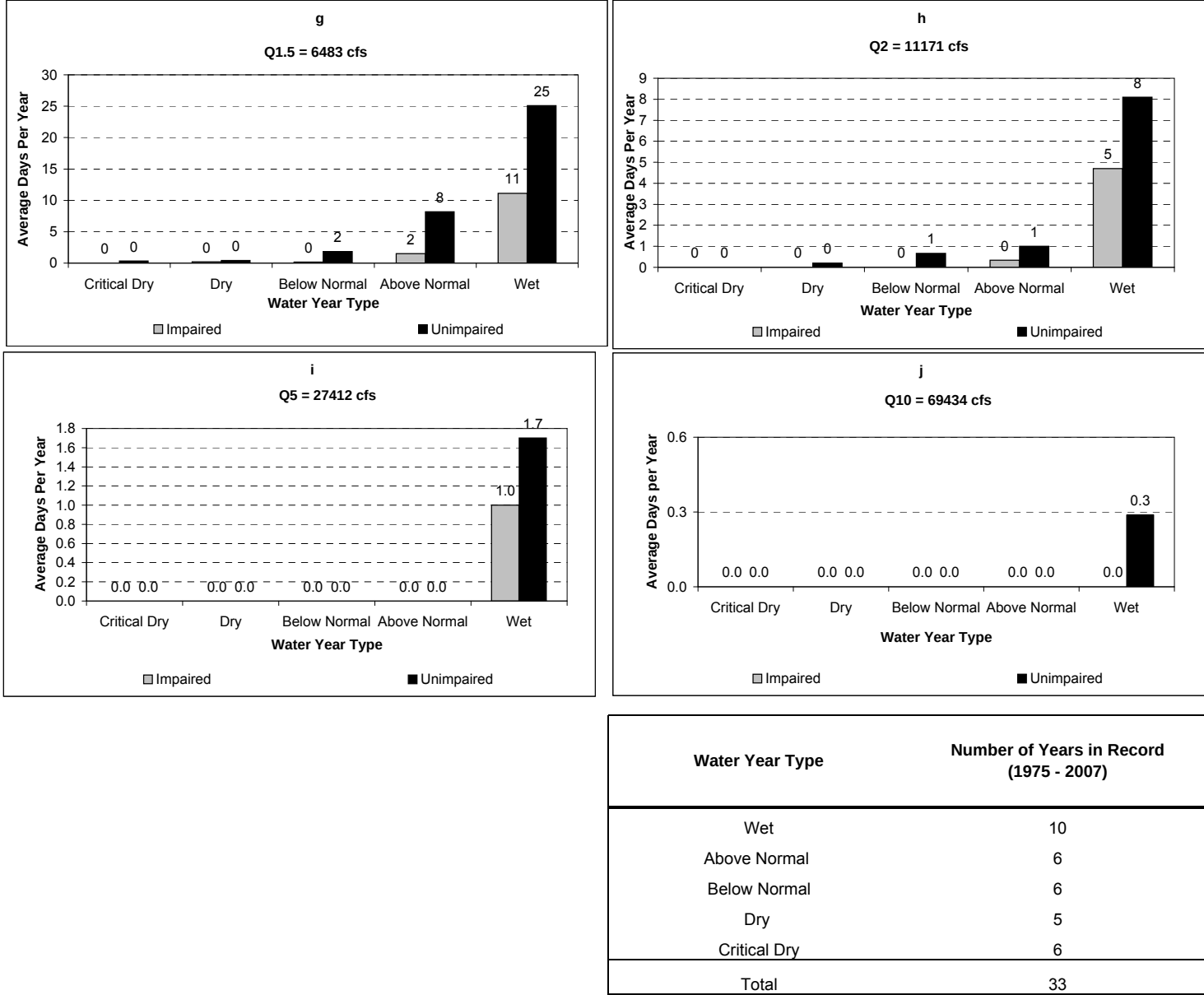


Figure A-11. Middle Fork American River MF14.1: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

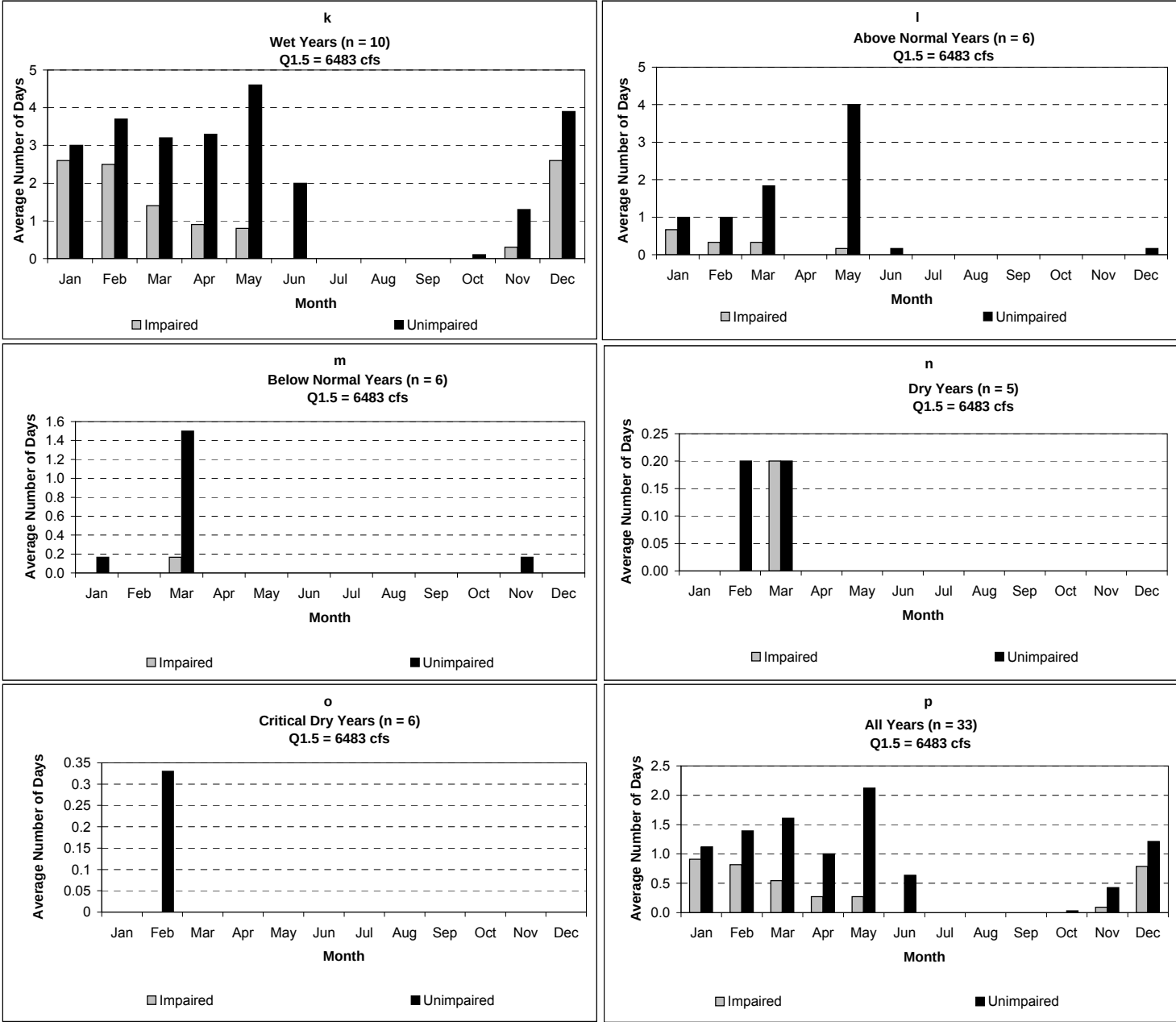
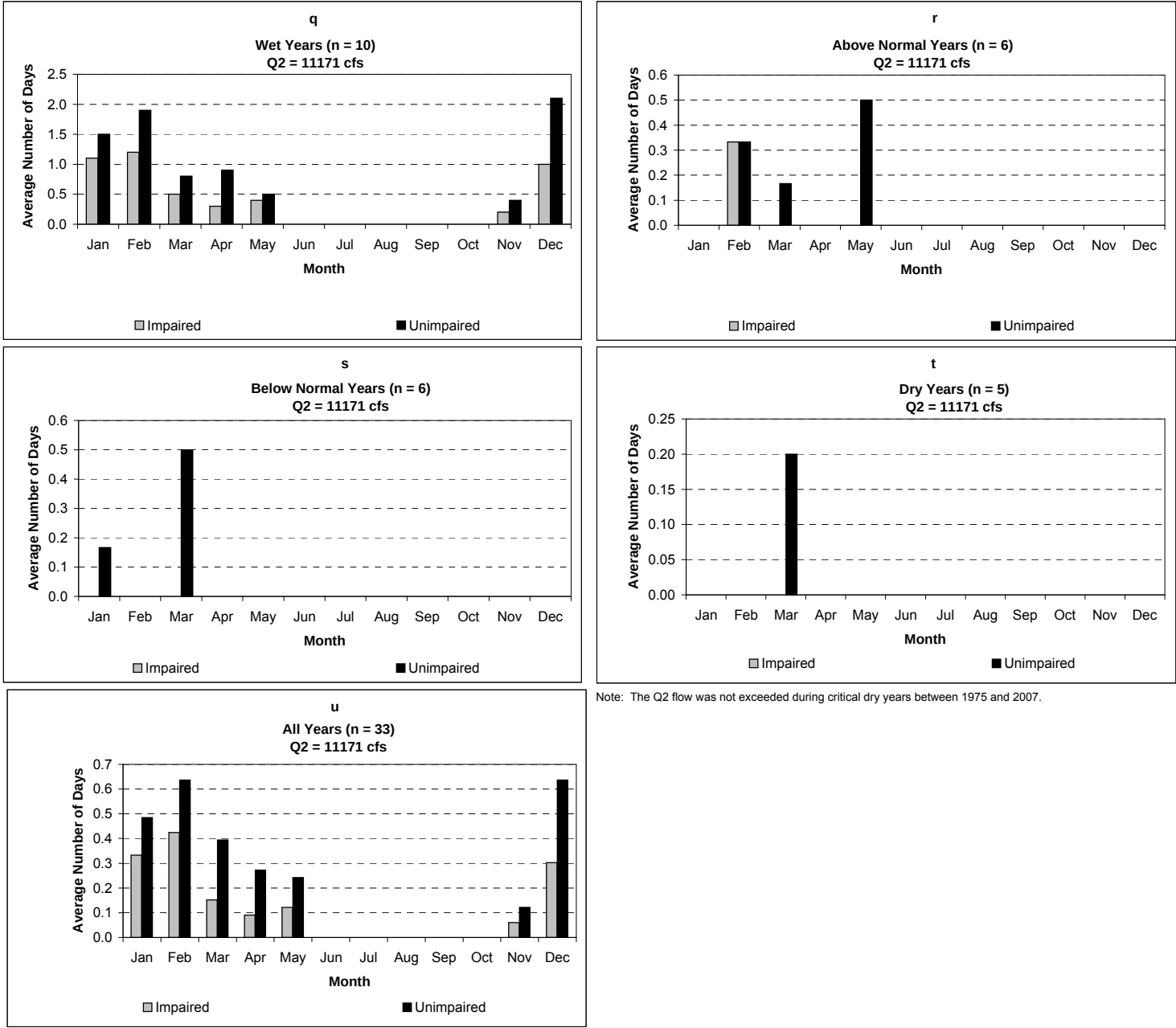
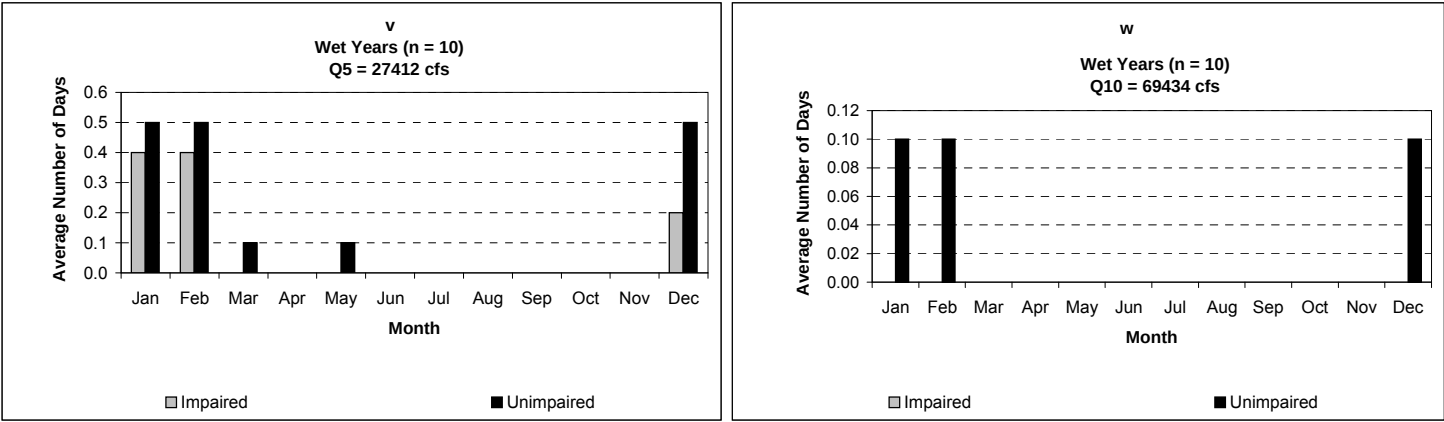


Figure A-11. Middle Fork American River MF14.1: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q2 flow was not exceeded during critical dry years between 1975 and 2007.

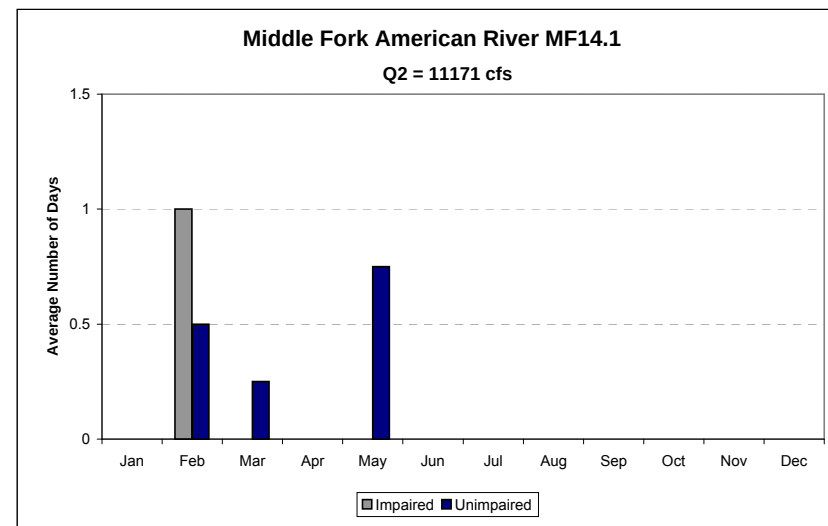
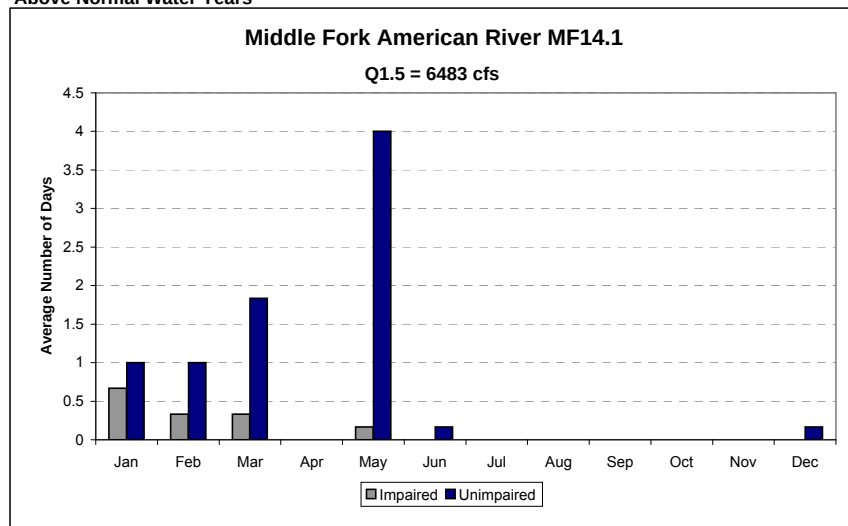
Figure A-11. Middle Fork American River MF14.1: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-12. Middle Fork American River MF14.1: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

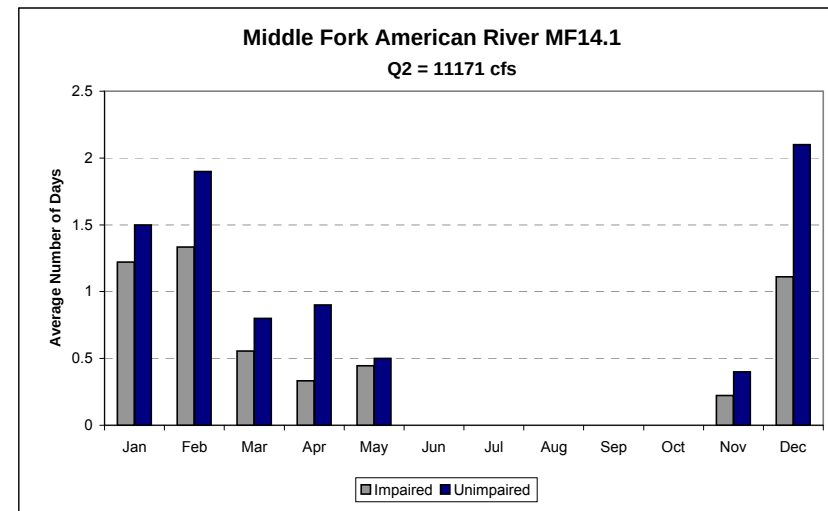
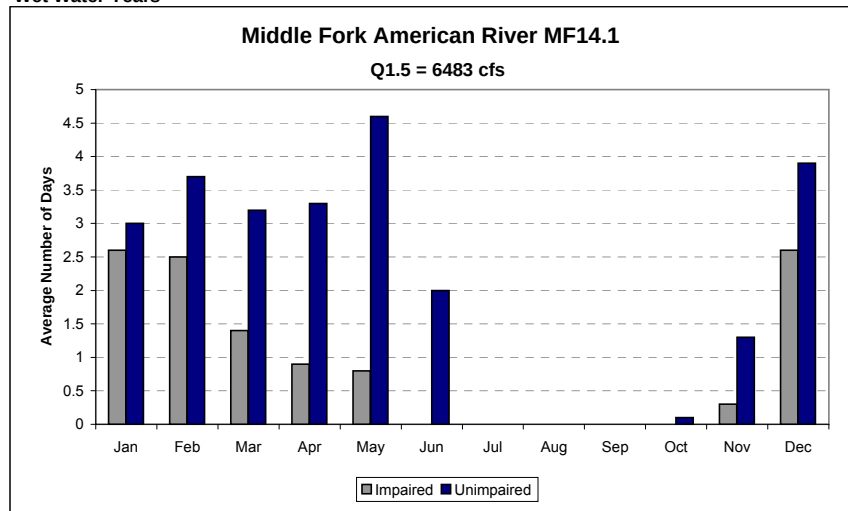


Figure A-13. Middle Fork American River MF4.8: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).

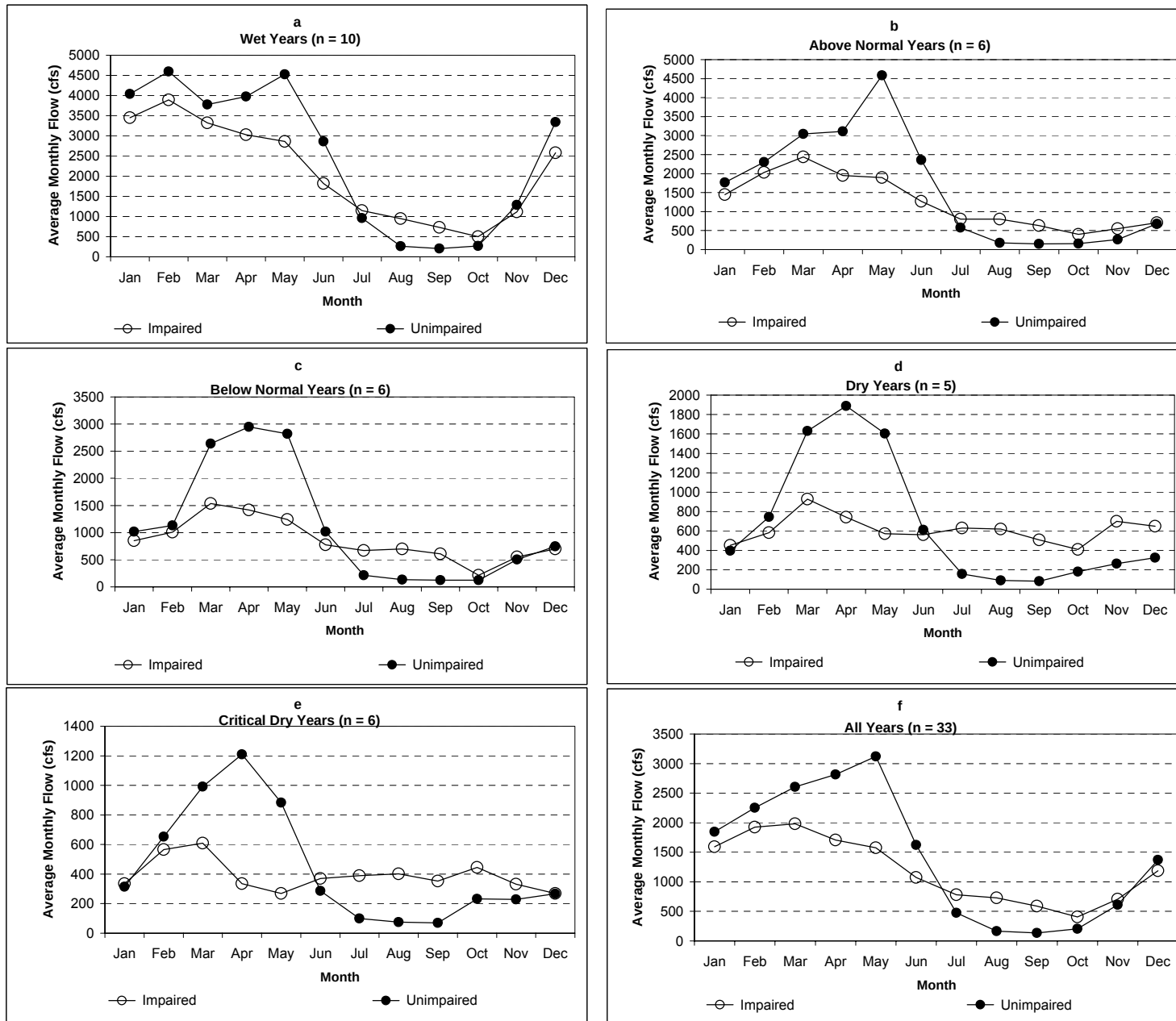
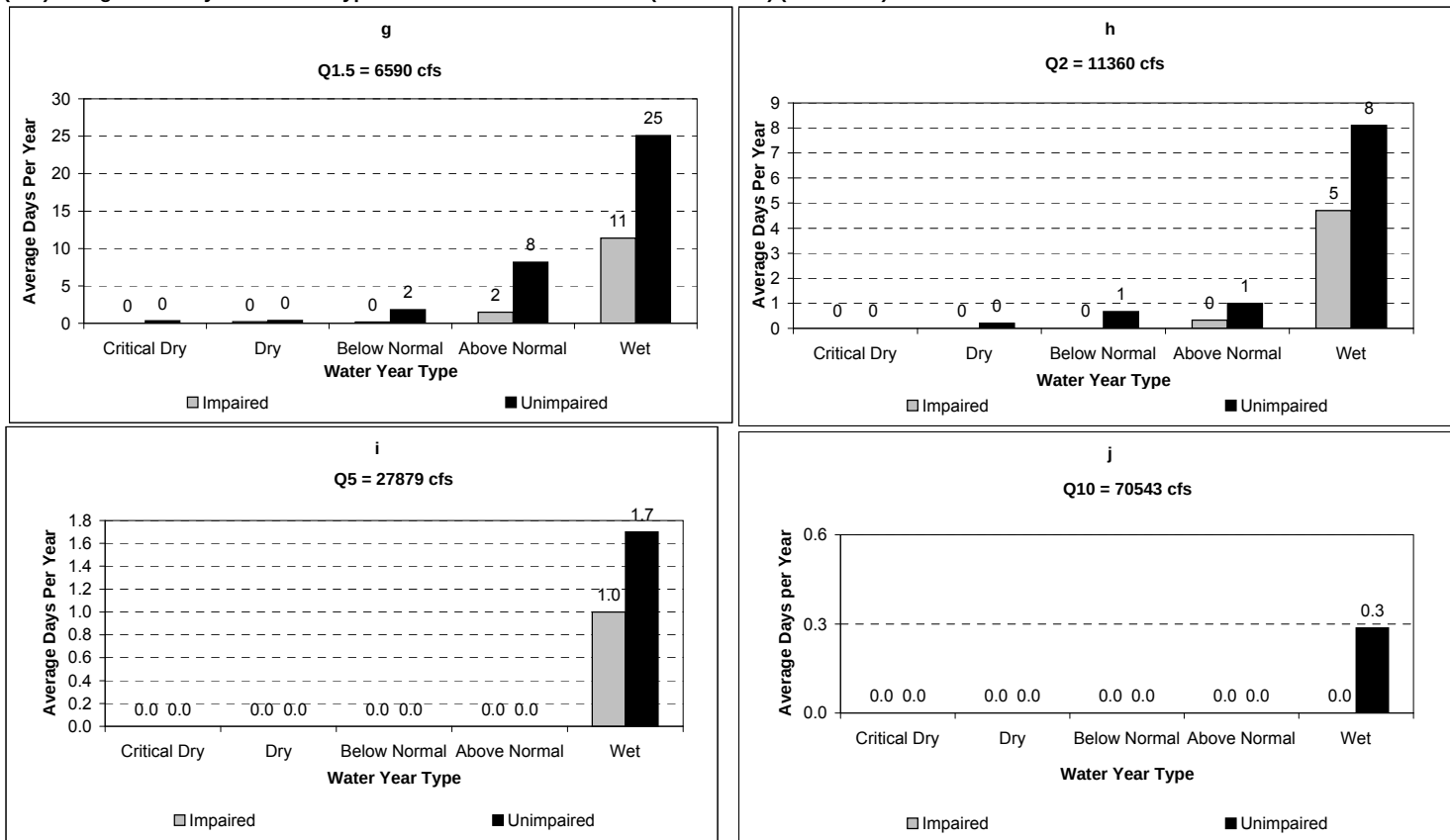


Figure A-13. Middle Fork American River MF4.8: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Water Year Type	Number of Years in Record (1975 - 2007)
Wet	10
Above Normal	6
Below Normal	6
Dry	5
Critical Dry	6
Total	33

Figure A-13. Middle Fork American River MF4.8: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

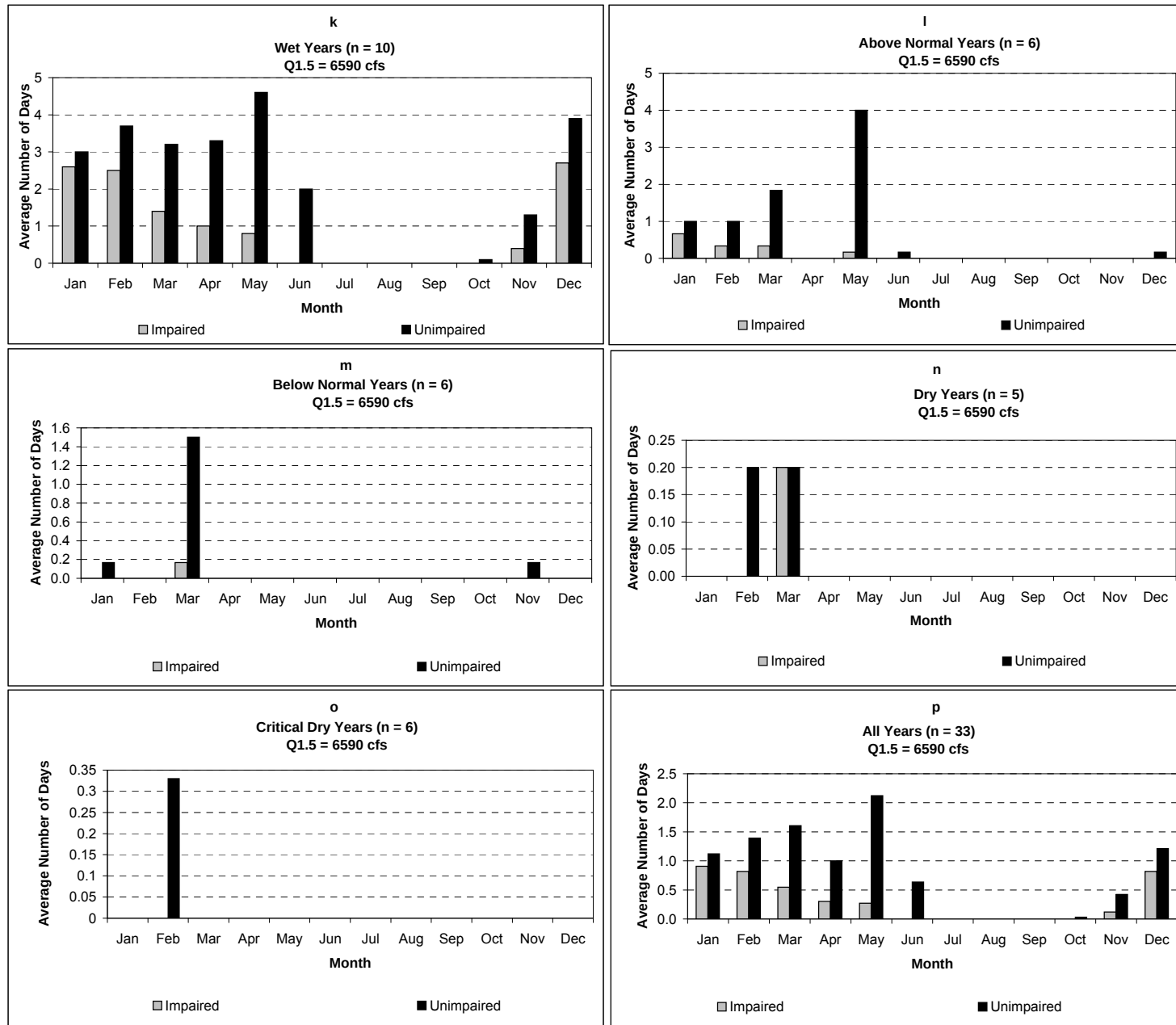
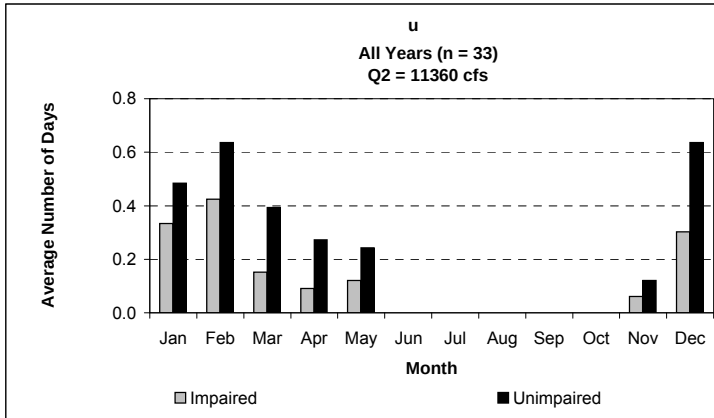
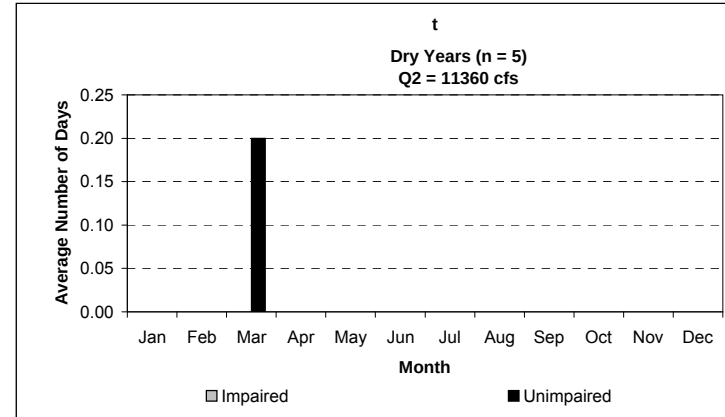
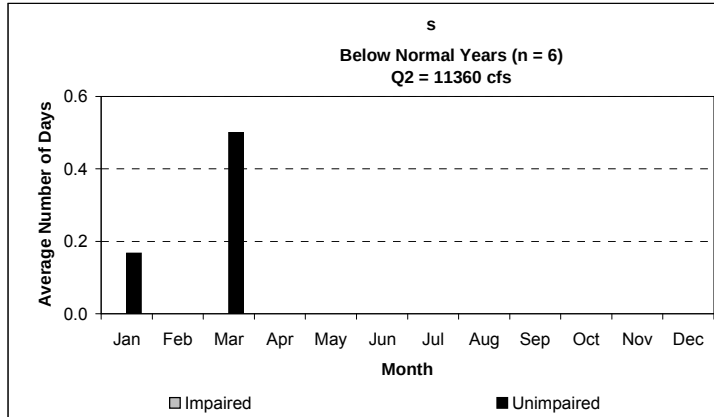
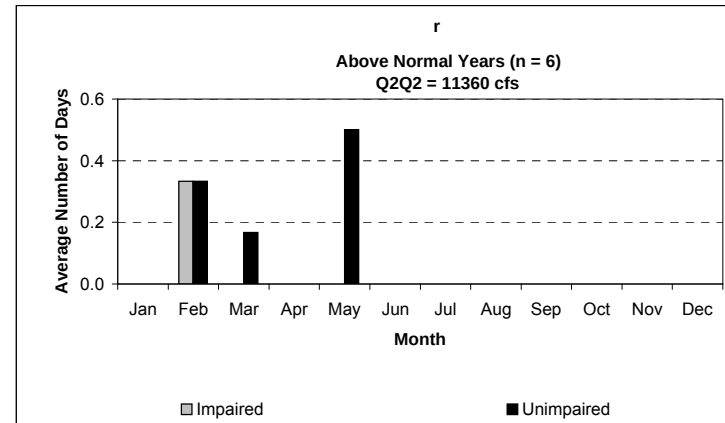
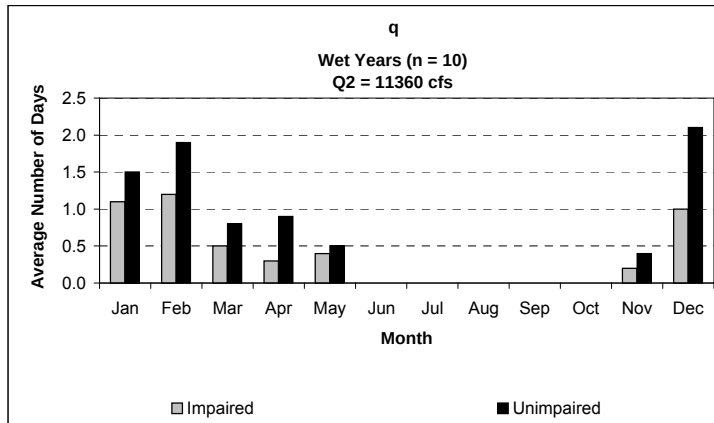
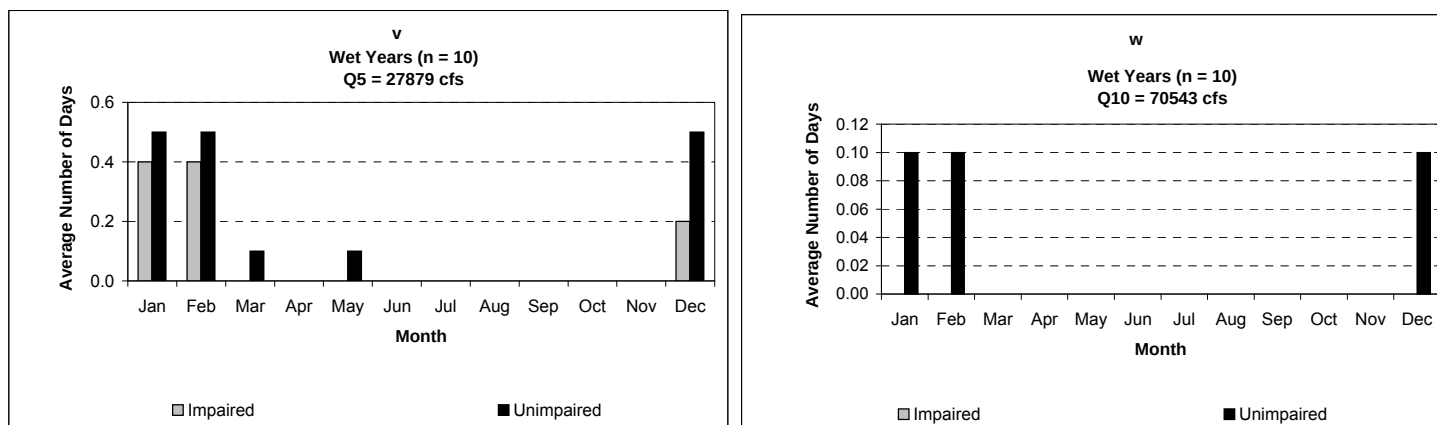


Figure A-13. Middle Fork American River MF4.8: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q2 flow was not exceeded during critical dry years between 1975 and 2007.

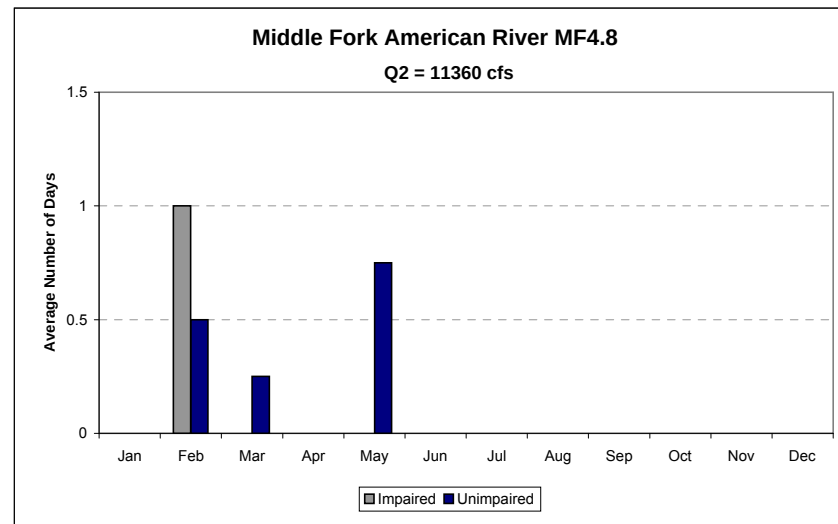
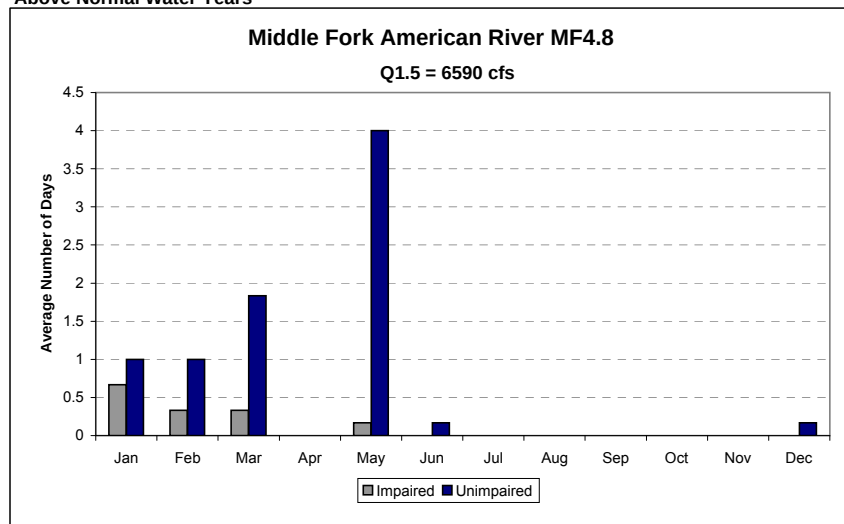
Figure A-13. Middle Fork American River MF4.8: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-14. Middle Fork American River MF4.8: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

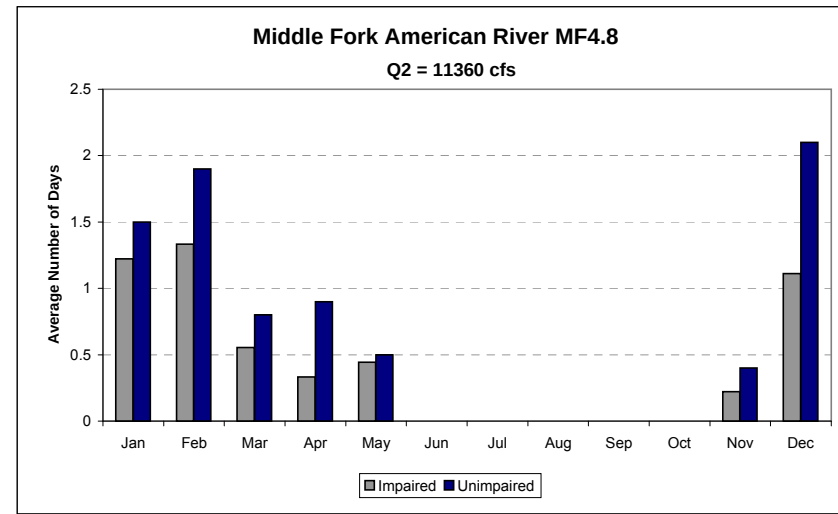
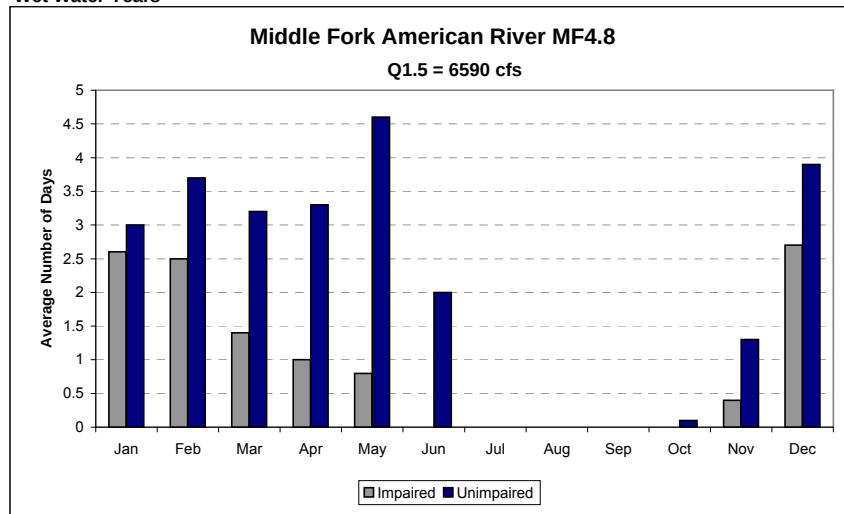


Figure A-15. Rubicon River R25.7: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).

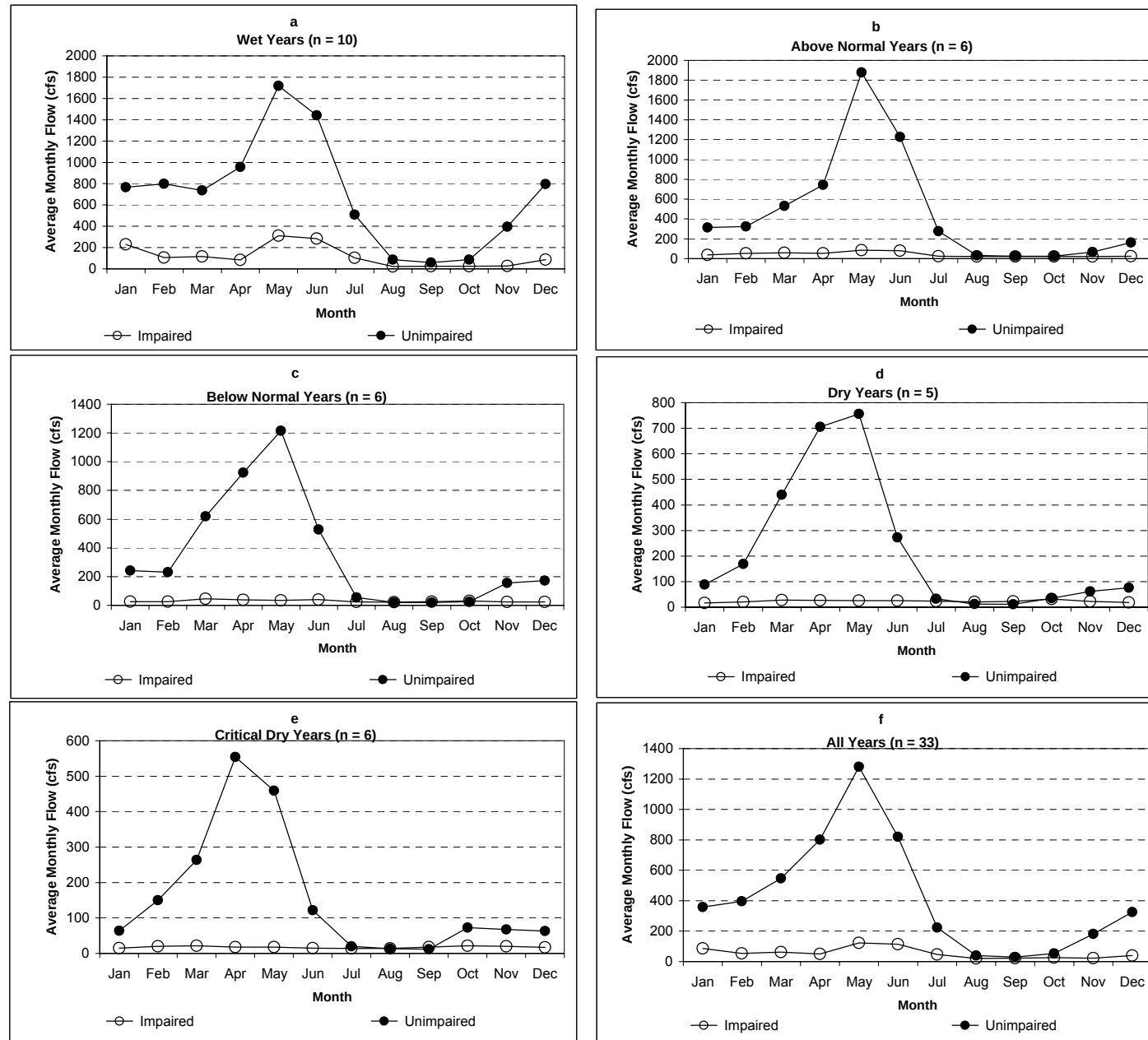


Figure A-15. Rubicon River R25.7: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

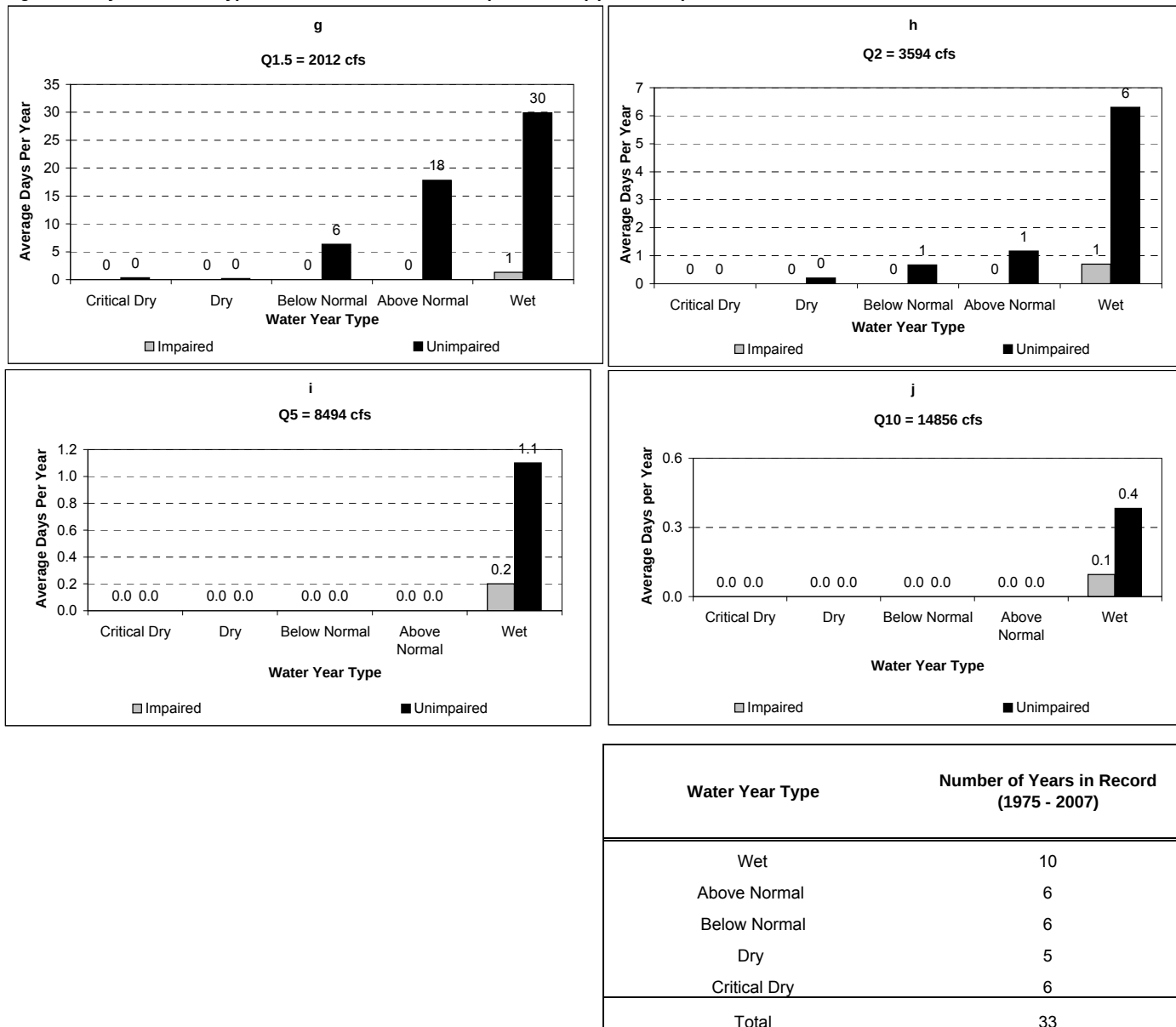


Figure A-15. Rubicon River R25.7: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

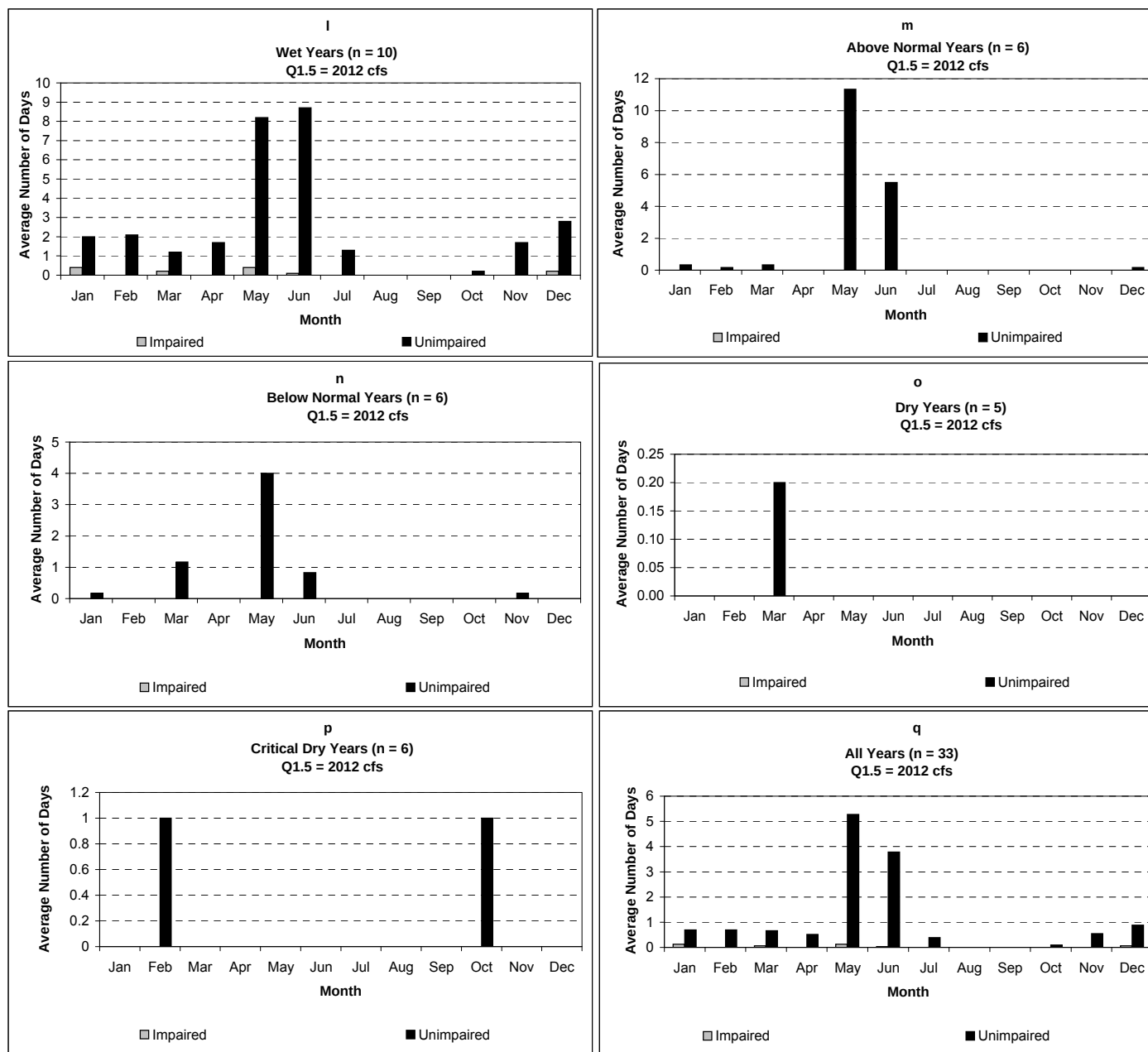


Figure A-15. Rubicon River R25.7: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

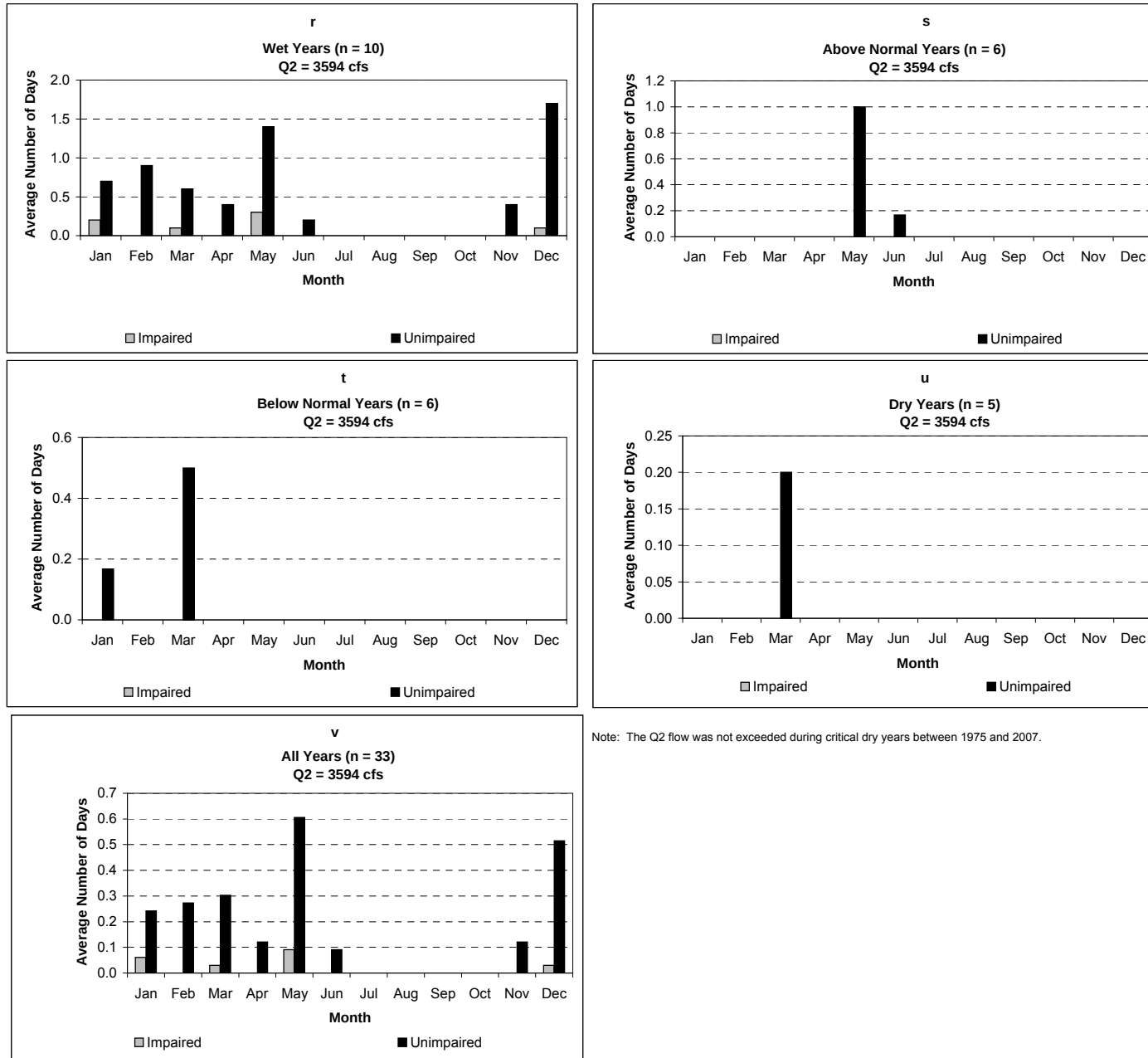
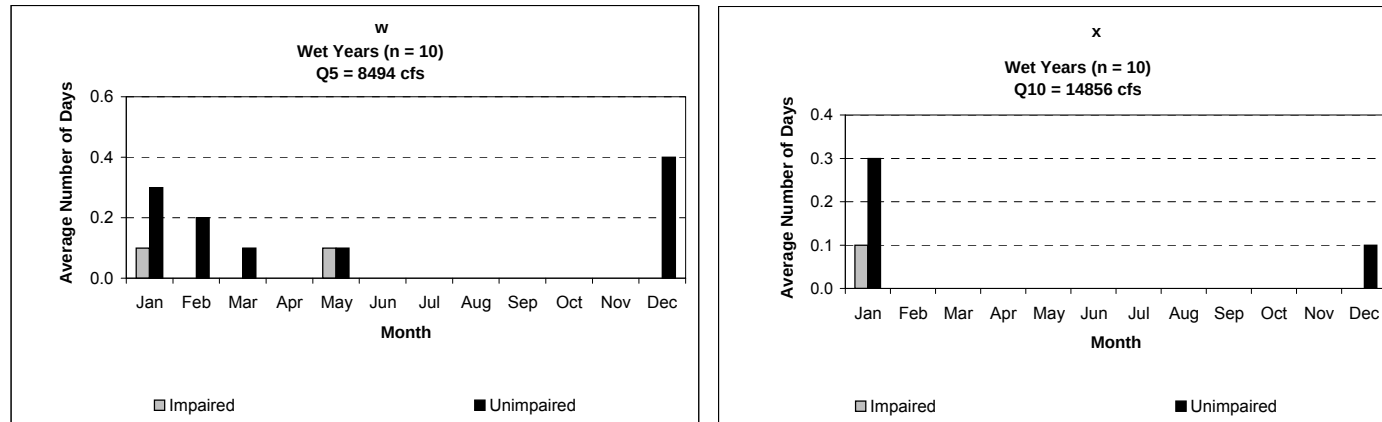


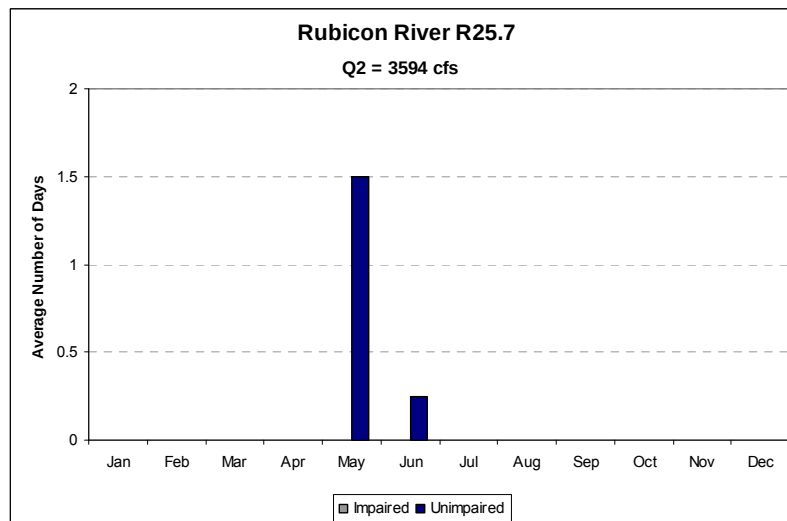
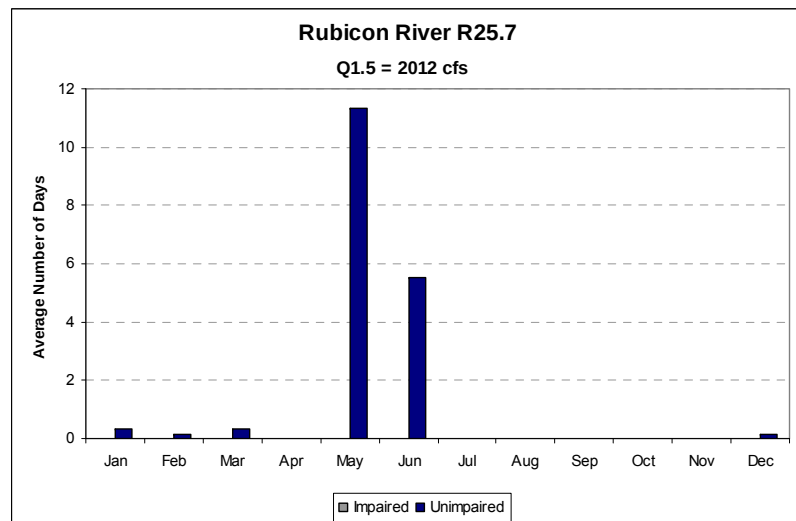
Figure A-15. Rubicon River R25.7: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-16. Rubicon River R25.7: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

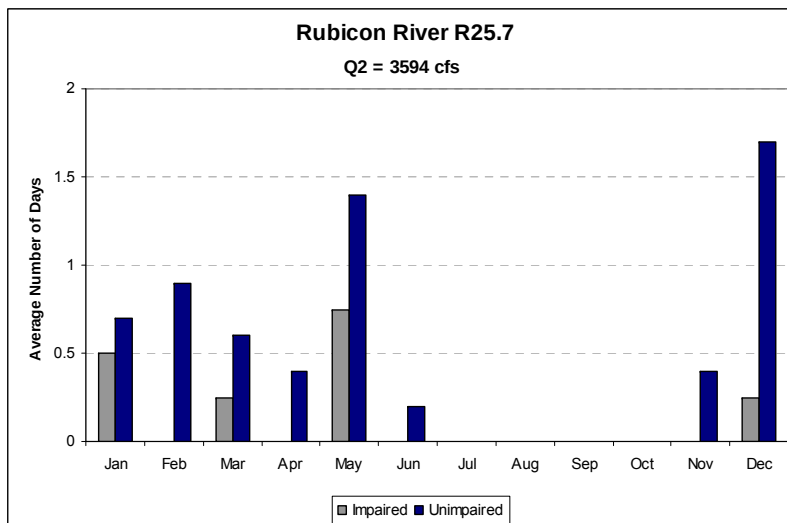
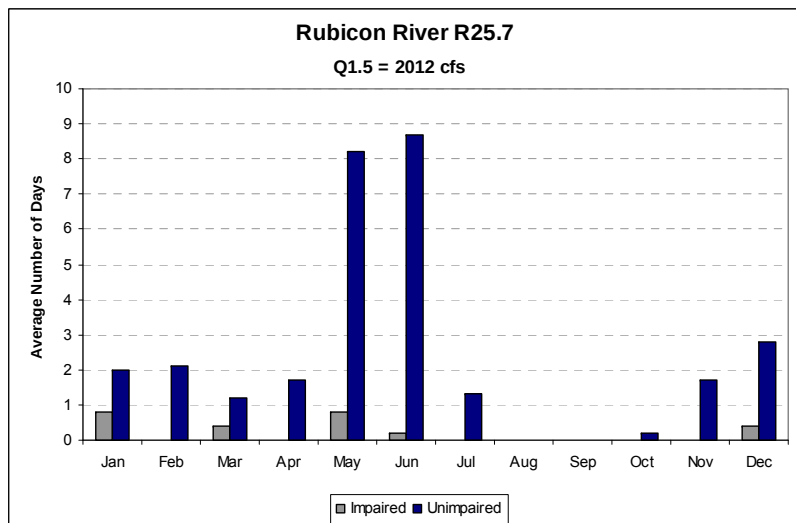
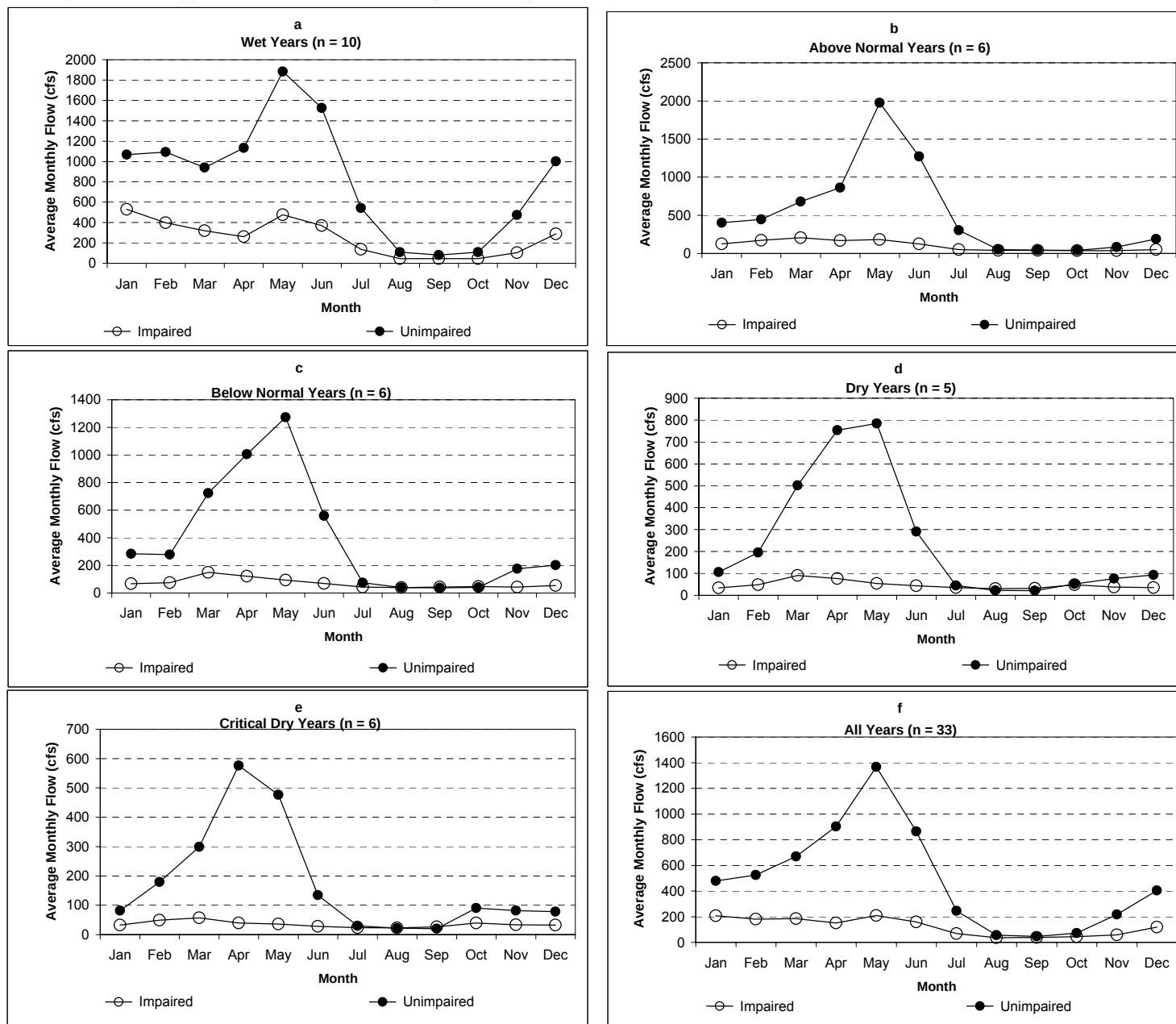


Figure A-17. Rubicon River R20.9: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).



g
Q1.5 = 2259 cfs

Water Year Type	Impaired	Unimpaired
Critical Dry	0	0
Dry	0	0
Below Normal	0	5
Above Normal	0	15
Wet	4	27

h
Q2 = 3799 cfs

Water Year Type	Impaired	Unimpaired
Critical Dry	0	0
Dry	0	0
Below Normal	0	1
Above Normal	0	1
Wet	2	8

i
Q5 = 11618 cfs

Water Year Type	Impaired	Unimpaired
Critical Dry	0.0	0.0
Dry	0.0	0.0
Below Normal	0.0	0.0
Above Normal	0.0	0.0
Wet	0.3	1.3

j
Q10 = 23739 cfs

Water Year Type	Impaired	Unimpaired
Critical Dry	0.0	0.0
Dry	0.0	0.0
Below Normal	0.0	0.0
Above Normal	0.0	0.0
Wet	0.1	0.4

Water Year Type	Number of Years in Record (1975 - 2007)
Wet	10
Above Normal	6
Below Normal	6
Dry	5
Critical Dry	6
Total	33

Figure A-17. Rubicon River R20.9: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

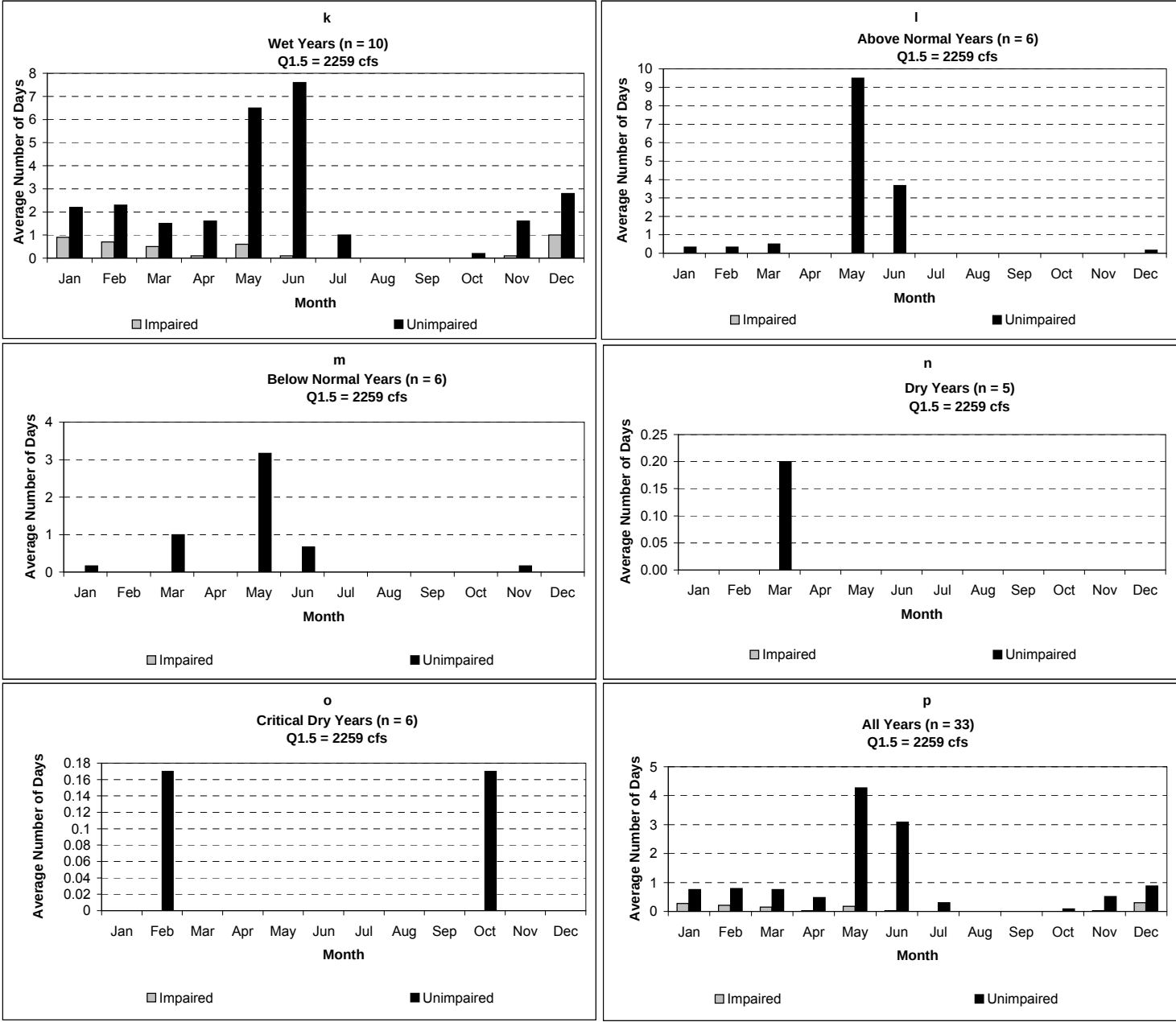
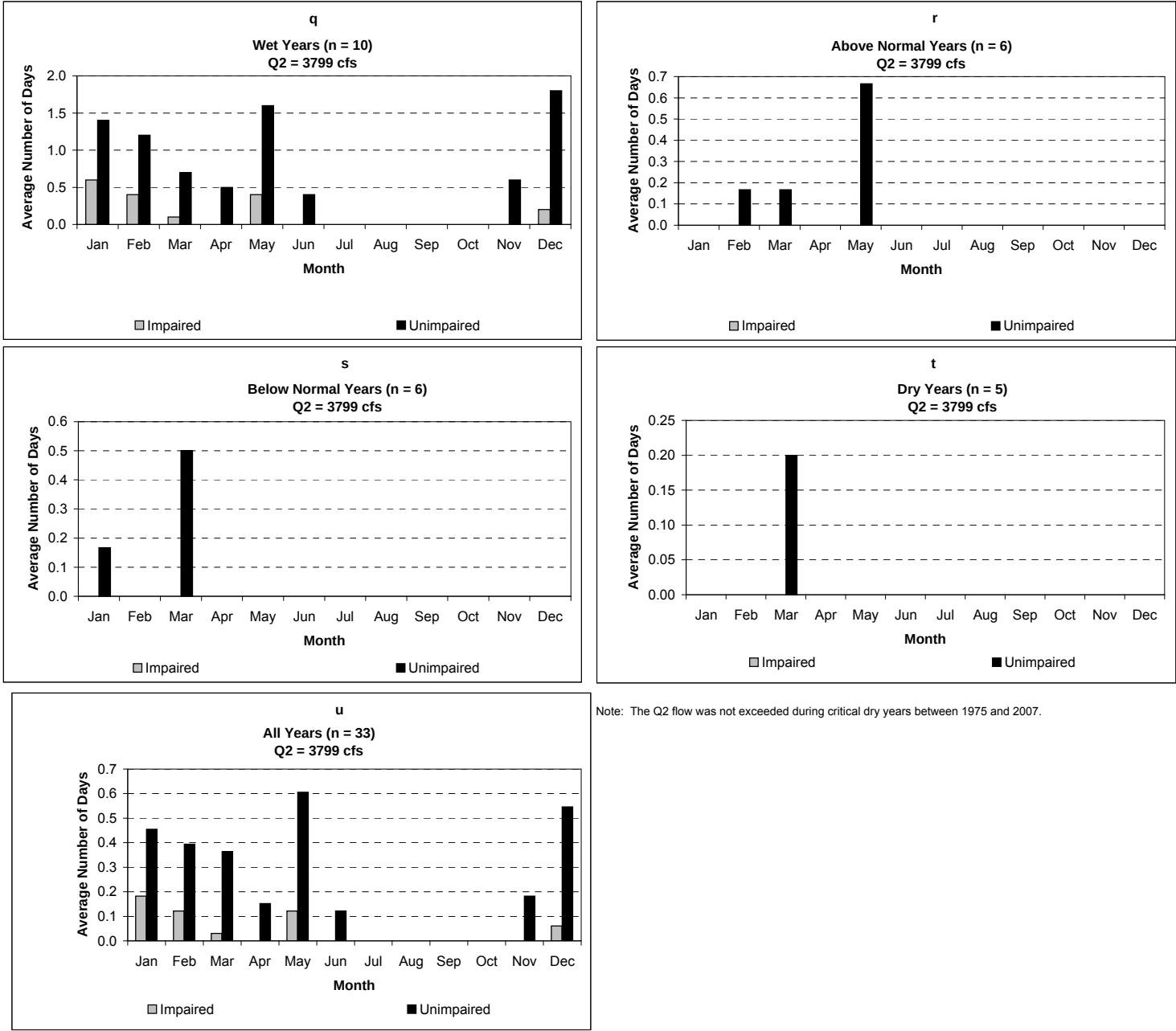
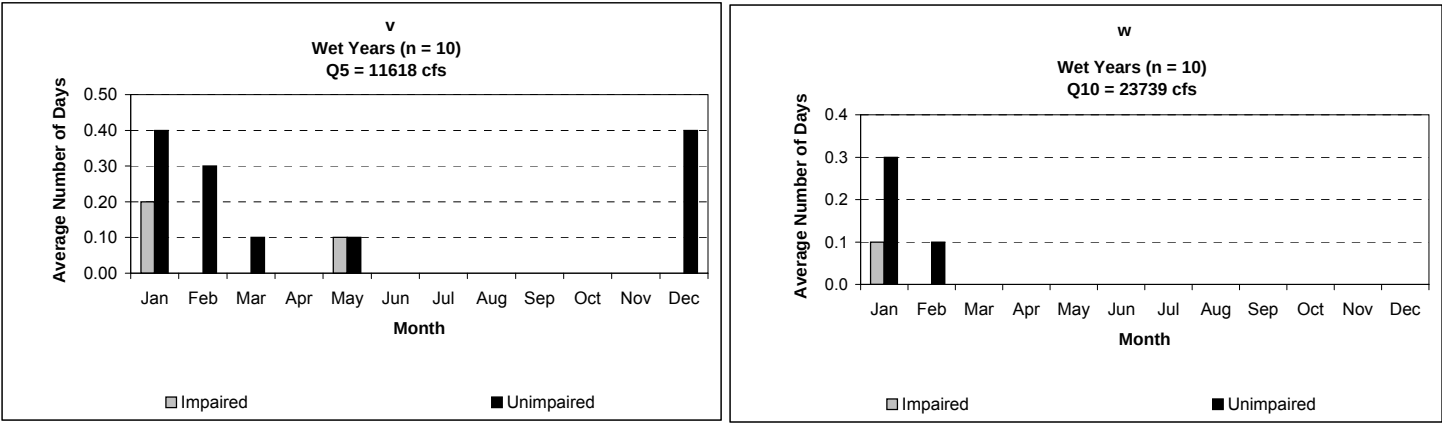


Figure A-17. Rubicon River R20.9: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q2 flow was not exceeded during critical dry years between 1975 and 2007.

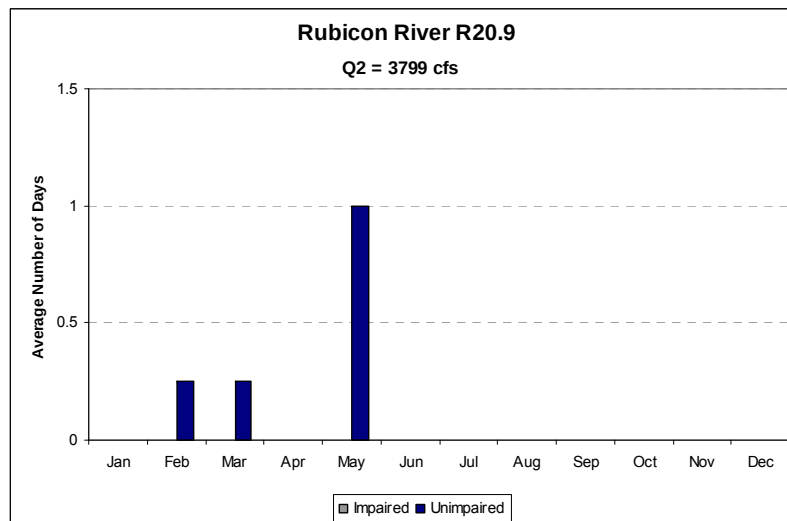
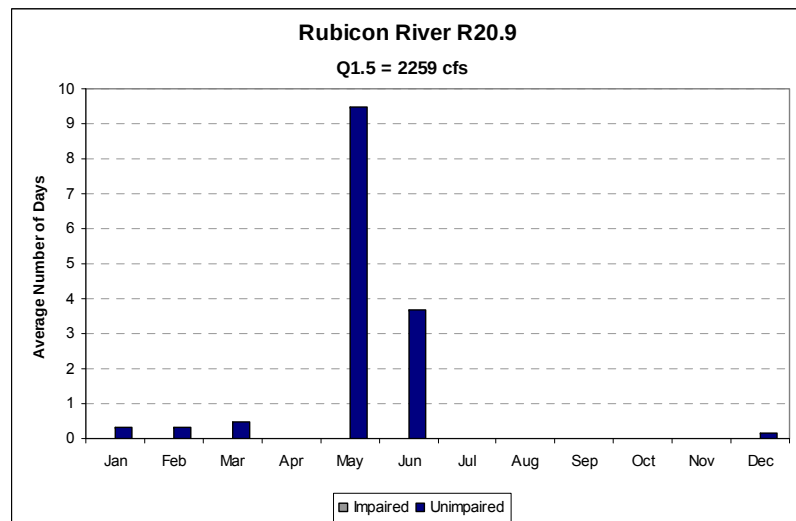
Figure A-17. Rubicon River R20.9: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-18. Rubicon River R20.9: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

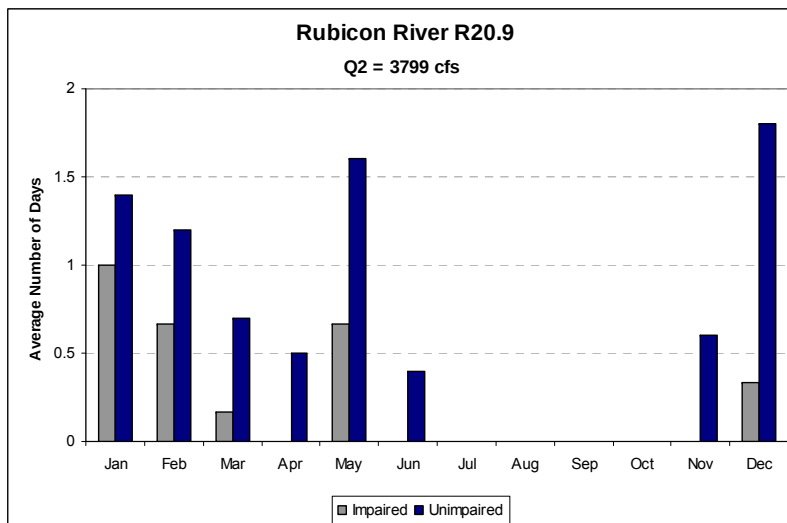
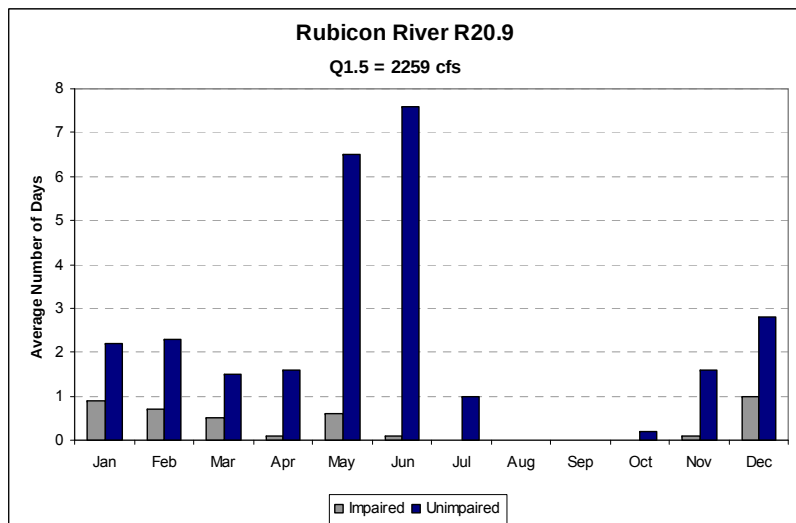


Figure A-19. Rubicon River R3.5: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).

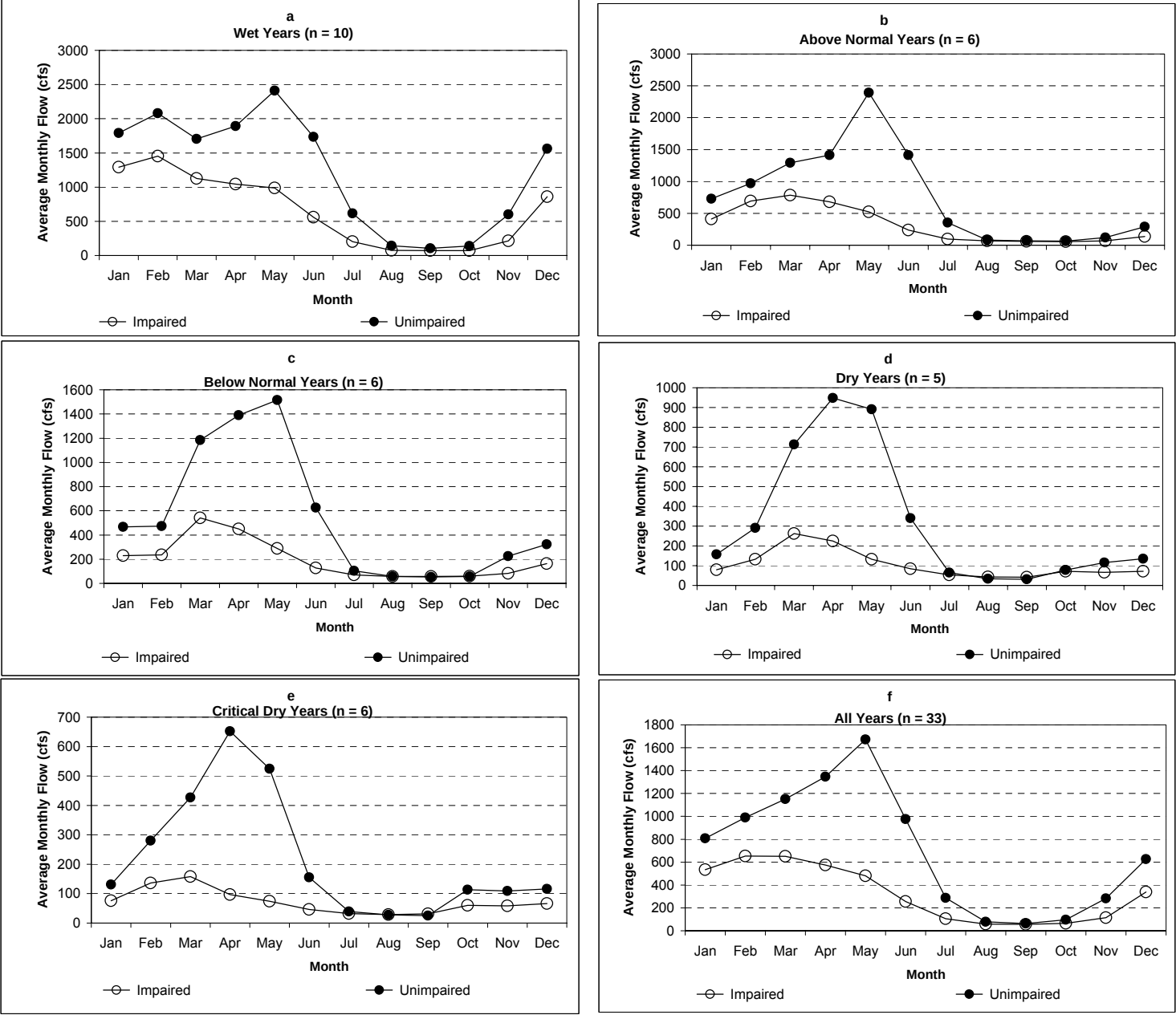


Figure A-19. Rubicon River R3.5: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

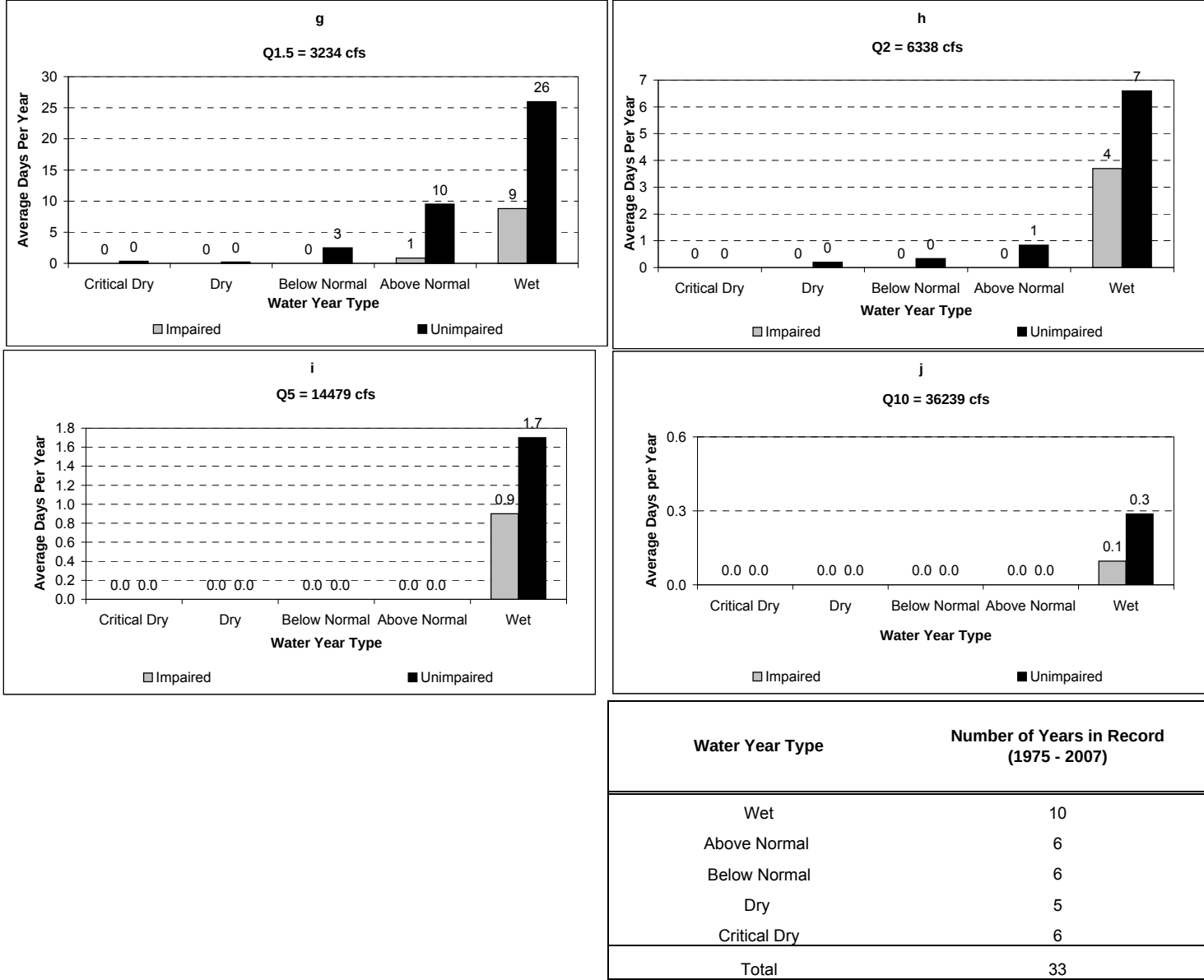


Figure A-19. Rubicon River R3.5: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

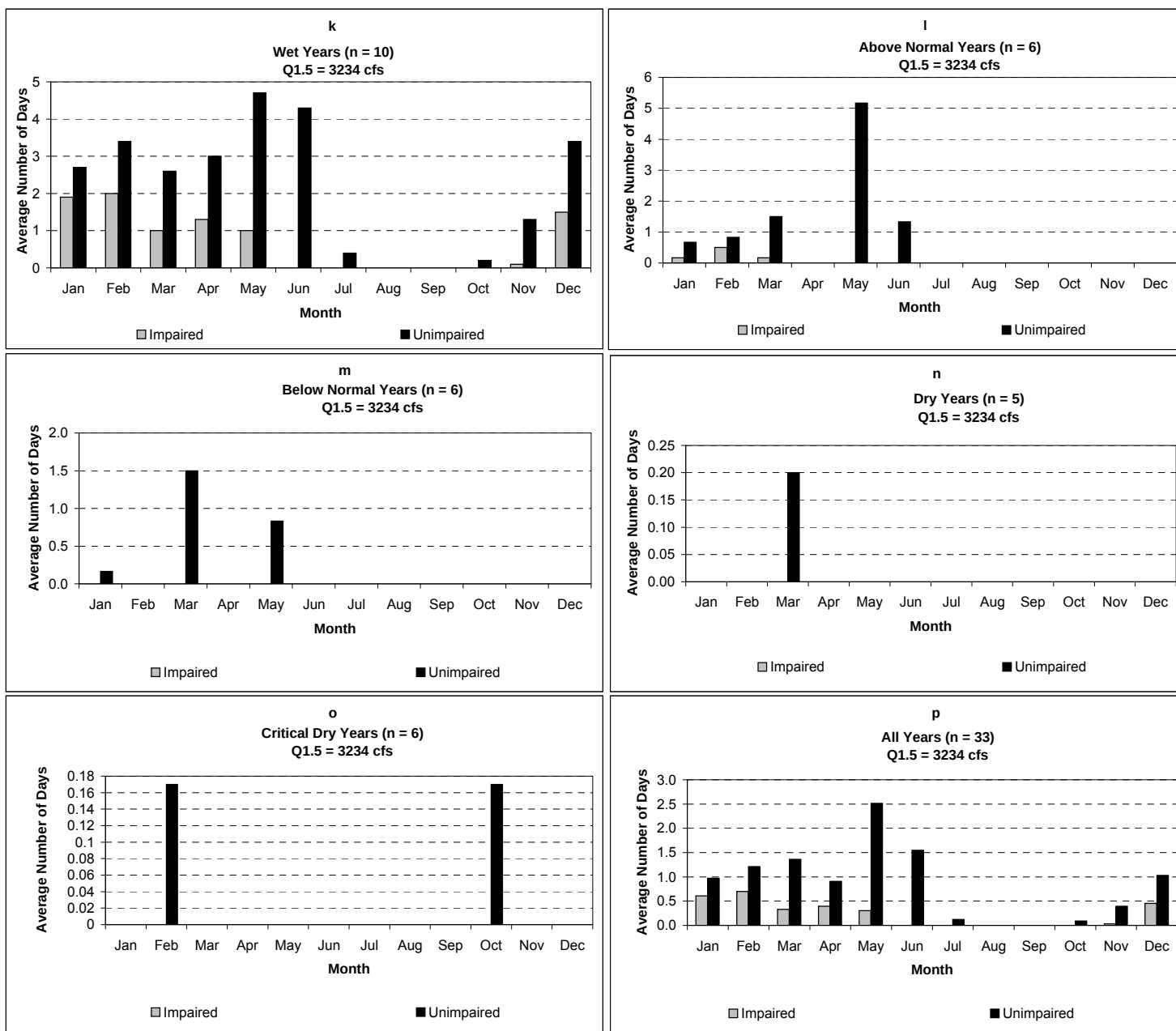
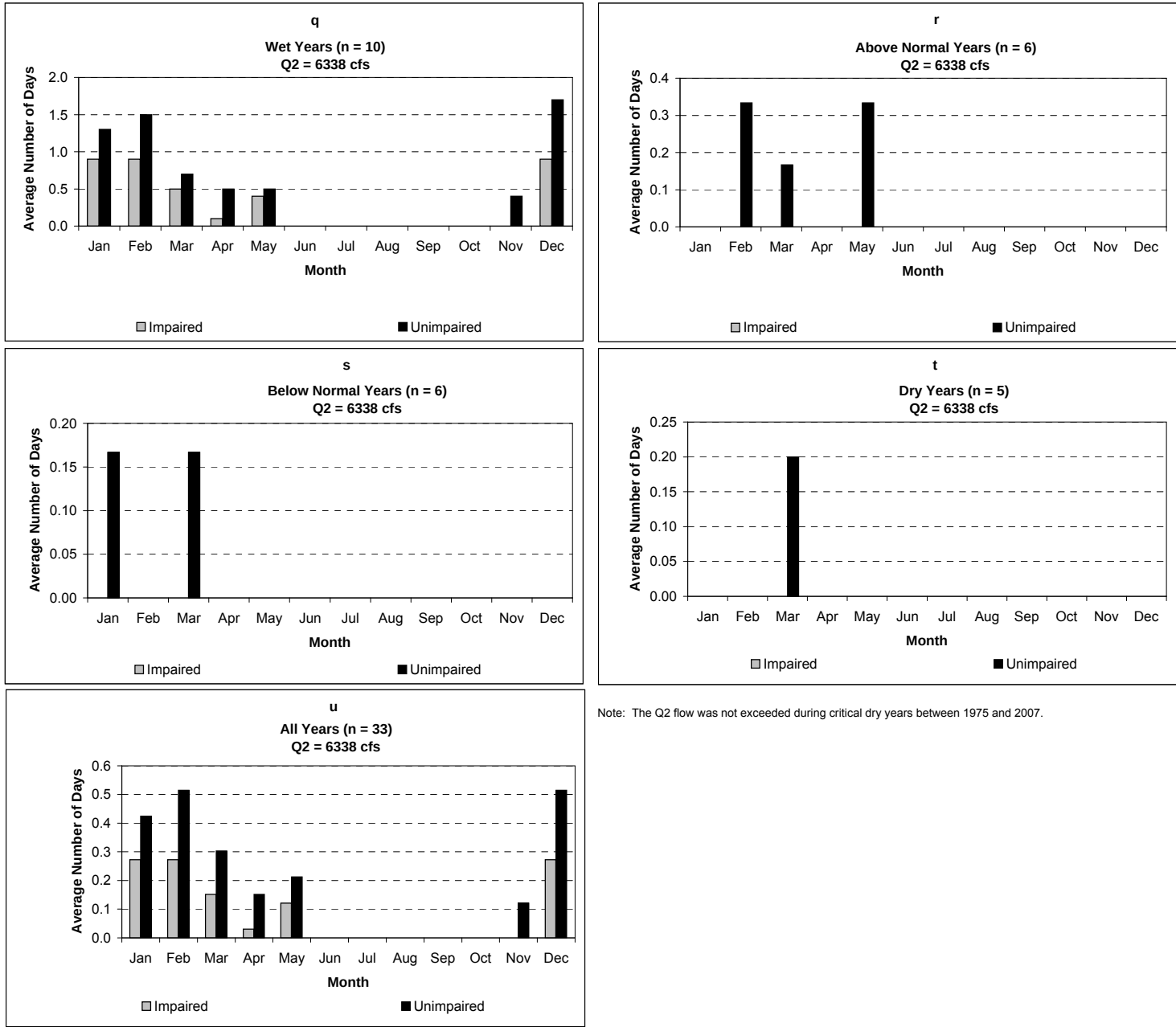
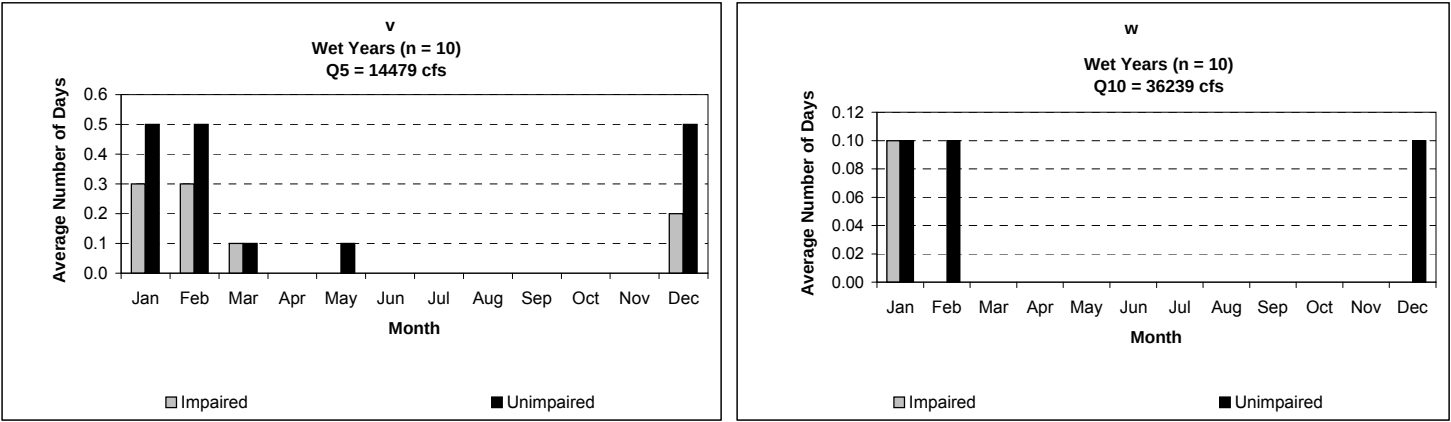


Figure A-19. Rubicon River R3.5: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q2 flow was not exceeded during critical dry years between 1975 and 2007.

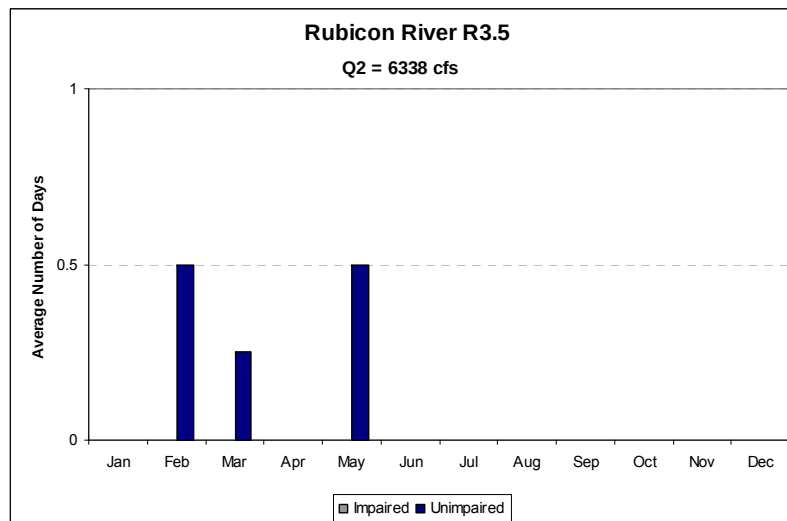
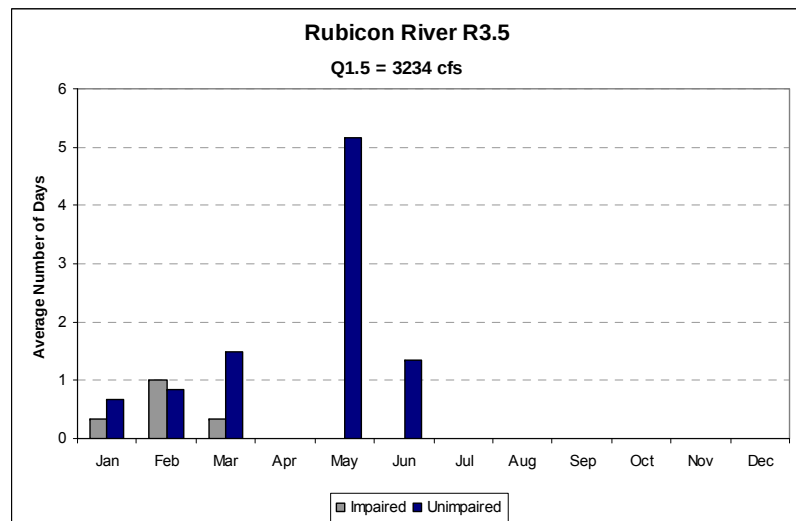
Figure A-19. Rubicon River R3.5: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-20. Rubicon River R3.5: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

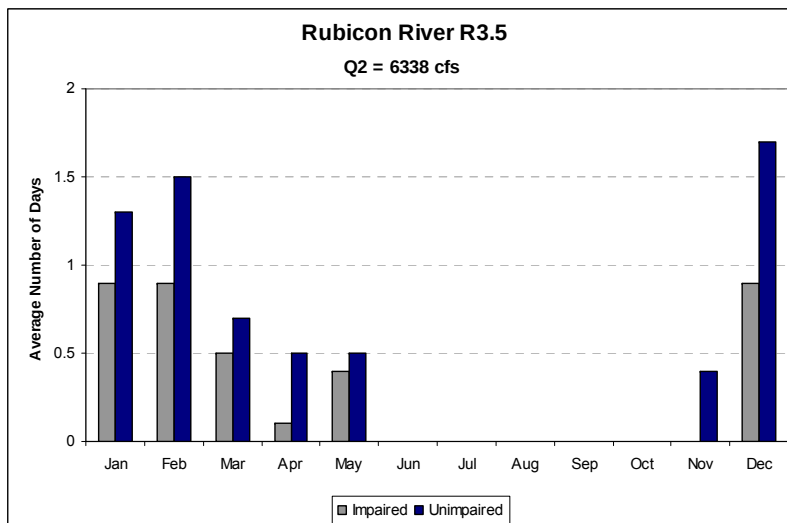
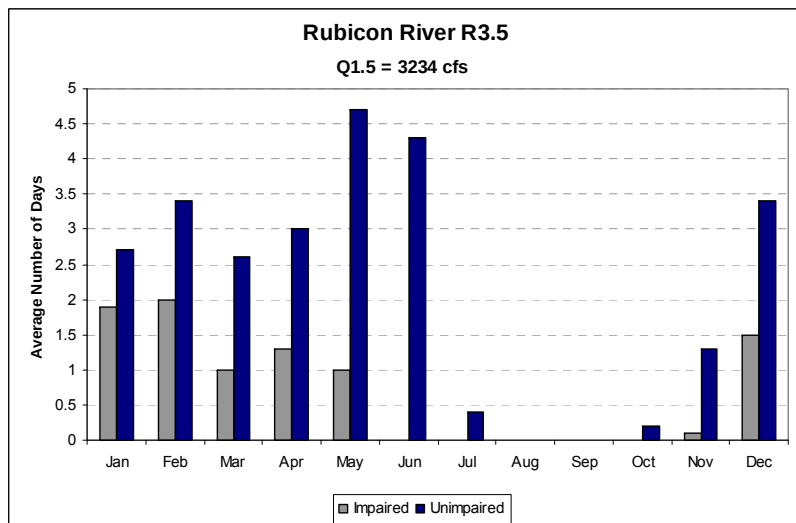


Figure A-21. South Fork Long Canyon SFLC2.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).

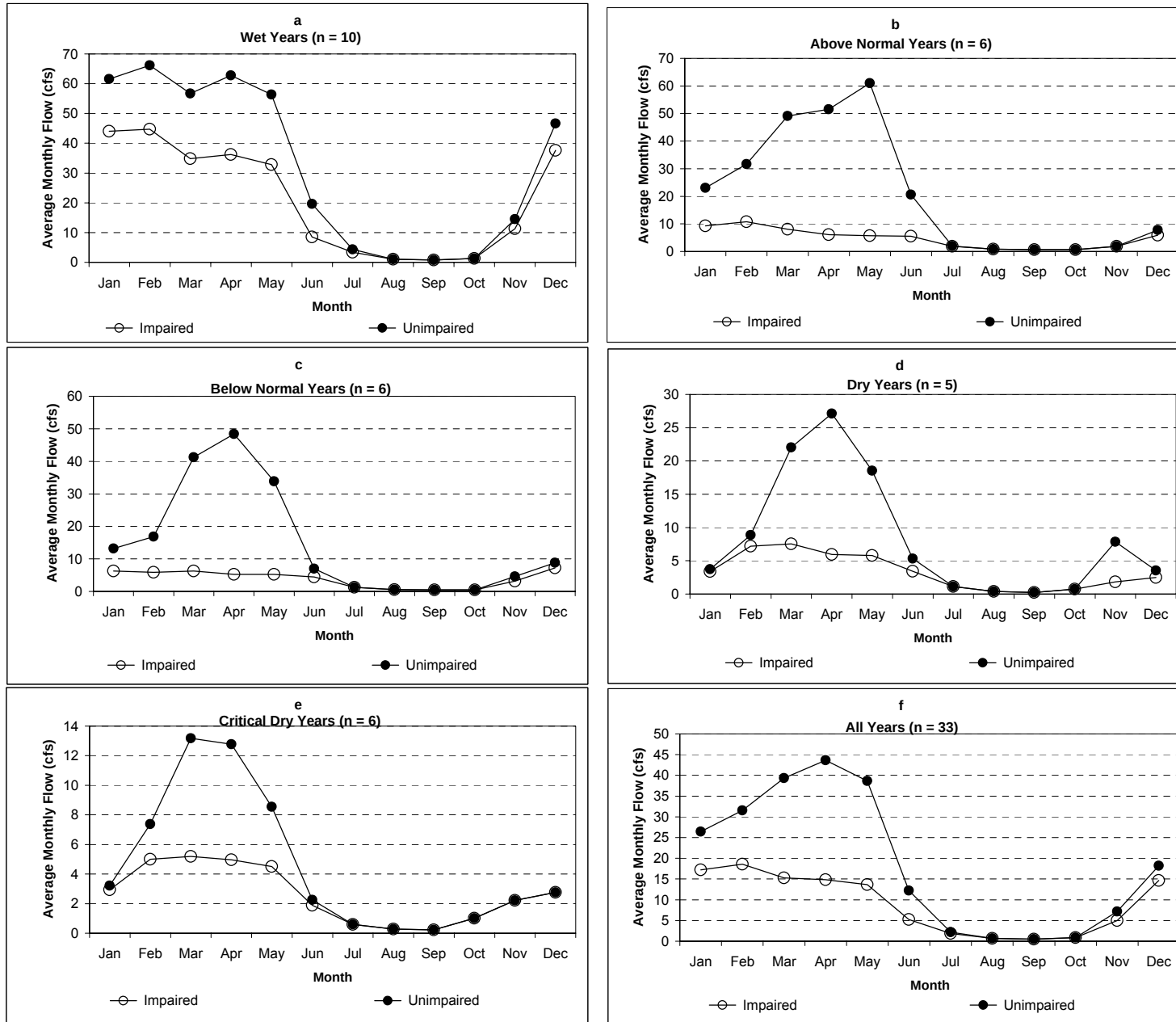


Figure A-21. South Fork Long Canyon SFLC2.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

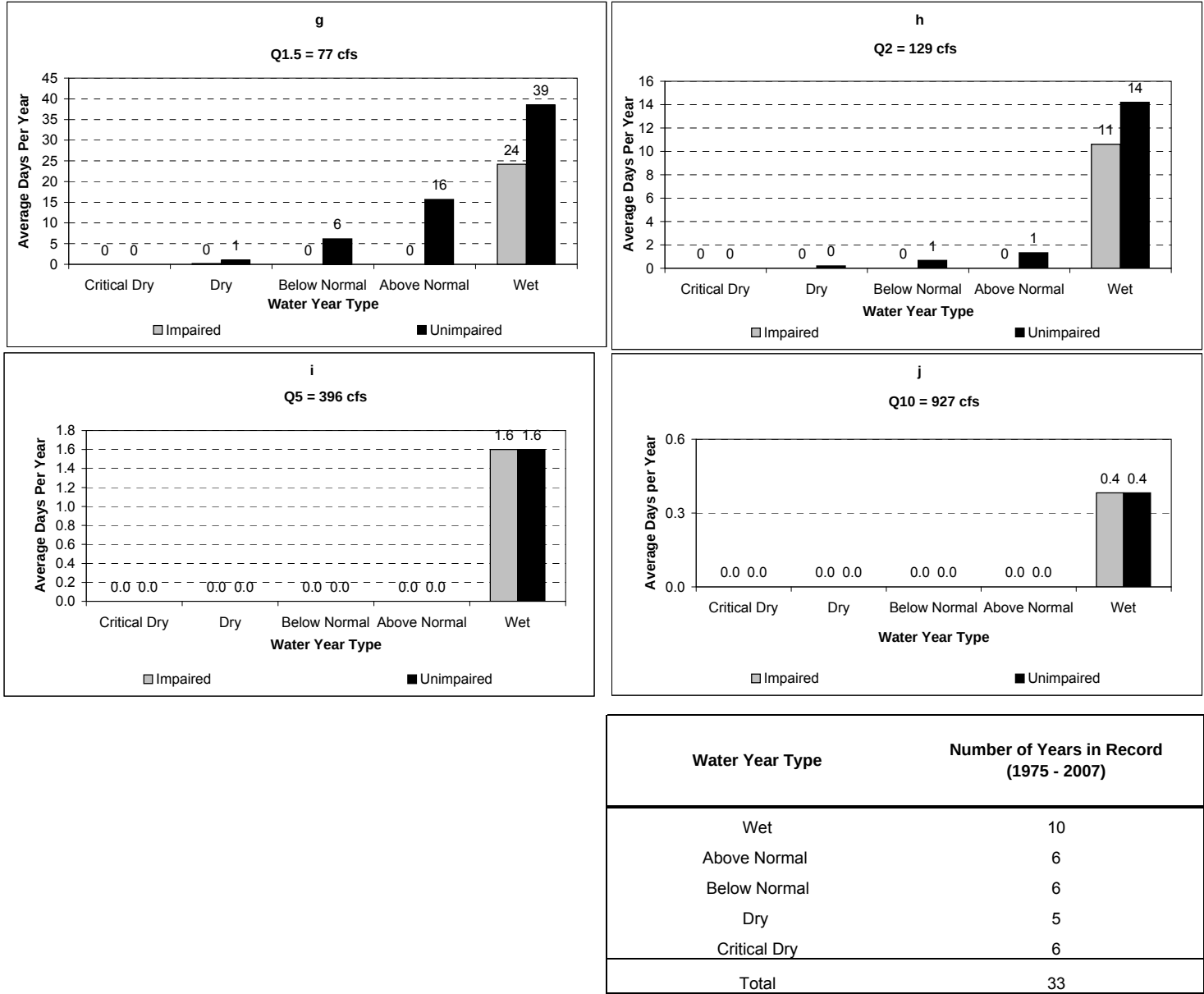
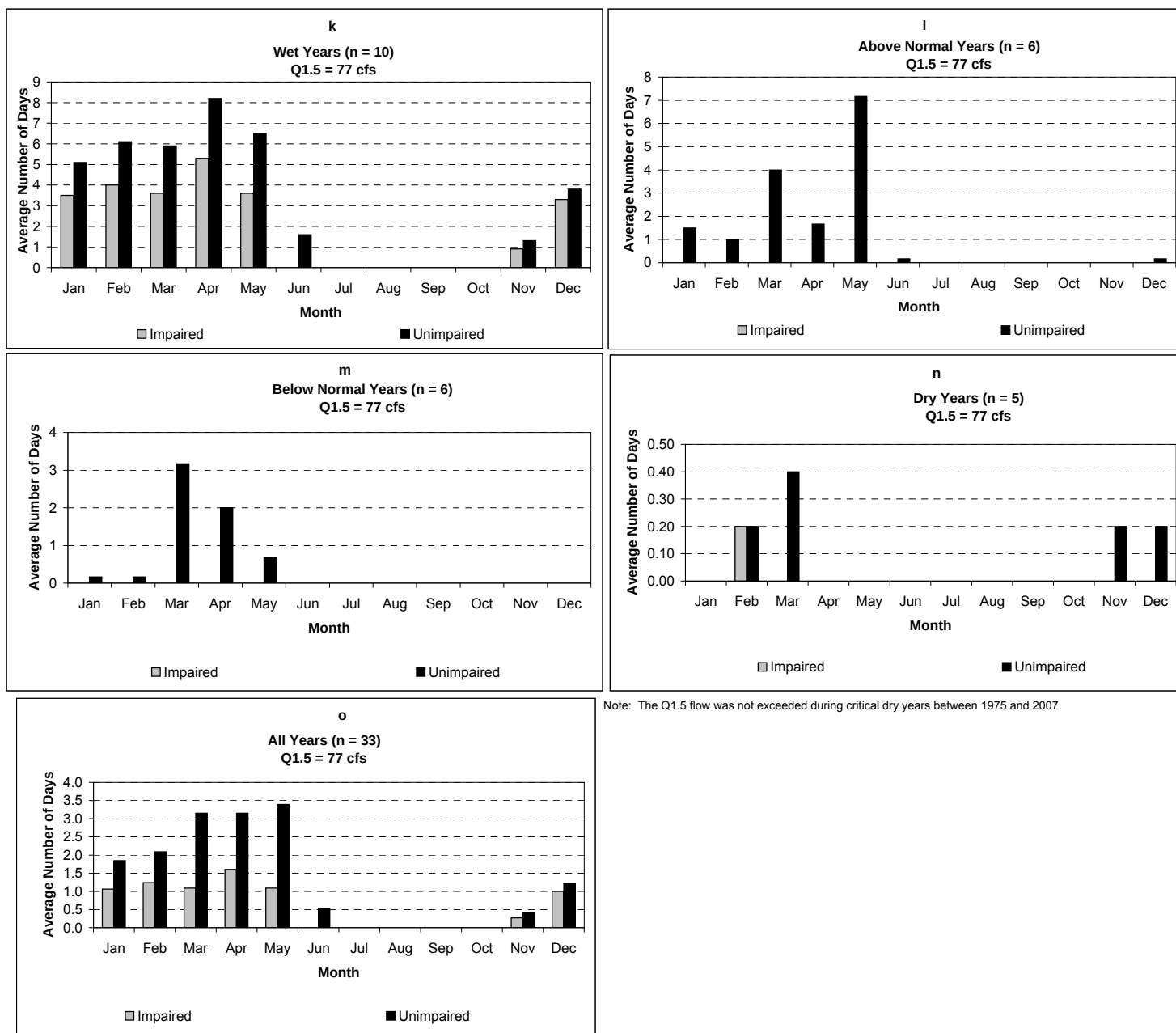


Figure A-21. South Fork Long Canyon SFLC2.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q1.5 flow was not exceeded during critical dry years between 1975 and 2007.

Figure A-21. South Fork Long Canyon SFLC2.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

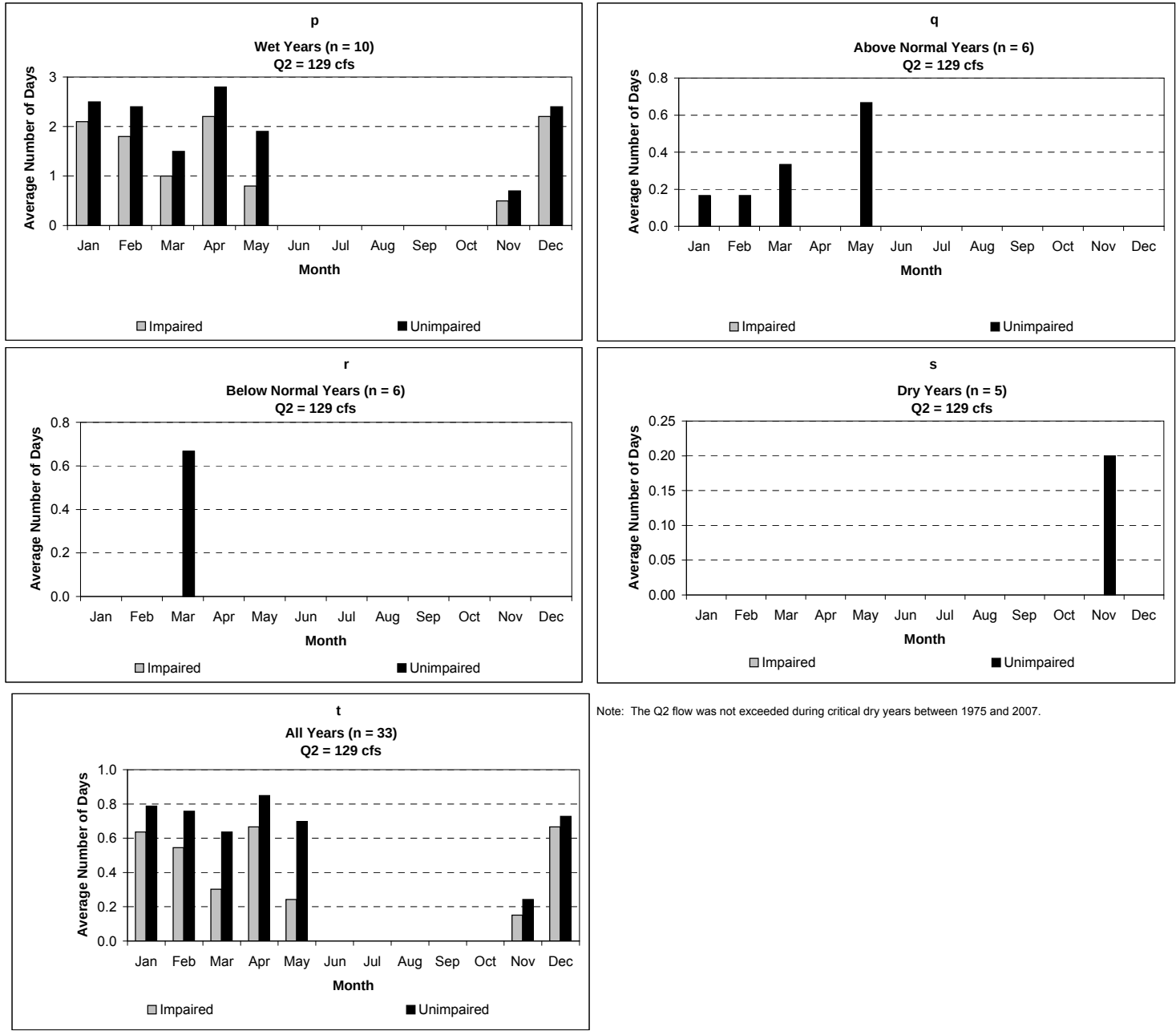
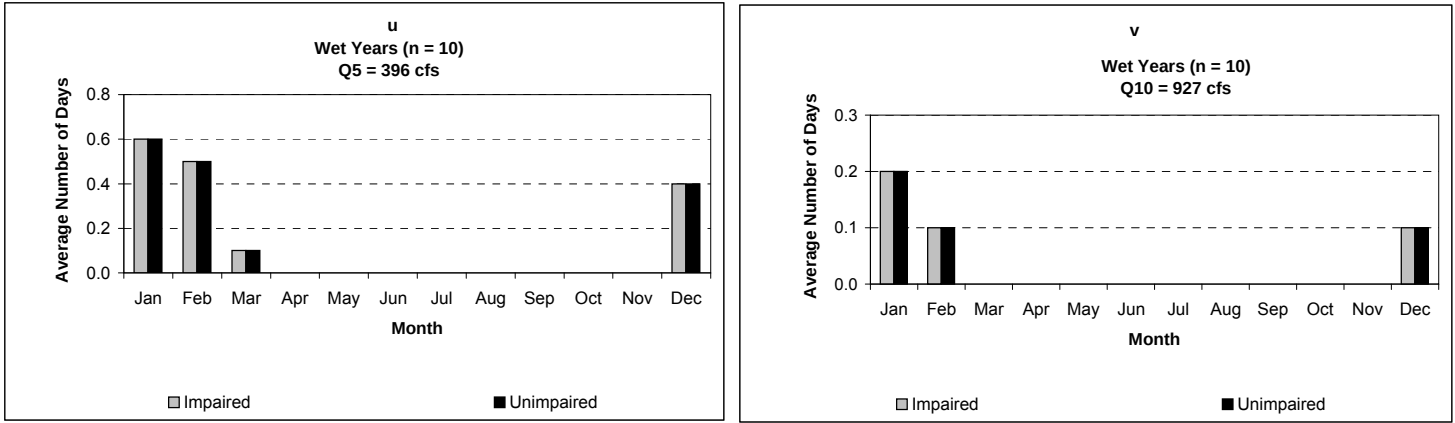


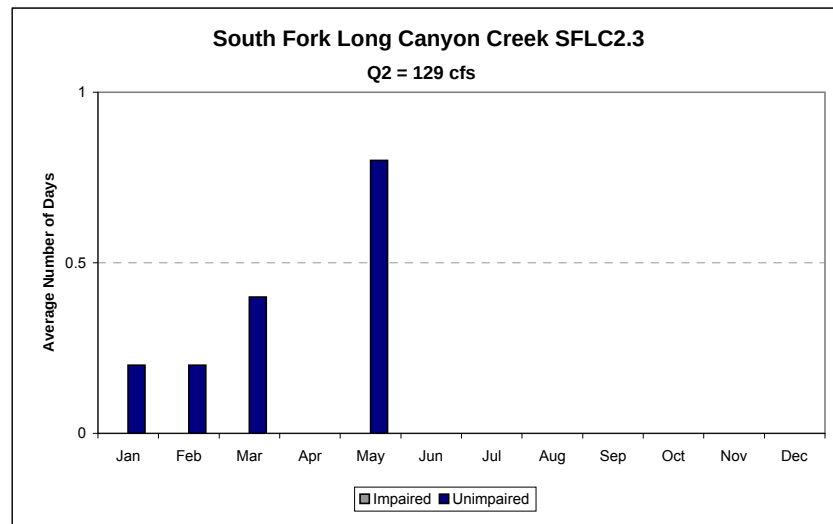
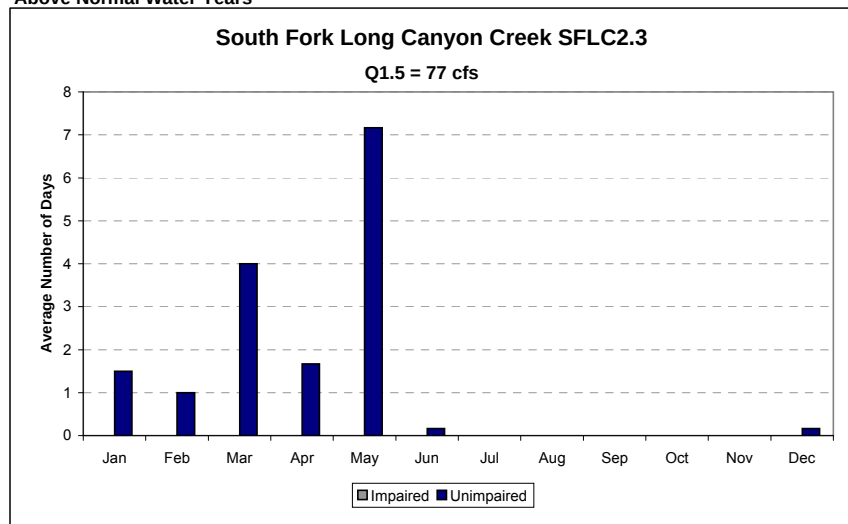
Figure A-21. South Fork Long Canyon SFLC2.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-22. South Fork Long Canyon Creek SFLC2.3: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

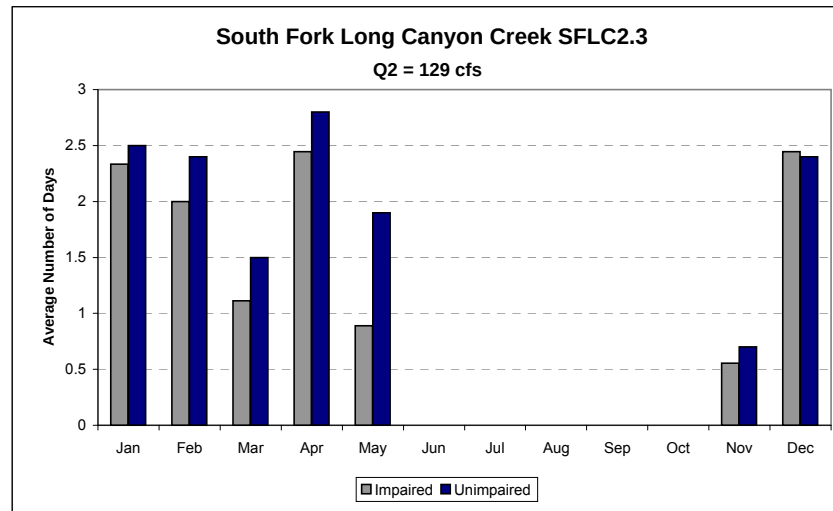
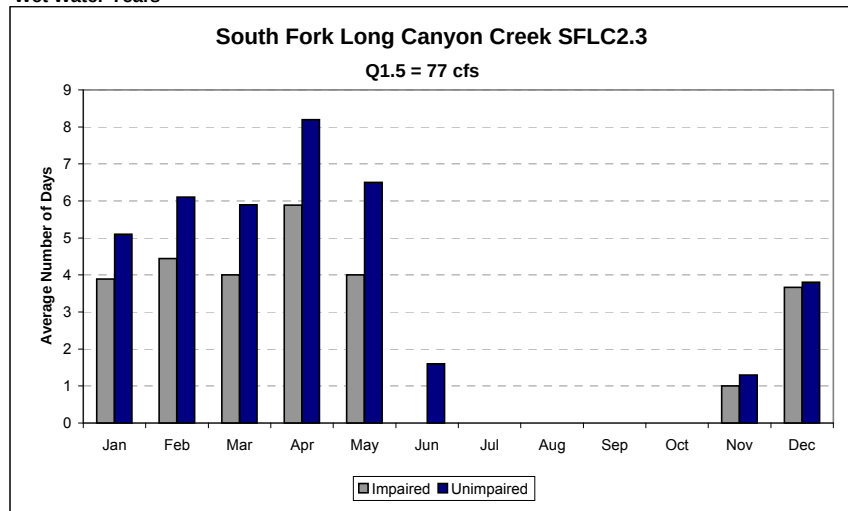


Figure A-23. North Fork Long Canyon NFLC1.9: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-u) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).

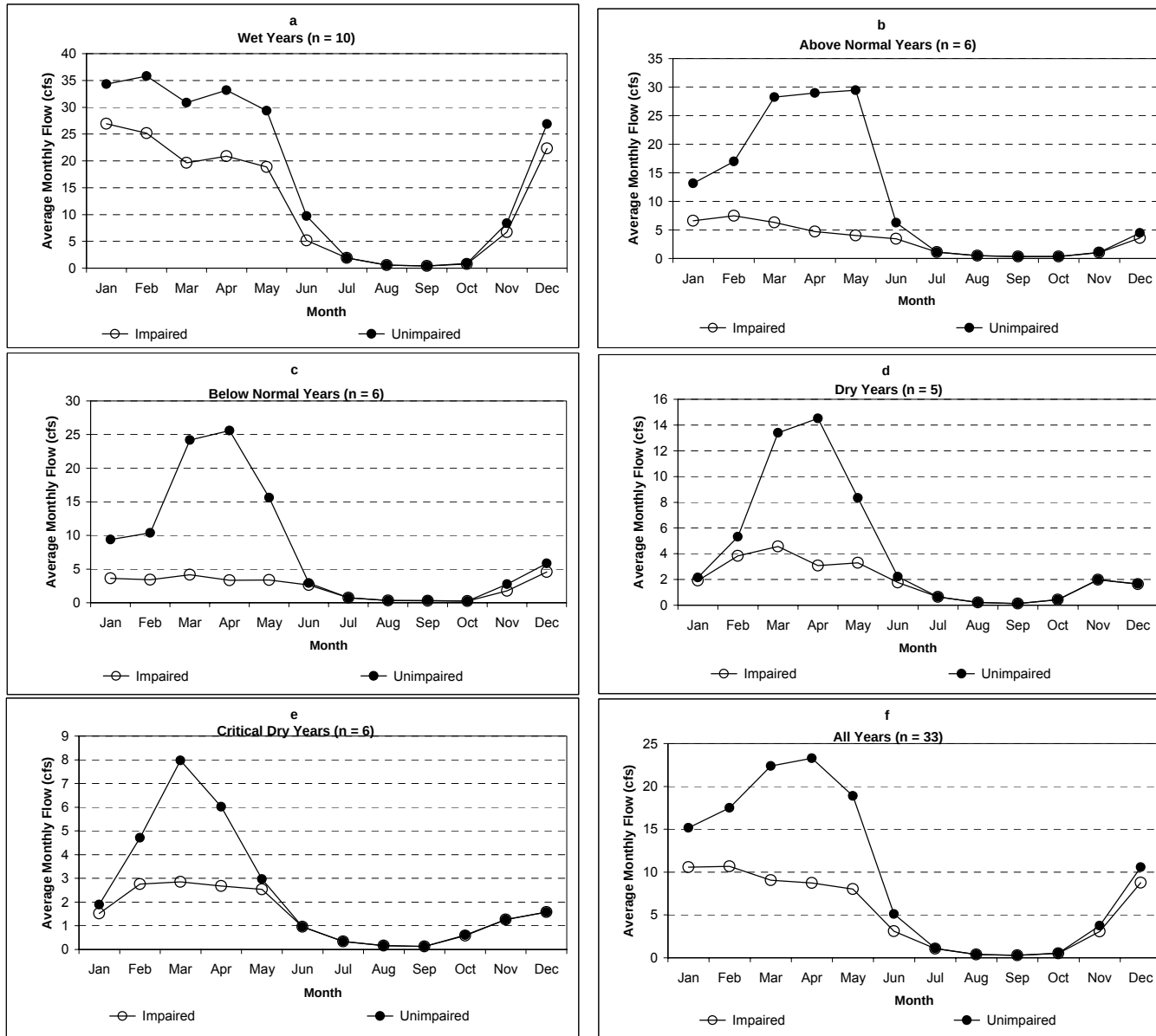


Figure A-23. North Fork Long Canyon NFLC1.9: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-u) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

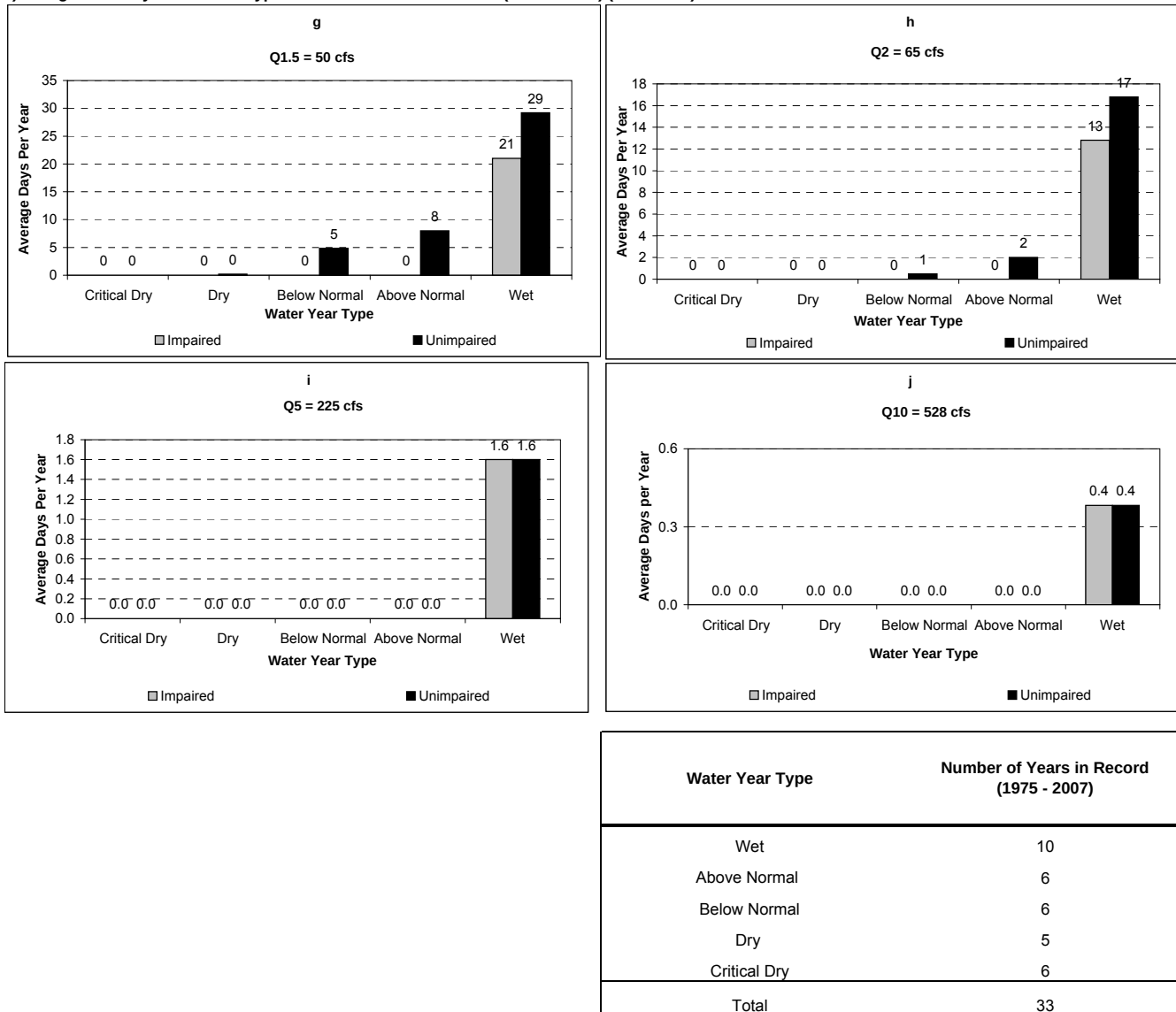
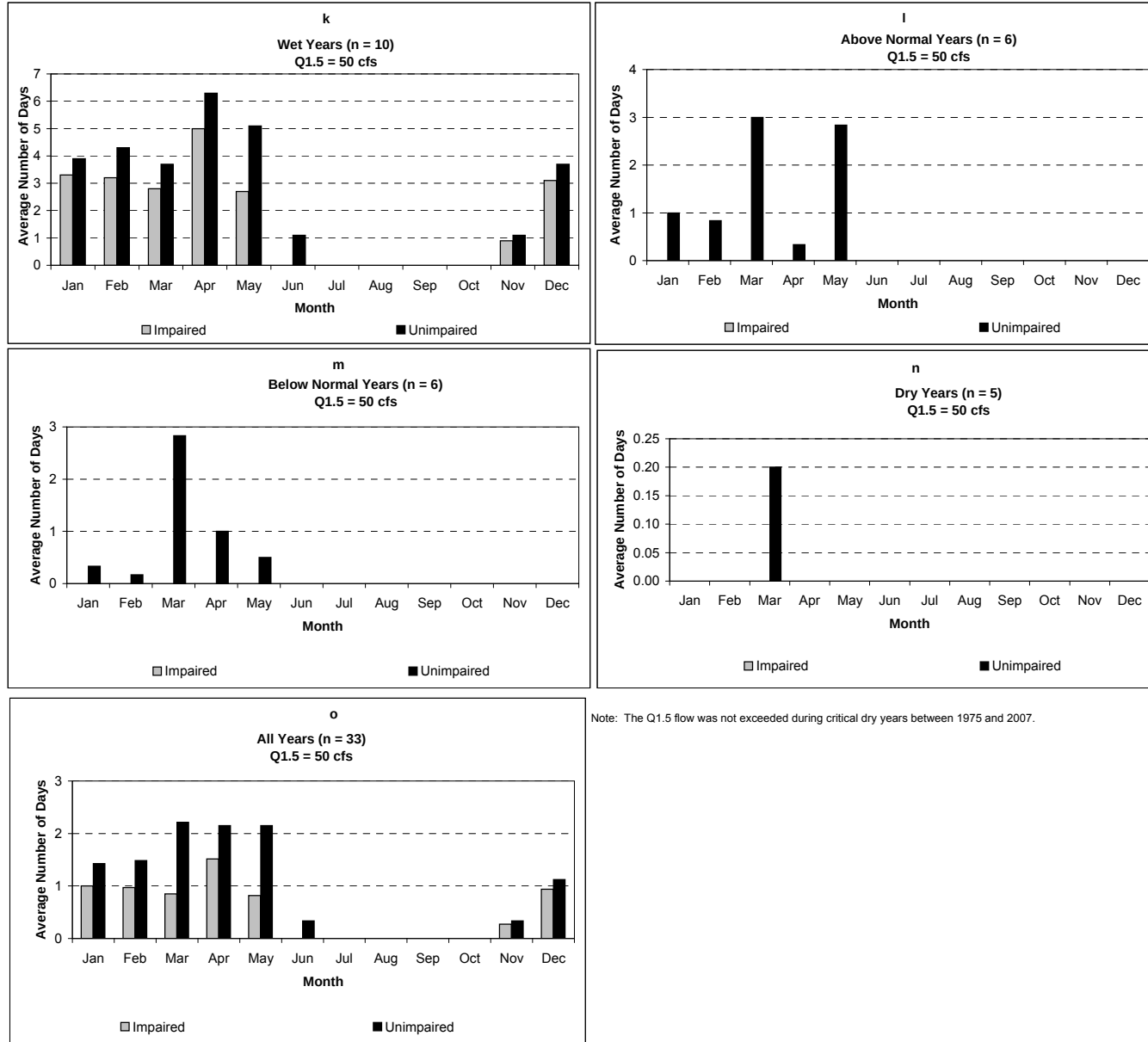
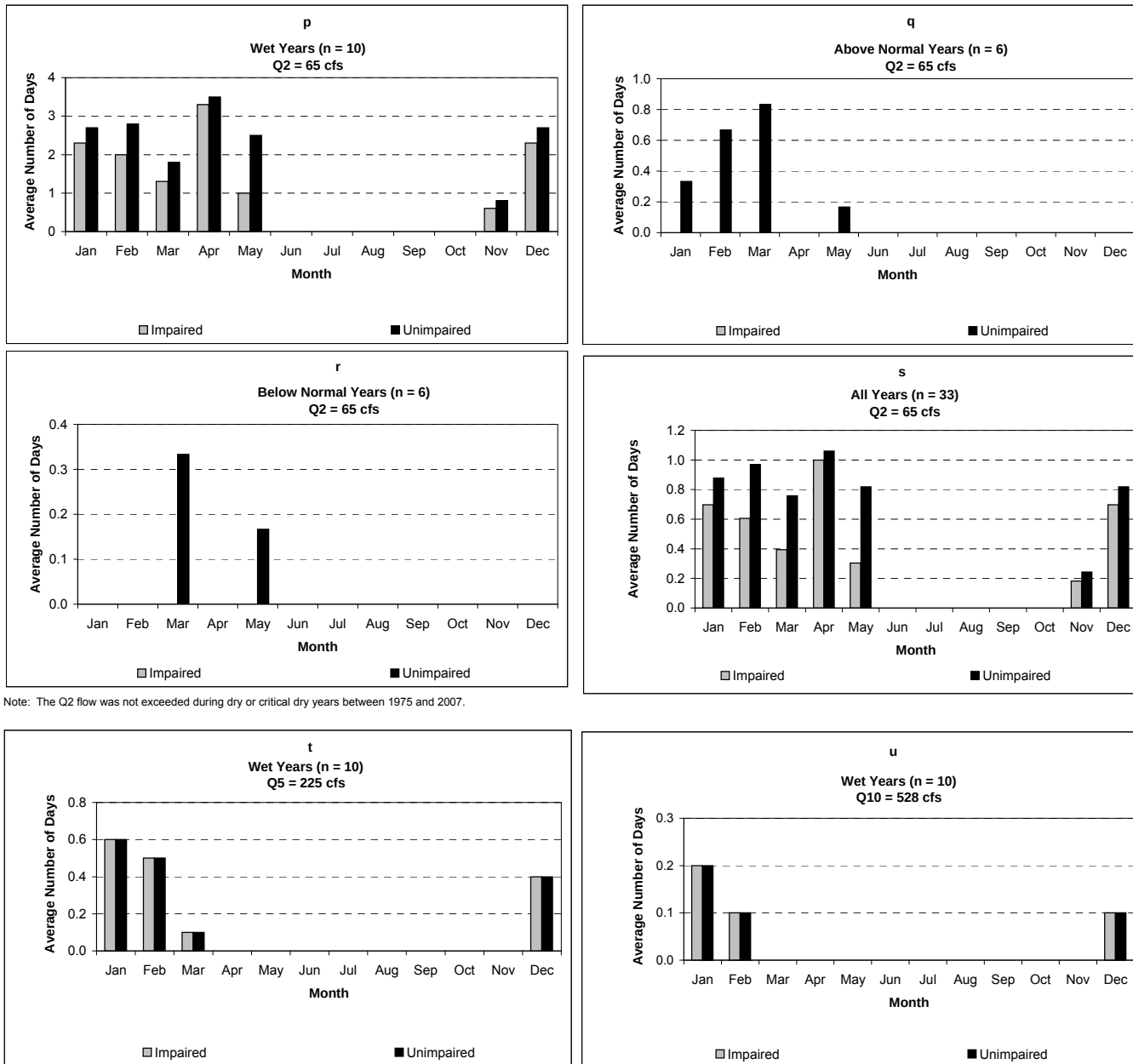


Figure A-23. North Fork Long Canyon NFLC1.9: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-u) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q1.5 flow was not exceeded during critical dry years between 1975 and 2007.

Figure A-23. North Fork Long Canyon NFLC1.9: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-u) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

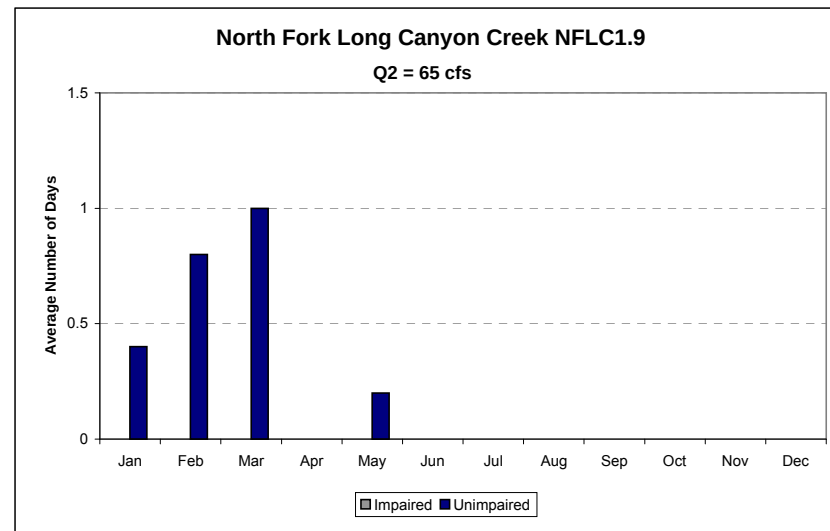
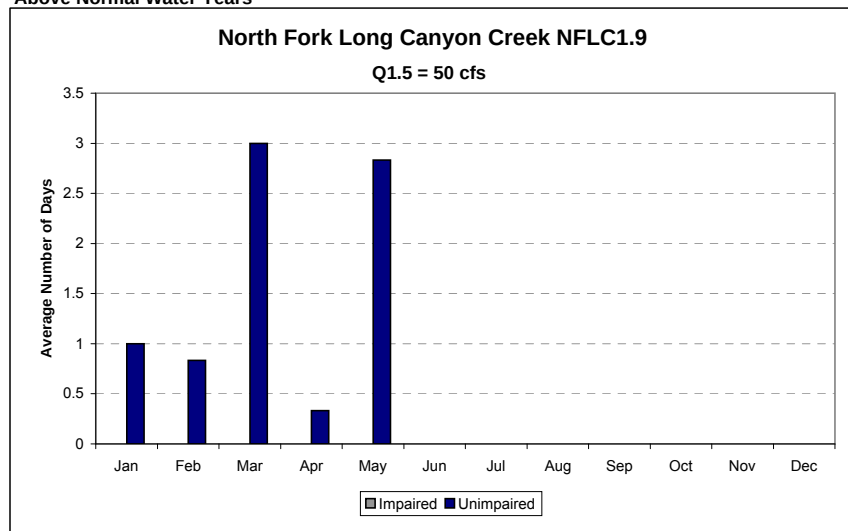


Note: The Q2 flow was not exceeded during dry or critical dry years between 1975 and 2007.

Note: The Q5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-24. North Fork Long Canyon Creek NFLC1.9: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

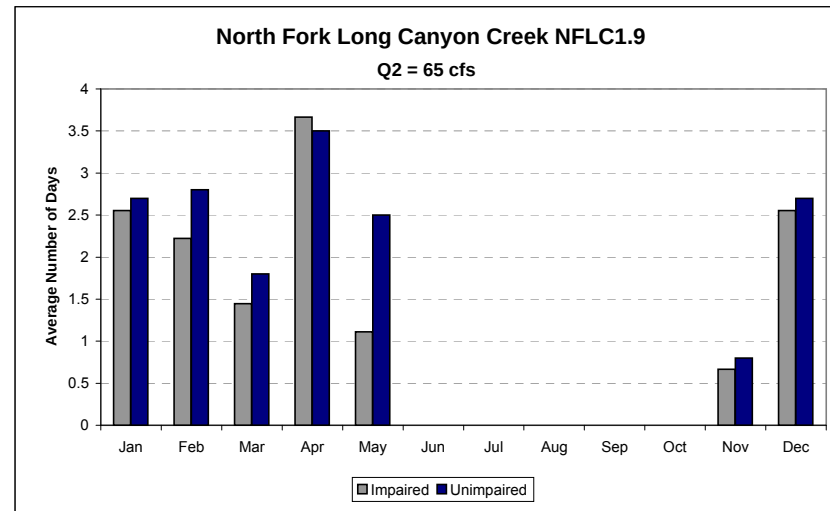
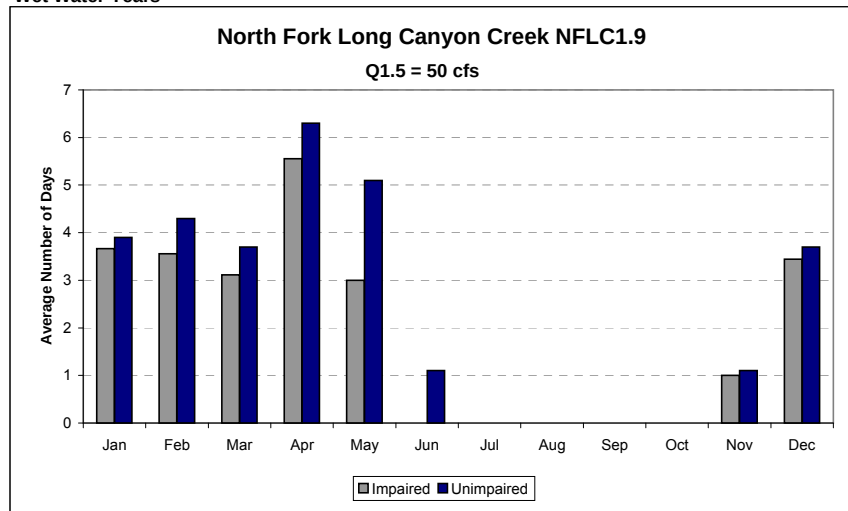


Figure A-25. Long Canyon LC9.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).

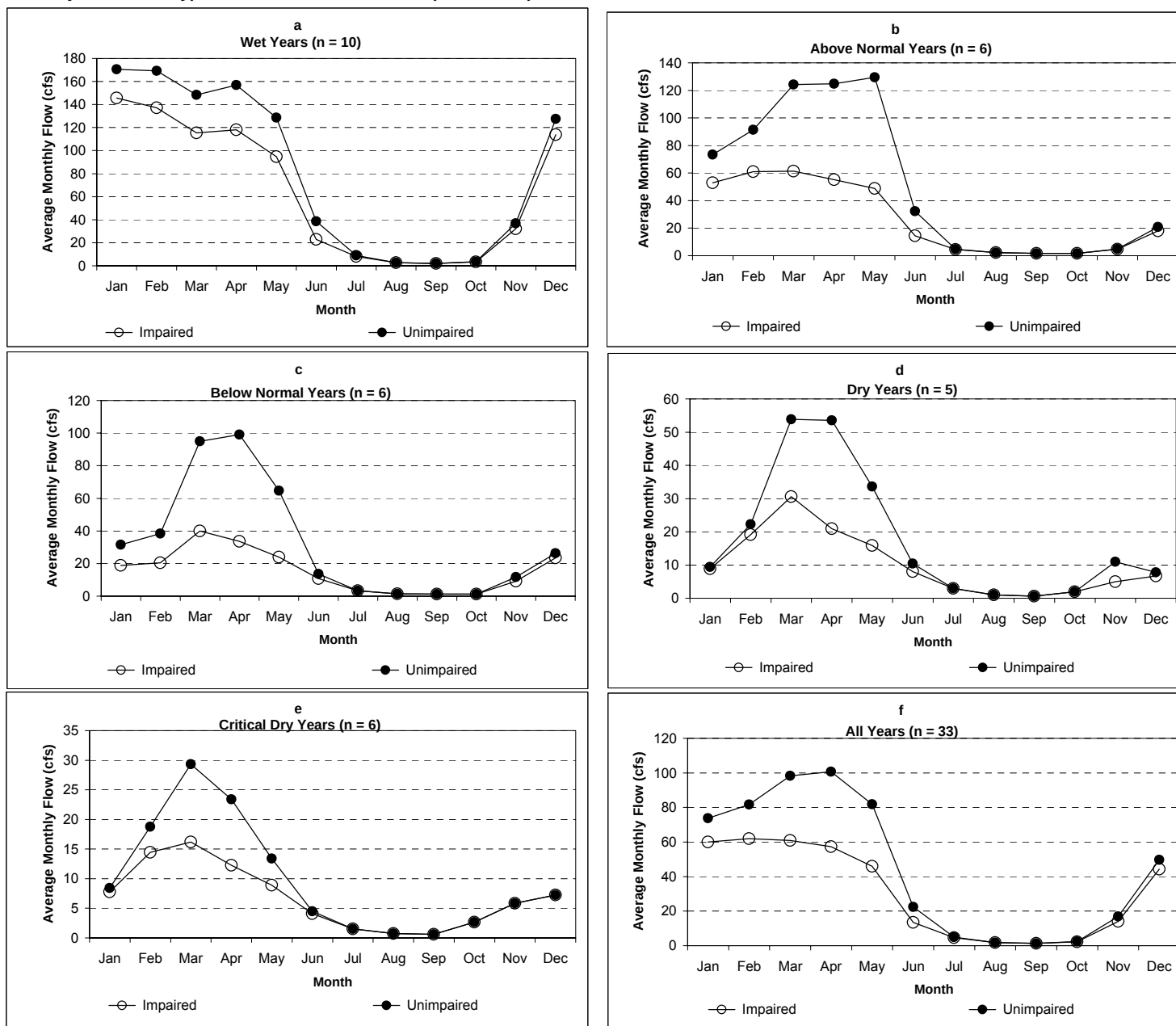


Figure A-25. Long Canyon LC9.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

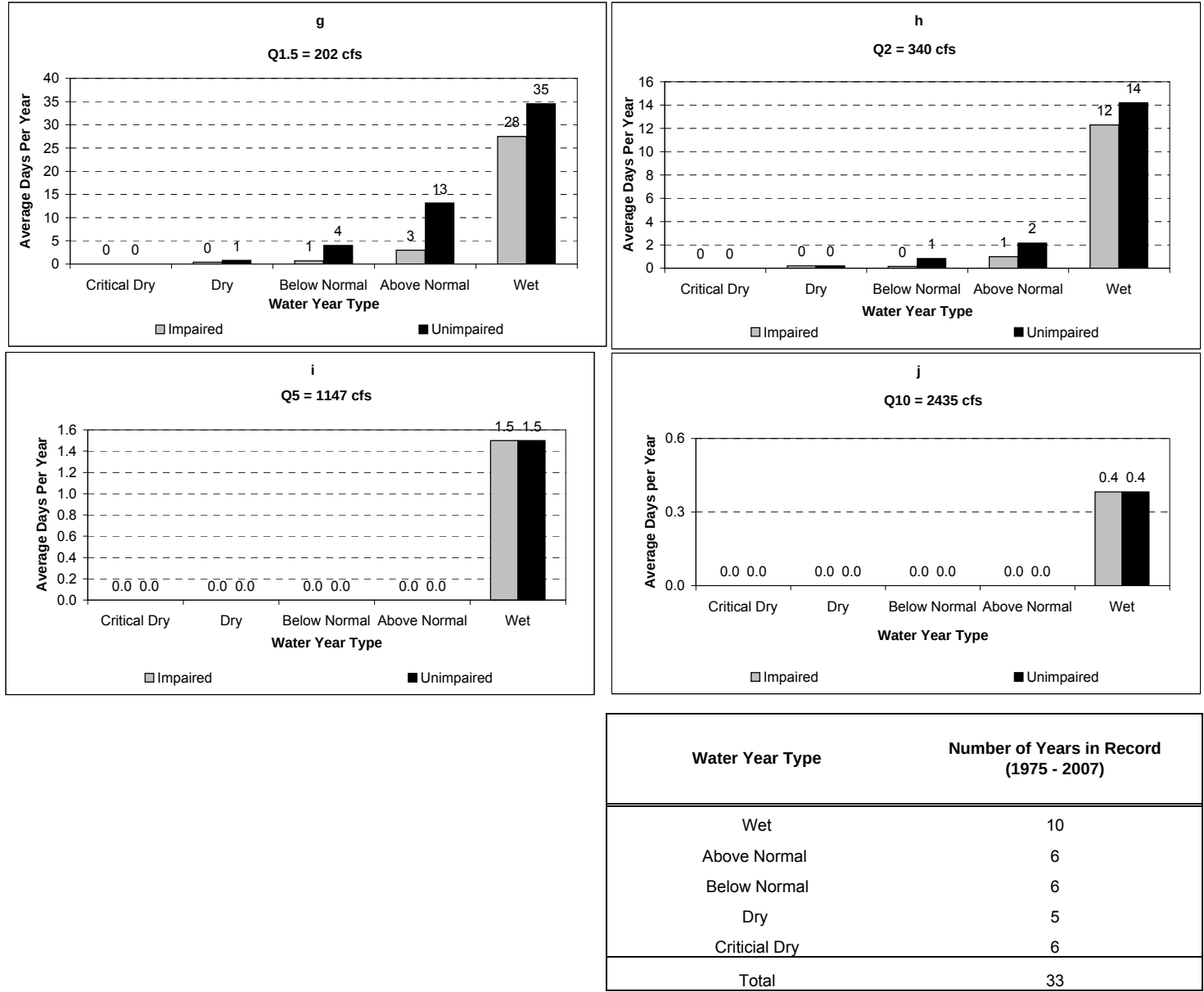
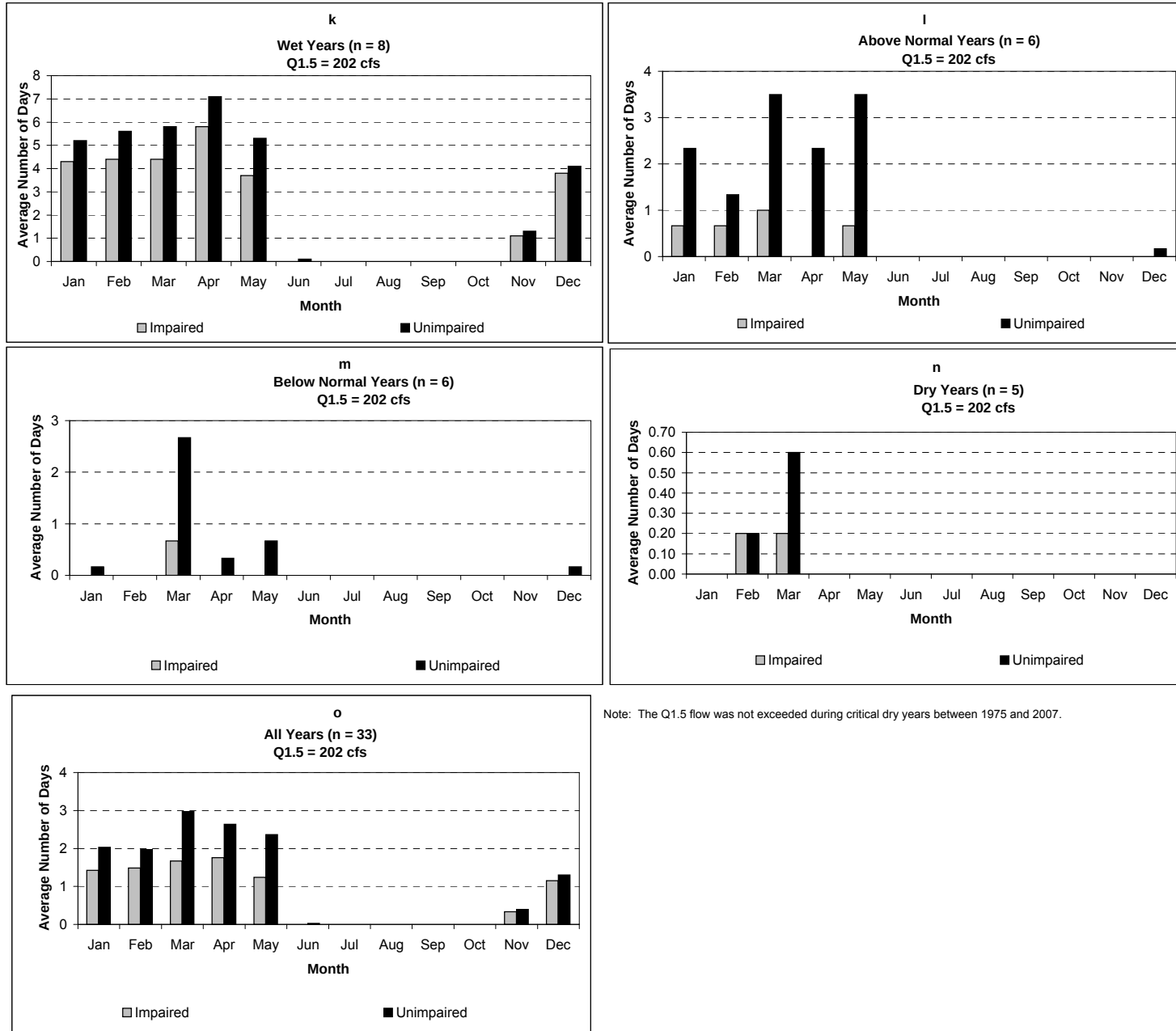
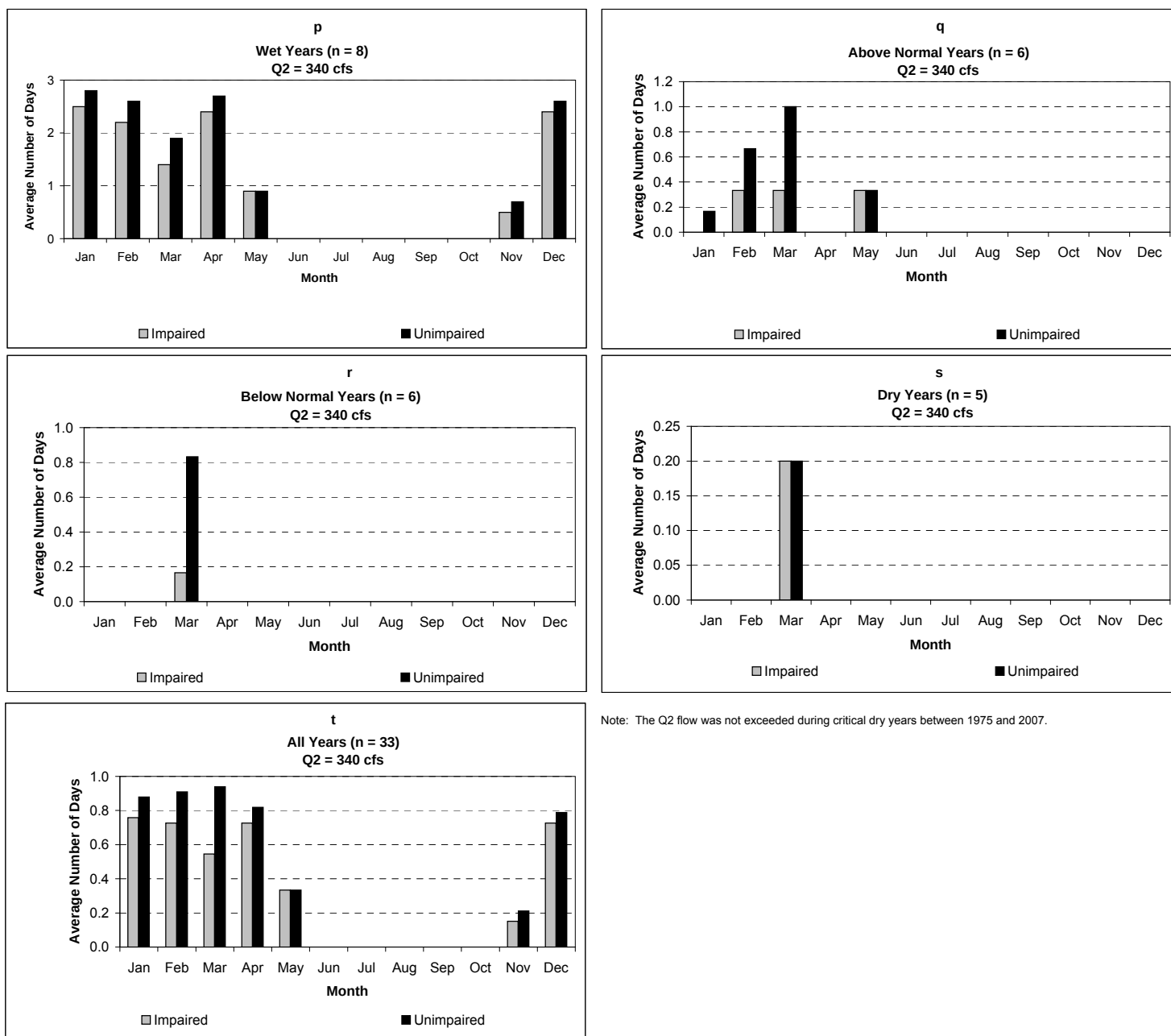


Figure A-25. Long Canyon LC9.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



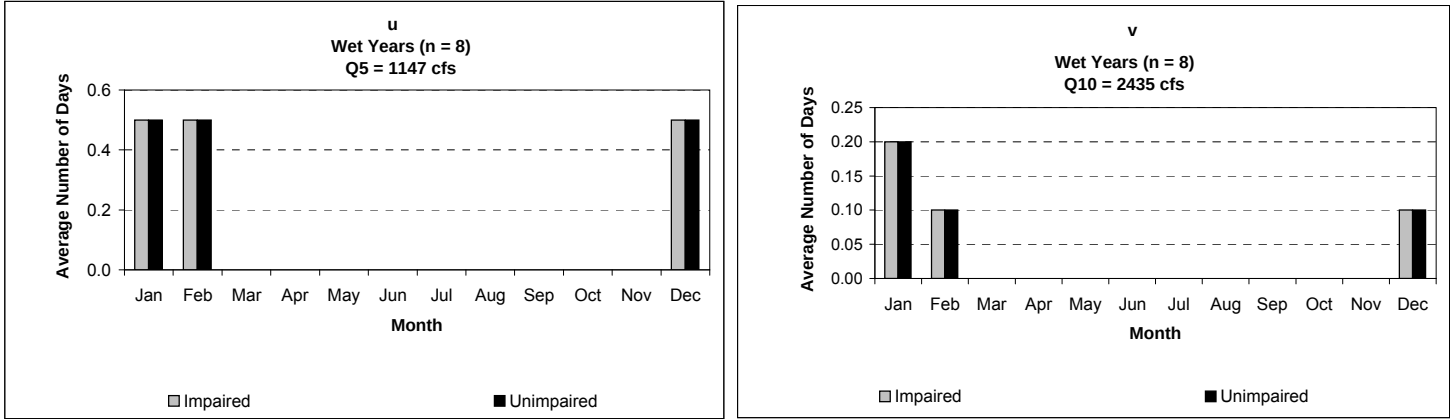
Note: The Q1.5 flow was not exceeded during critical dry years between 1975 and 2007.

Figure A-25. Long Canyon LC9.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q2 flow was not exceeded during critical dry years between 1975 and 2007.

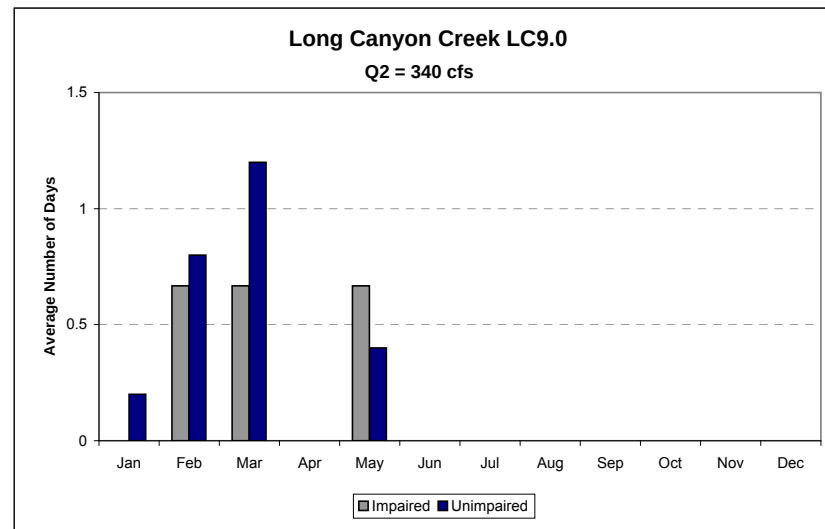
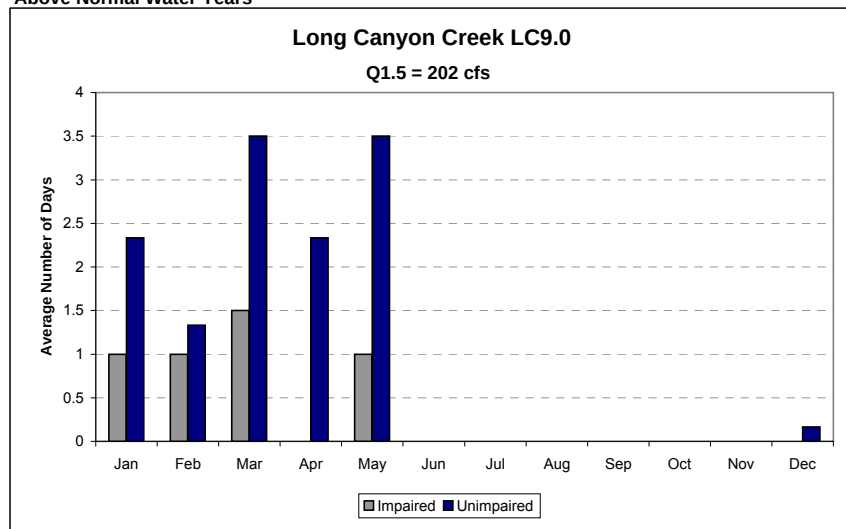
Figure A-25. Long Canyon LC9.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-26. Long Canyon Creek LC9.0: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

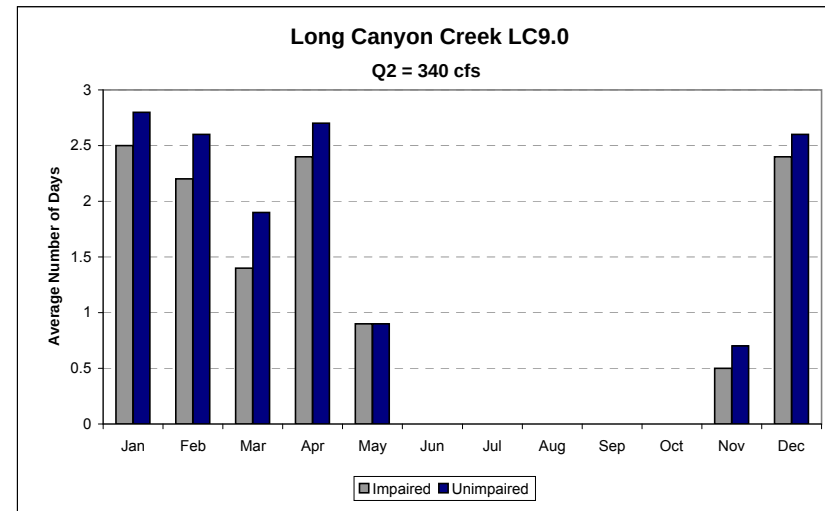
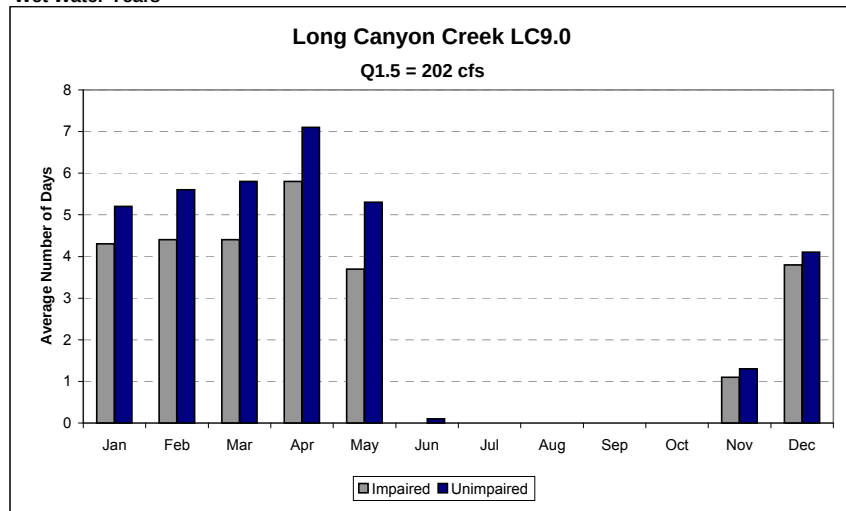


Figure A-27. Long Canyon Creek at Rubicon River Confluence LC0.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).

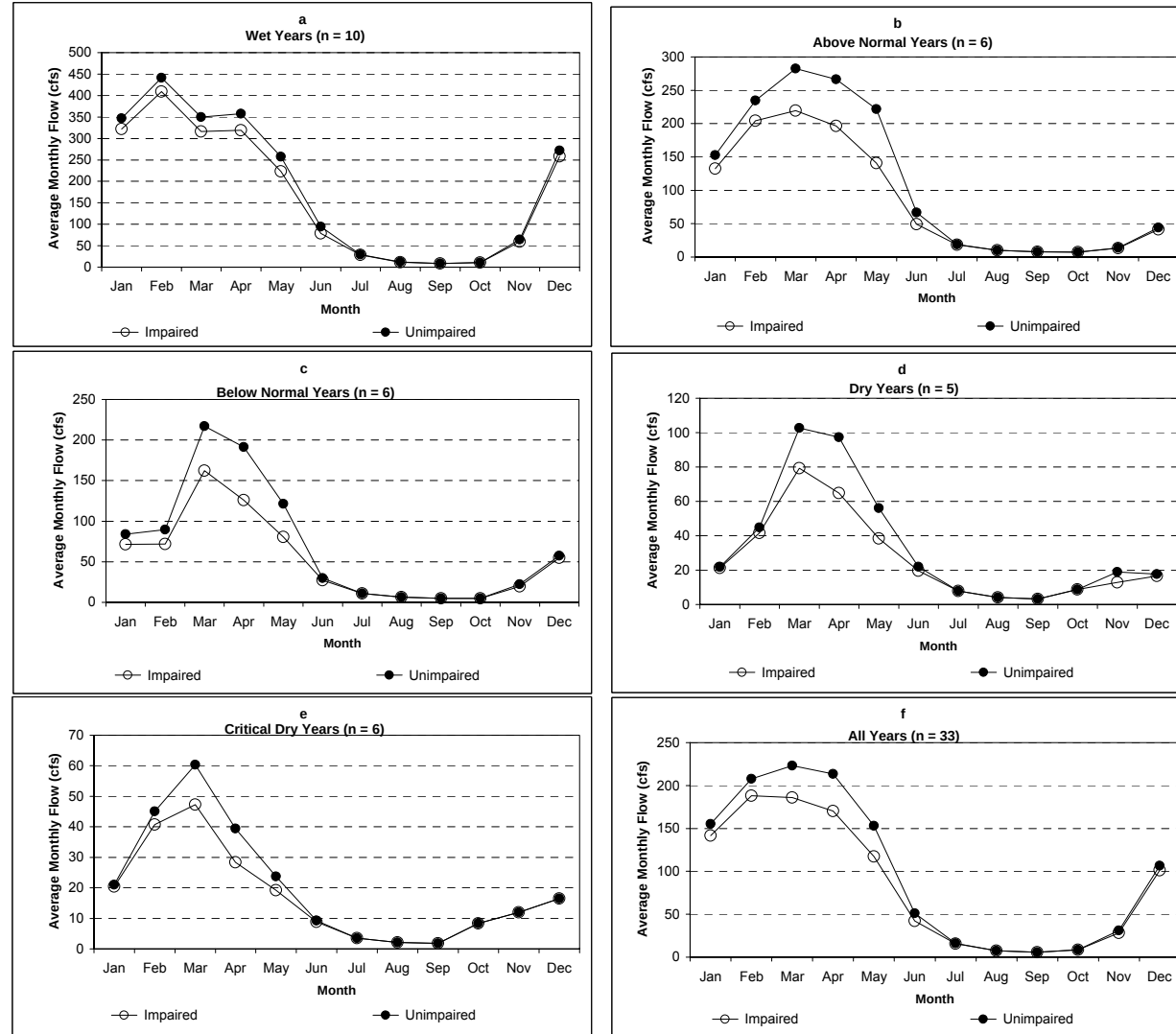


Figure A-27. Long Canyon Creek at Rubicon River Confluence LC0.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

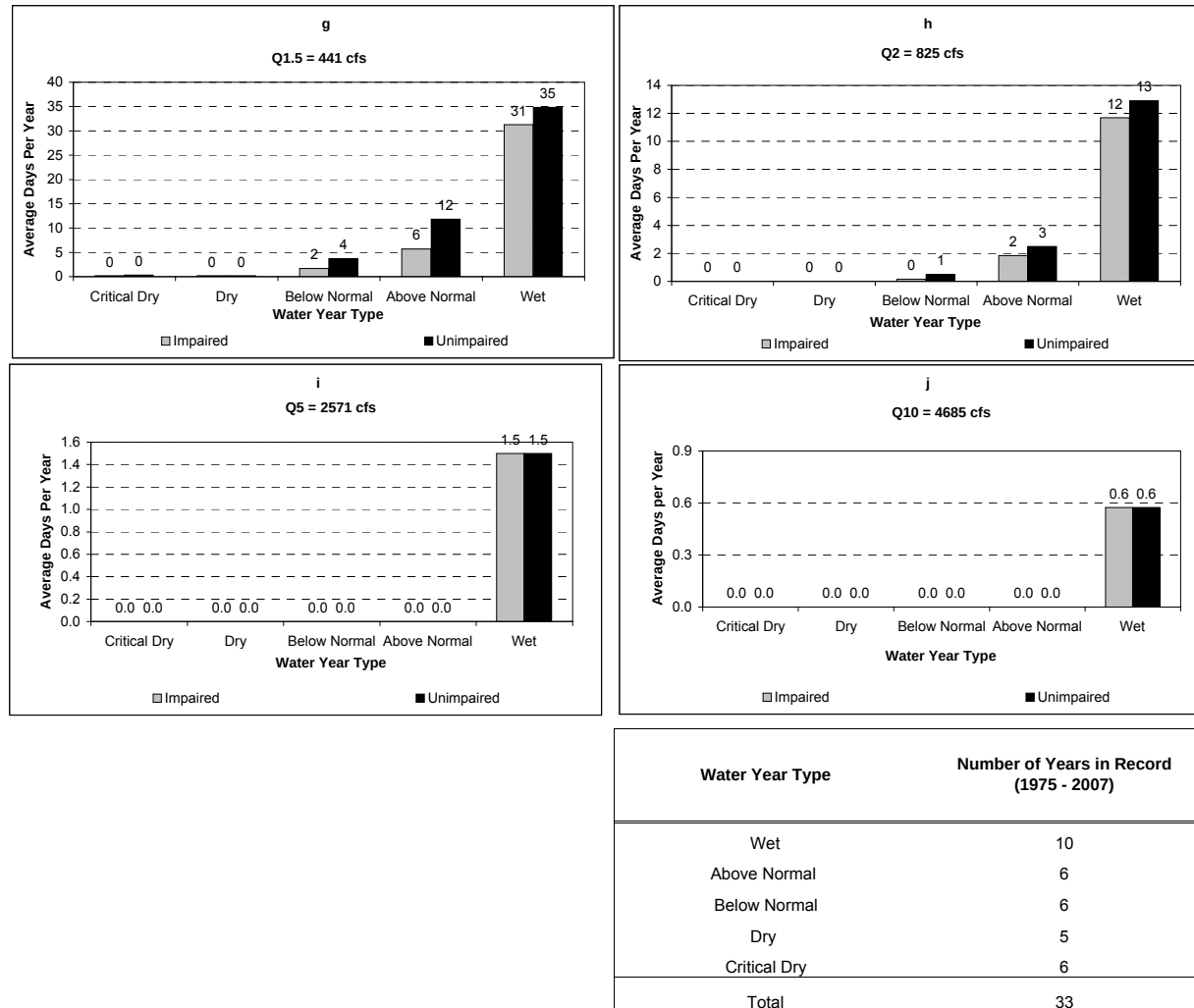


Figure A-27. Long Canyon Creek at Rubicon River Confluence LC0.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

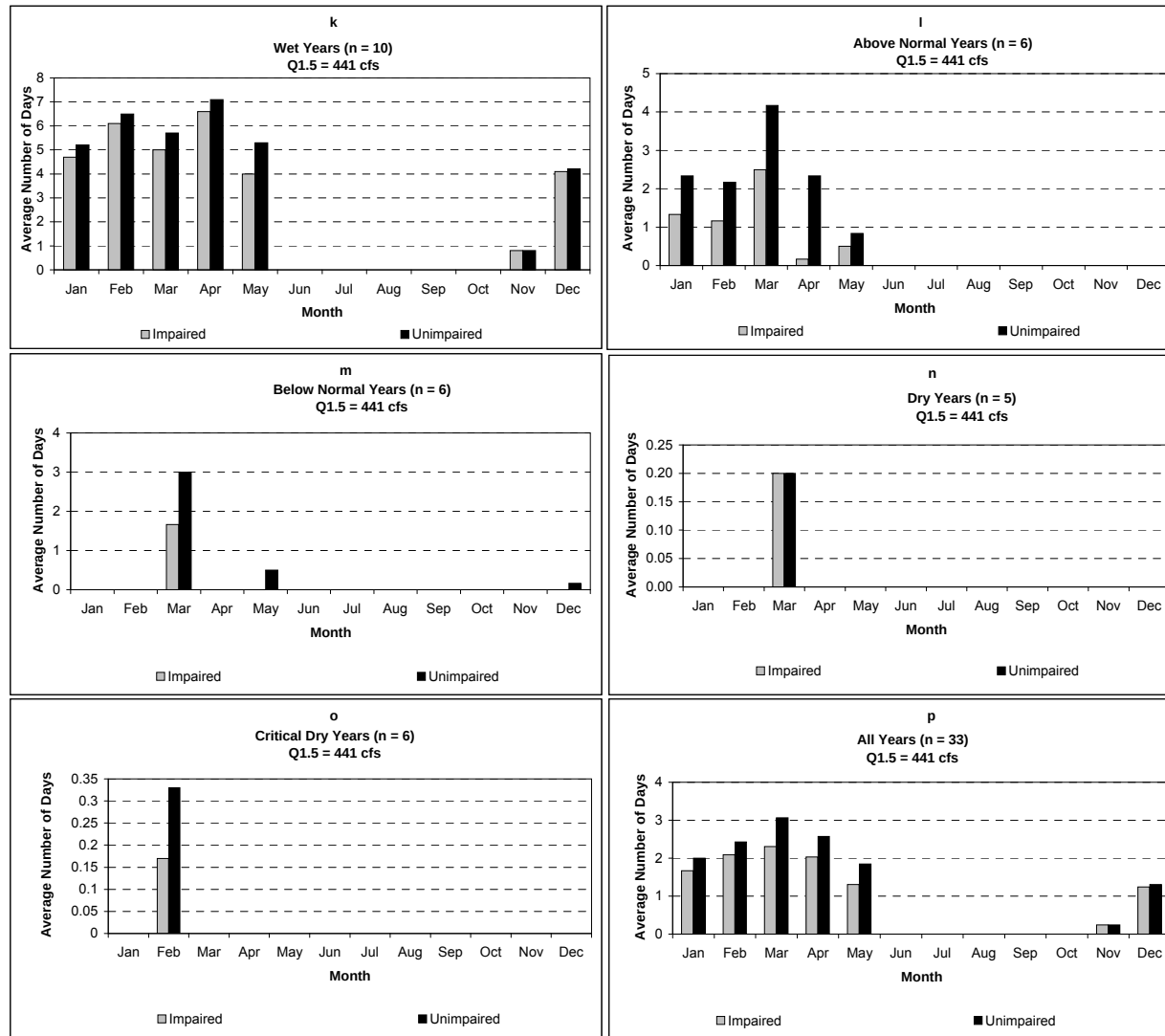
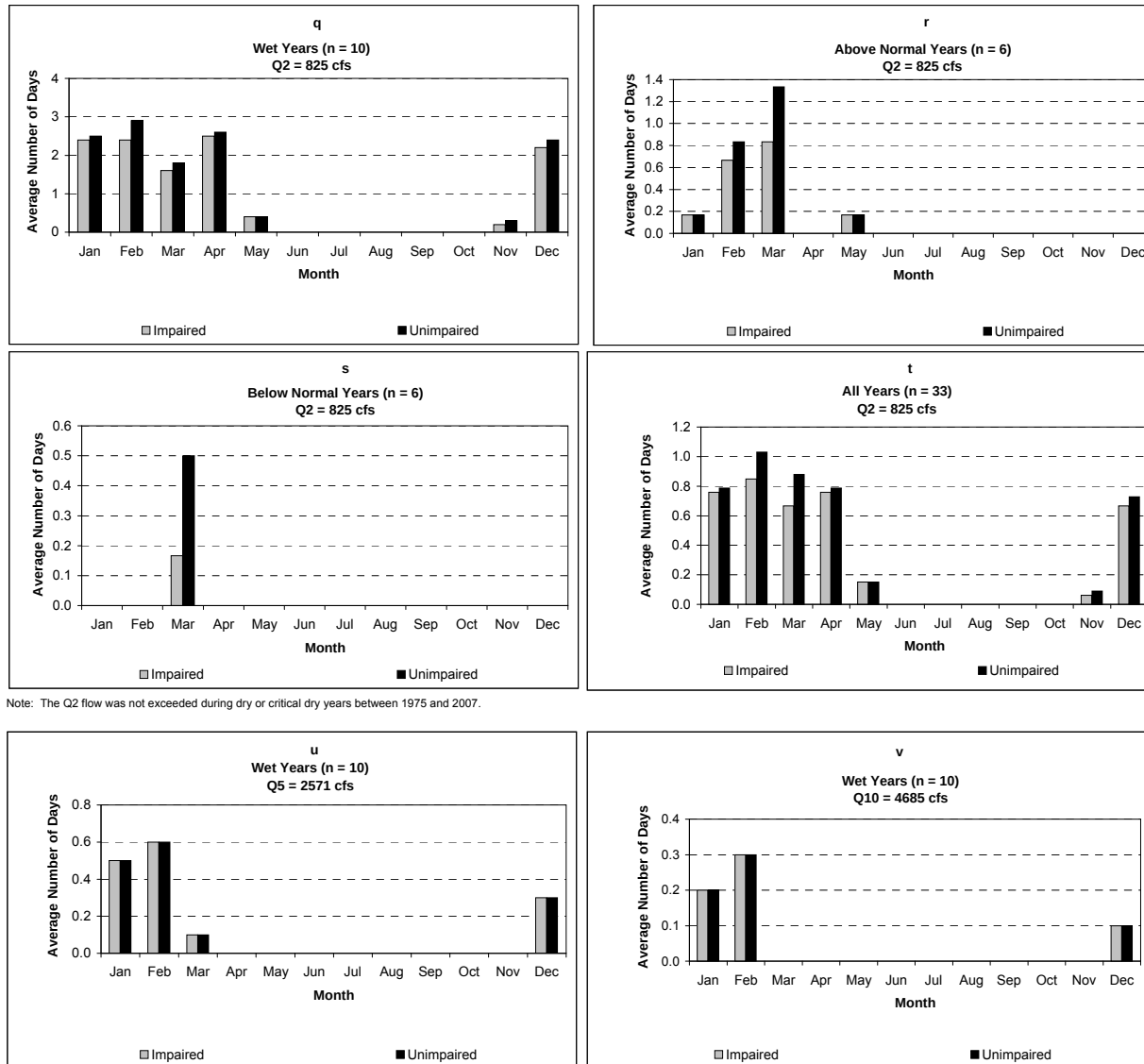


Figure A-27. Long Canyon Creek at Rubicon River Confluence LC0.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

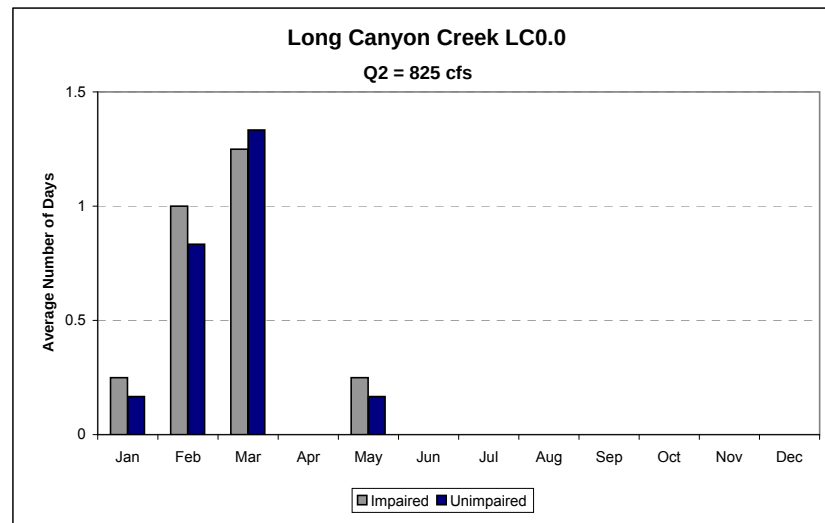
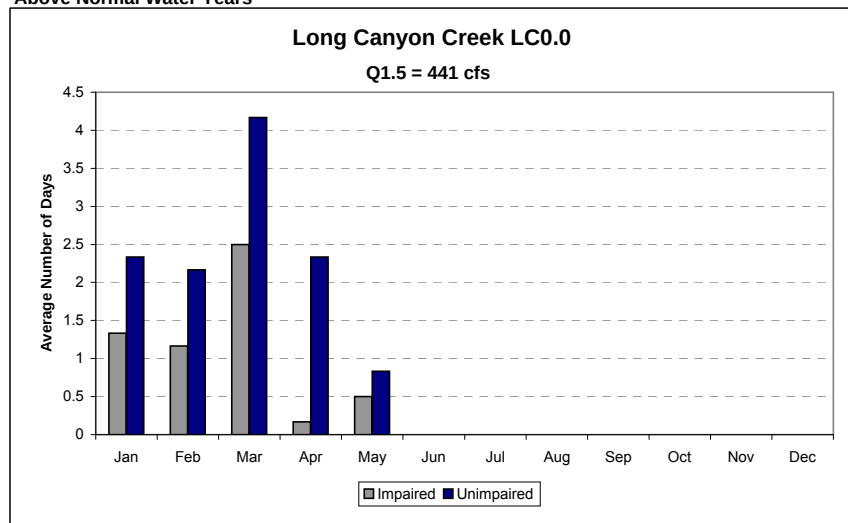


Note: The Q2 flow was not exceeded during dry or critical dry years between 1975 and 2007.

Note: The Q.5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-28. Long Canyon Creek at Rubicon River Confluence LC0.0: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

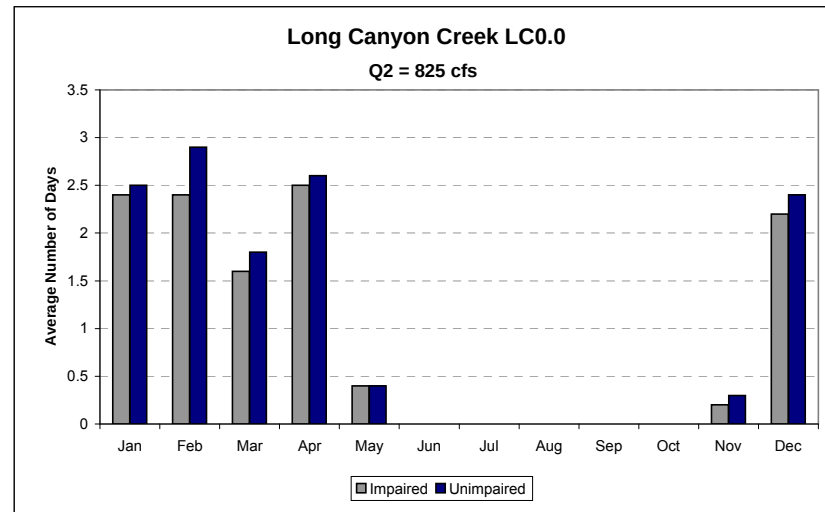
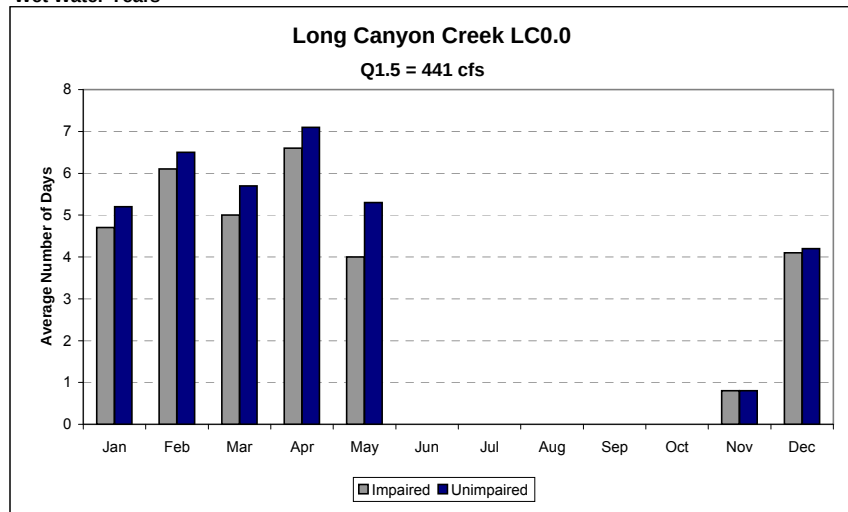
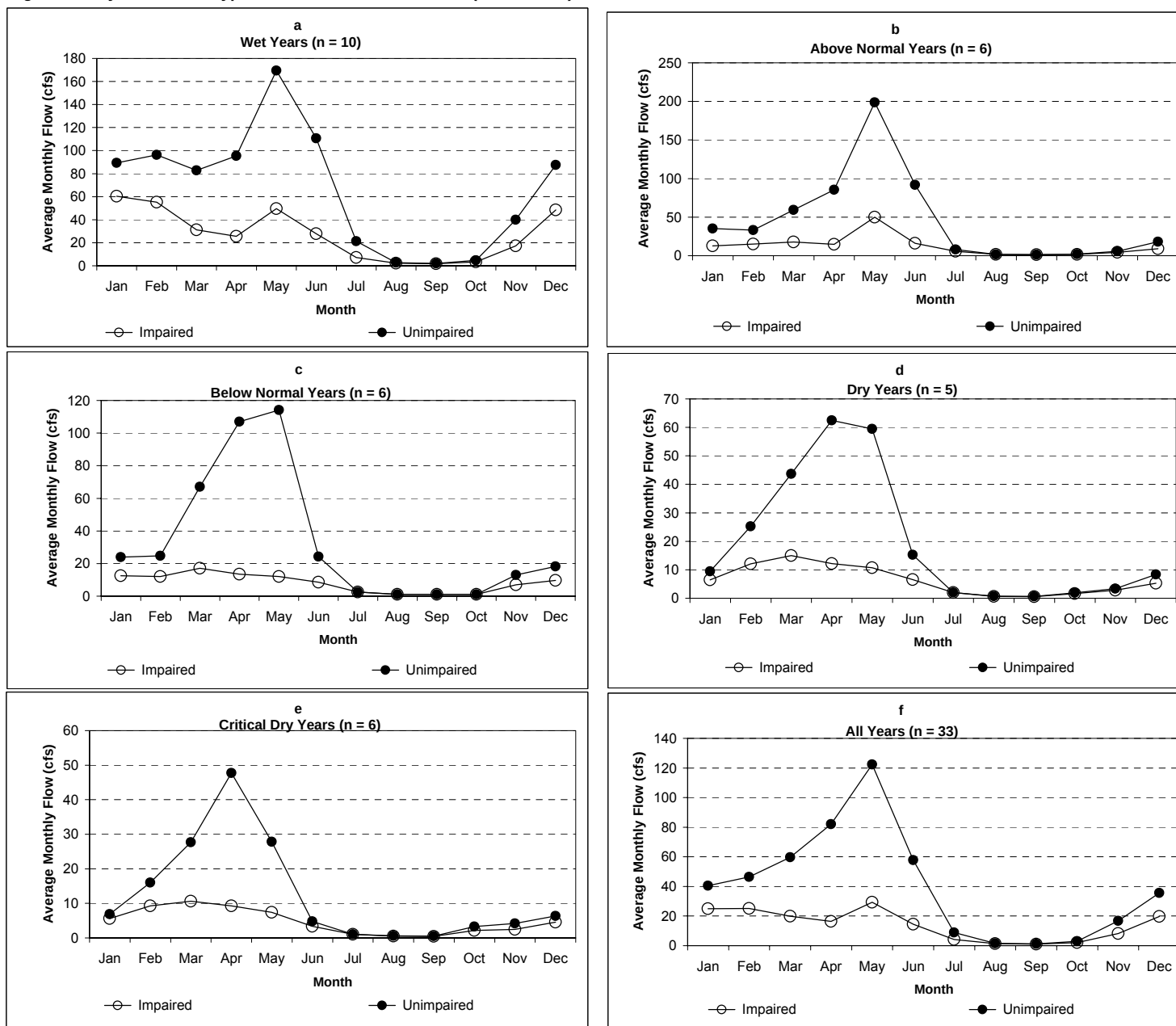


Figure A-29. Duncan Creek D8.3 and D6.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-y) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).



g
Q1.5 = 253 cfs

Water Year Type	Impaired	Unimpaired
Critical Dry	0	0
Dry	0	1
Below Normal	0	3
Above Normal	1	9
Wet	6	20

h
Q2 = 408 cfs

Water Year Type	Impaired	Unimpaired
Critical Dry	0	0
Dry	0	1
Below Normal	0	0
Above Normal	0	1
Wet	4	6

i
Q5 = 928 cfs

Water Year Type	Impaired	Unimpaired
Critical Dry	0.0	0.0
Dry	0.0	0.0
Below Normal	0.0	0.0
Above Normal	0.0	0.2
Wet	1.0	1.2

j
Q10 = 1756 cfs

Water Year Type	Impaired	Unimpaired
Critical Dry	0.0	0.0
Dry	0.0	0.0
Below Normal	0.0	0.0
Above Normal	0.0	0.0
Wet	0.2	0.3

Water Year Type	Number of Years in Record (1975 - 2007)
Wet	10
Above Normal	6
Below Normal	6
Dry	5
Critical Dry	6
Total	33

Figure A-29. Duncan Creek D8.3 and D6.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-y) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

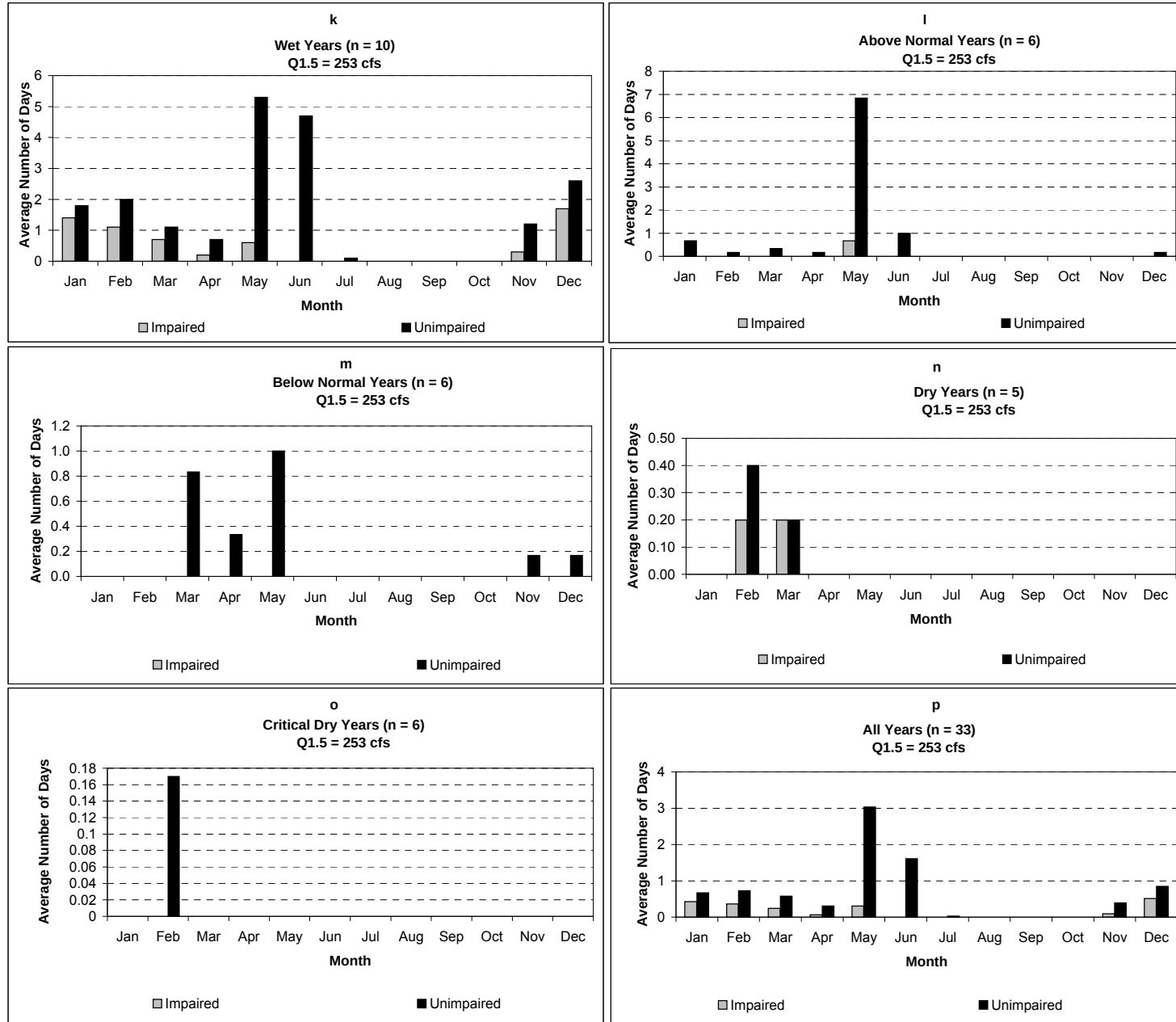
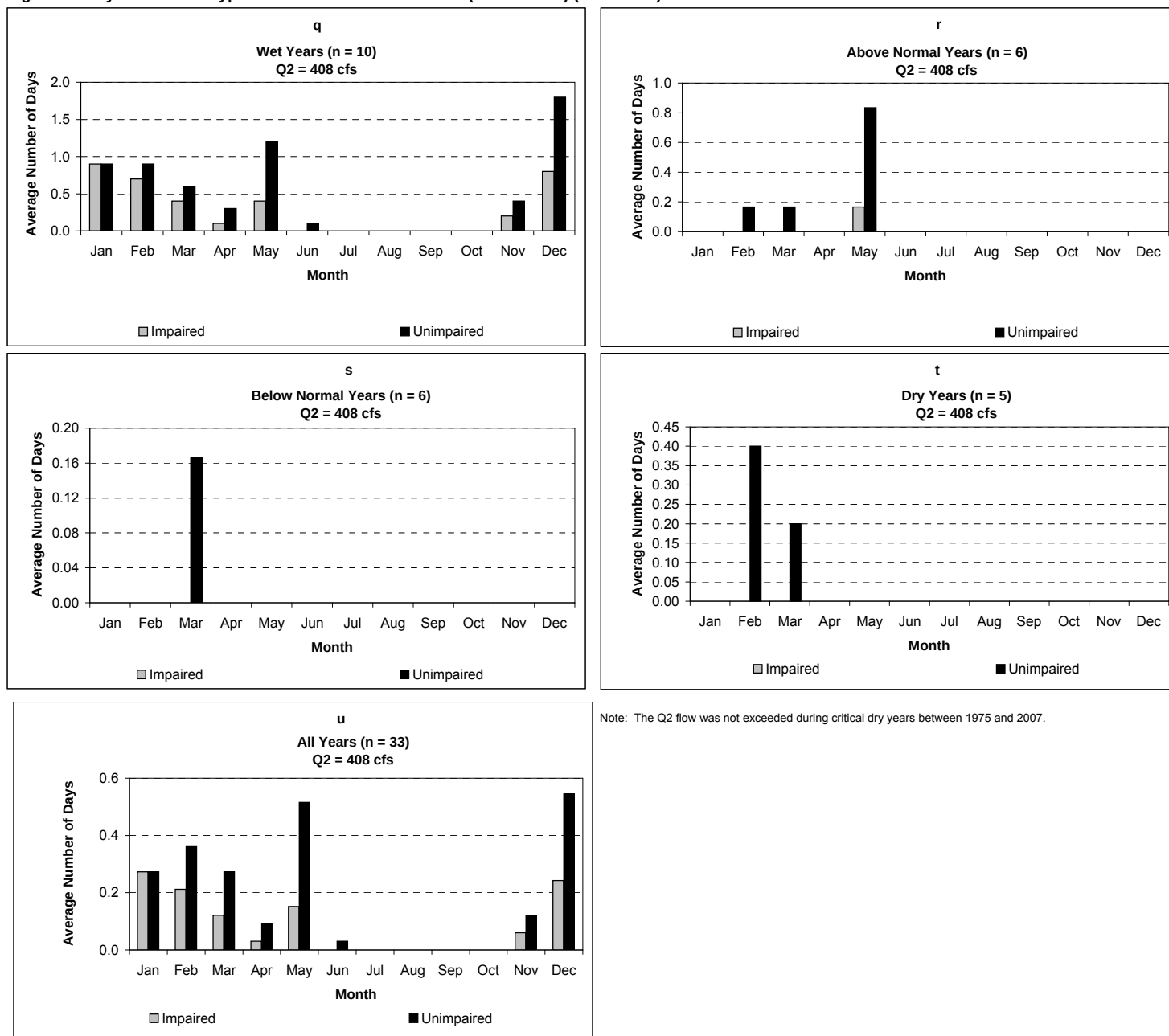
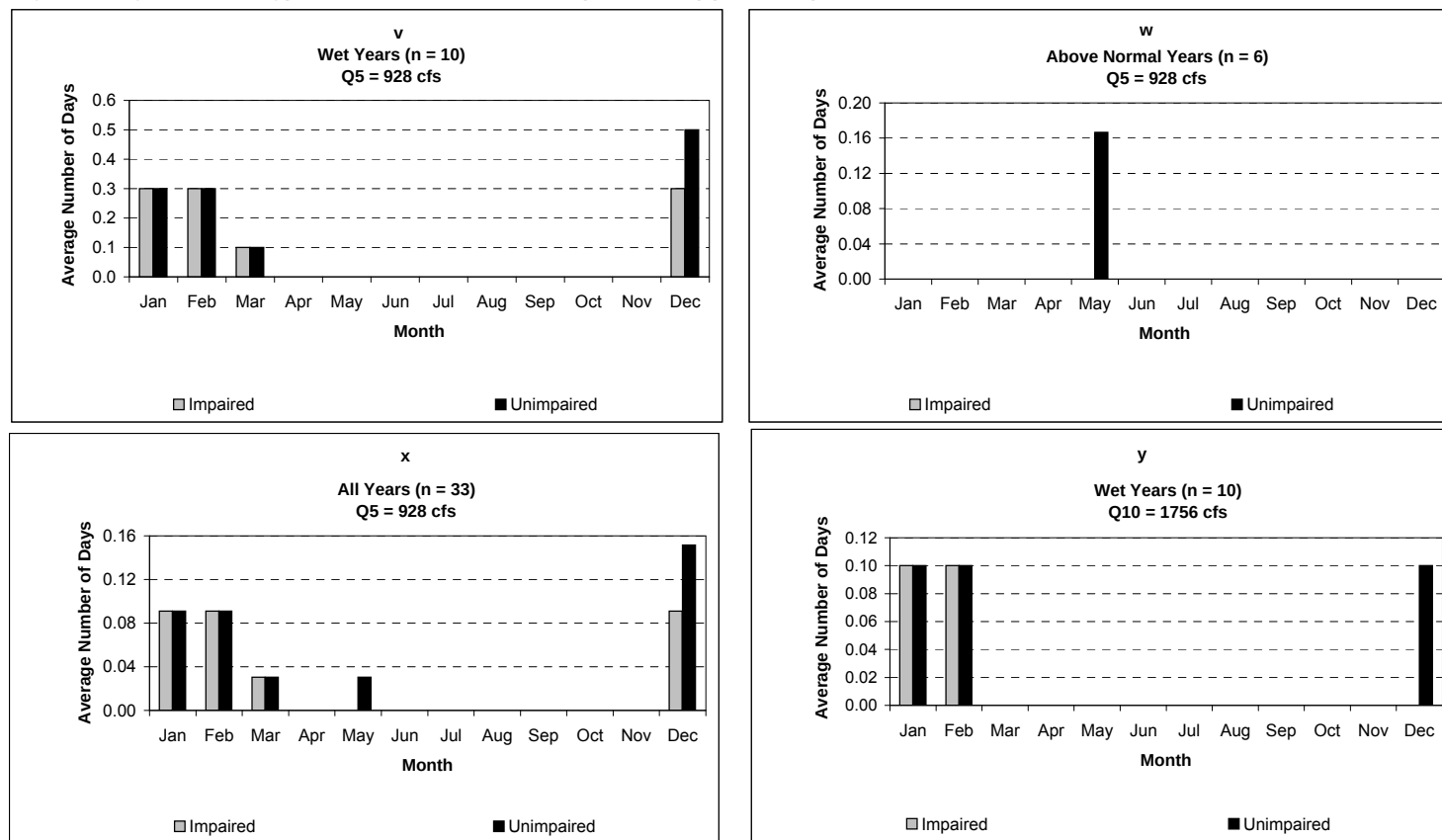


Figure A-29. Duncan Creek D8.3 and D6.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-i) and Timing (k-y) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q2 flow was not exceeded during critical dry years between 1975 and 2007.

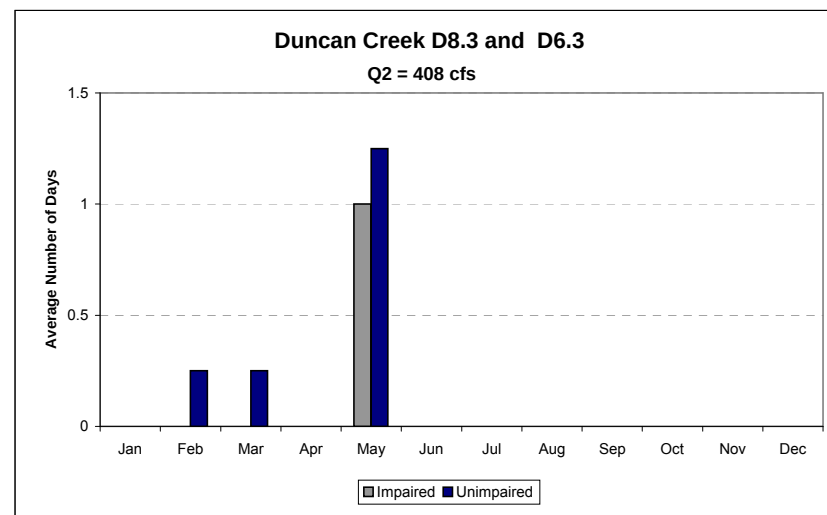
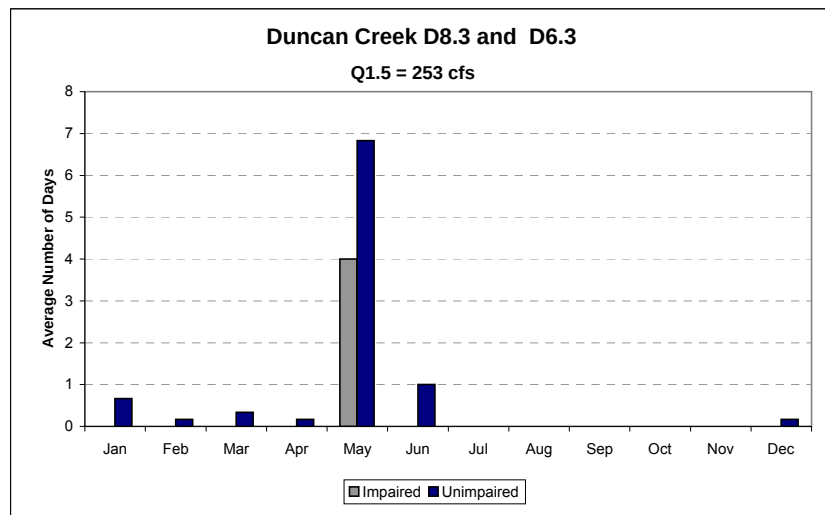
Figure A-29. Duncan Creek D8.3 and D6.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-y) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q5 flow was only exceeded during wet and above normal years between 1975 and 2007.
The Q10 flow was only exceeded during wet years between 1975 and 2007.

Figure A-30. Duncan Creek D8.3 and D6.3: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

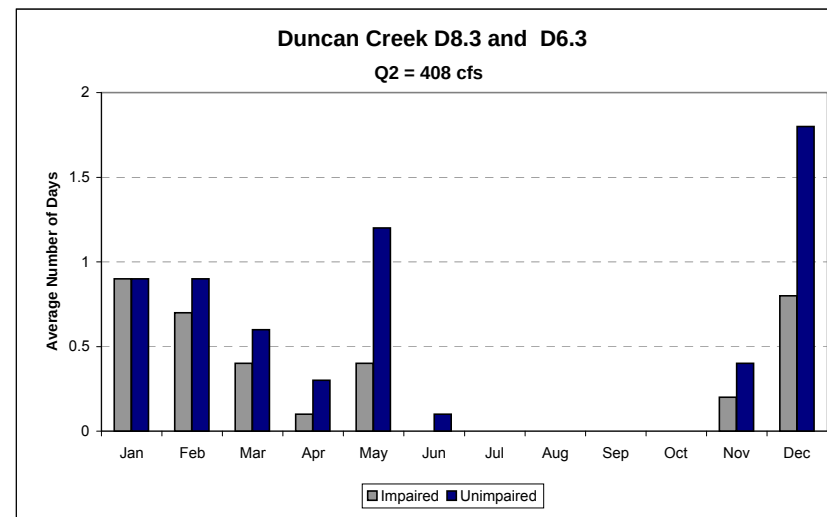
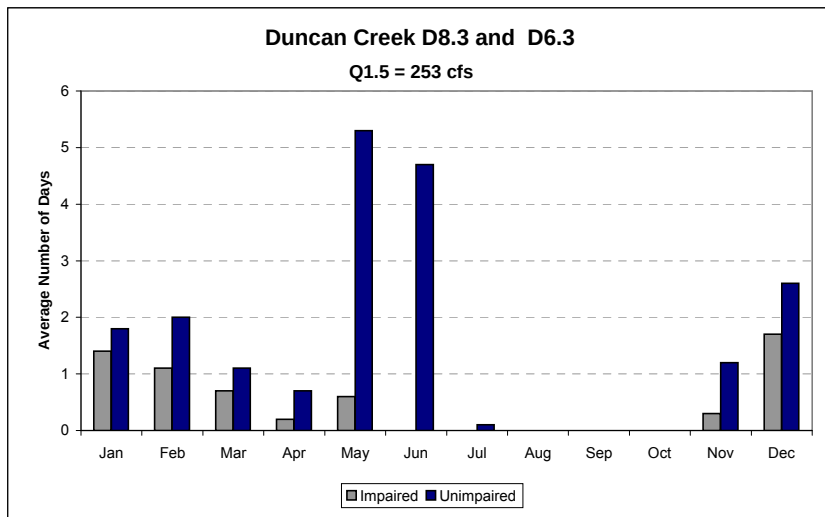


Figure A-31. Duncan Creek at Middle Fork American River Confluence D0.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-v) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).

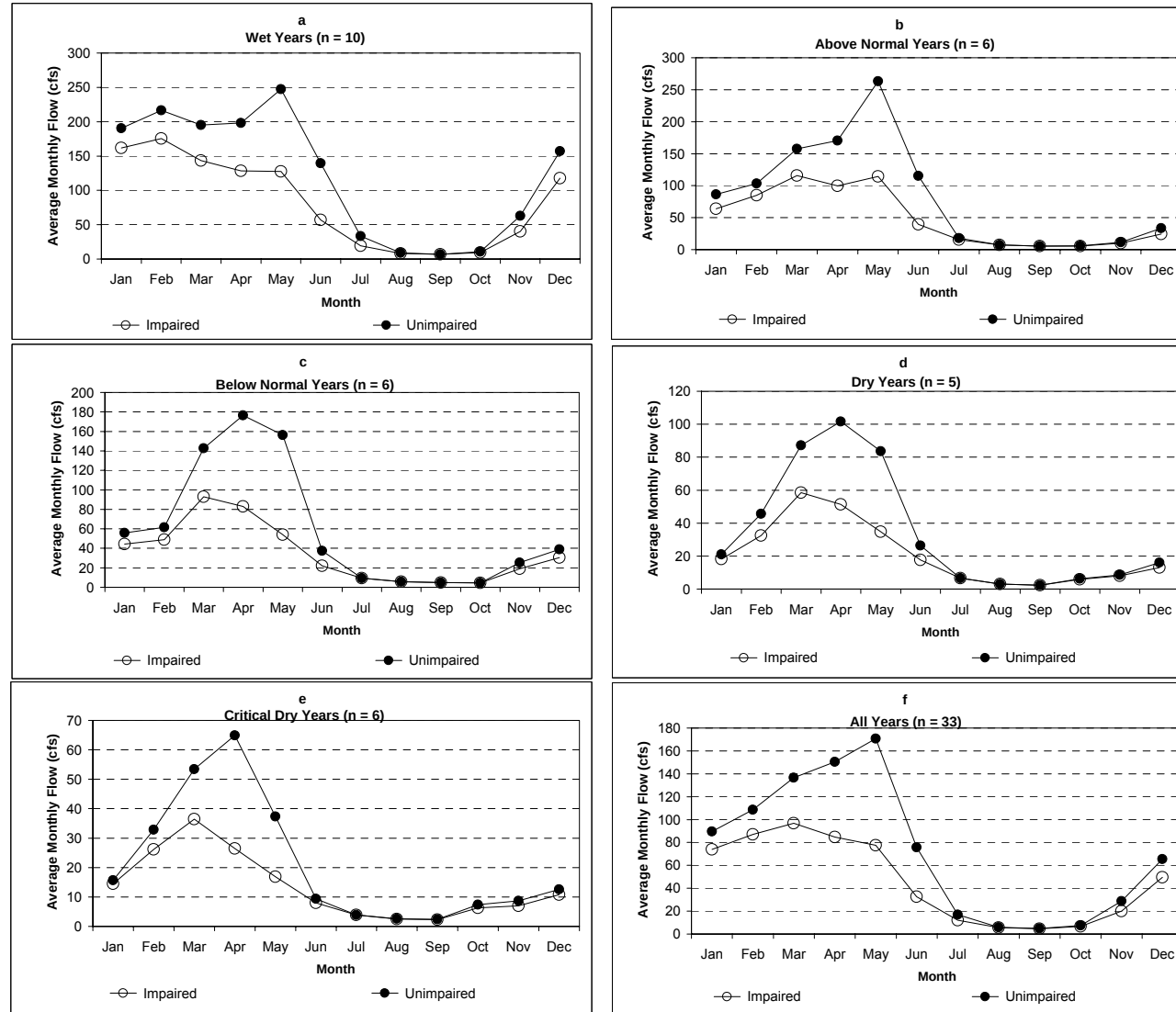


Figure A-31. Duncan Creek at Middle Fork American River Confluence D0.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

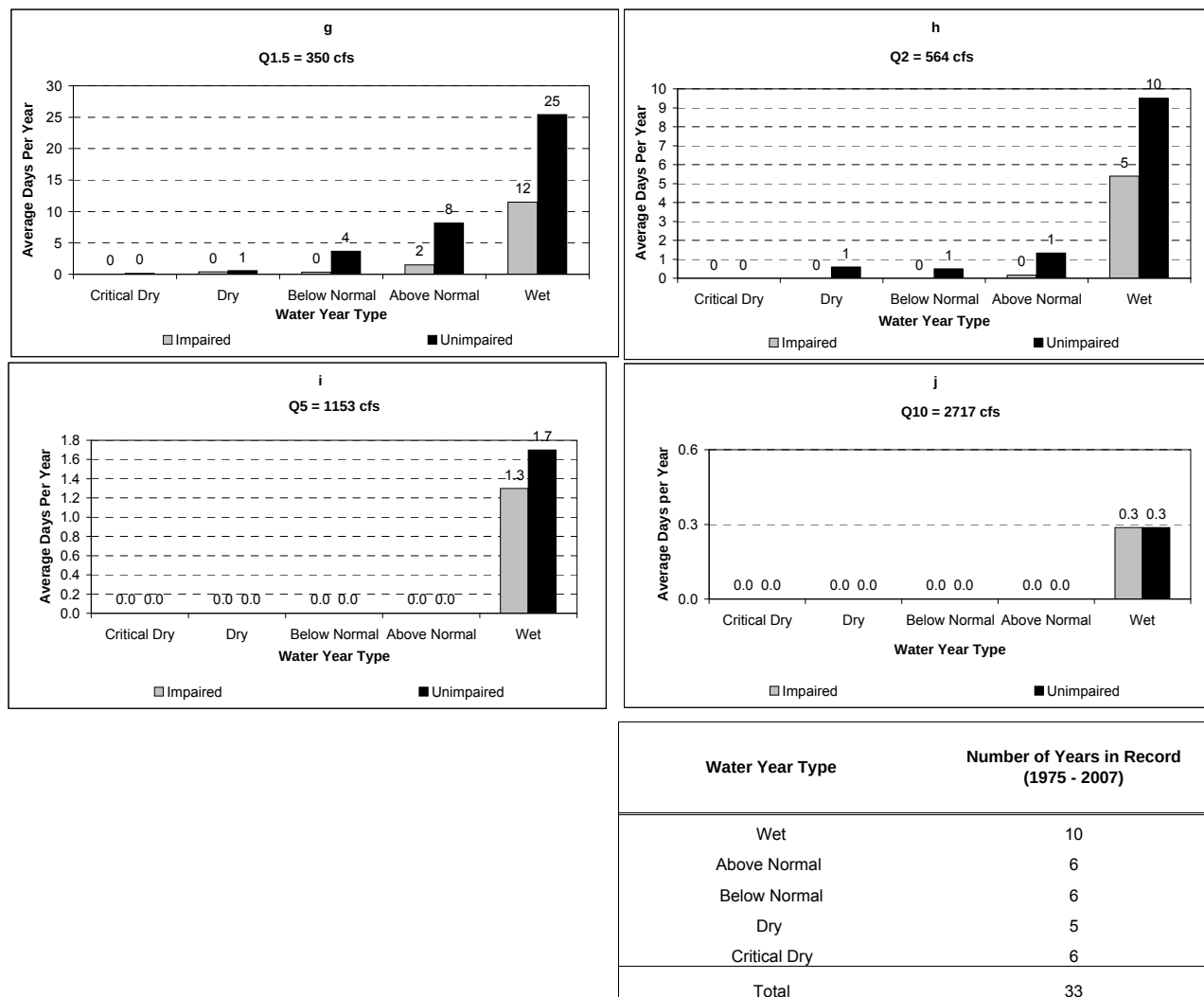


Figure A-31. Duncan Creek at Middle Fork American River Confluence D0.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

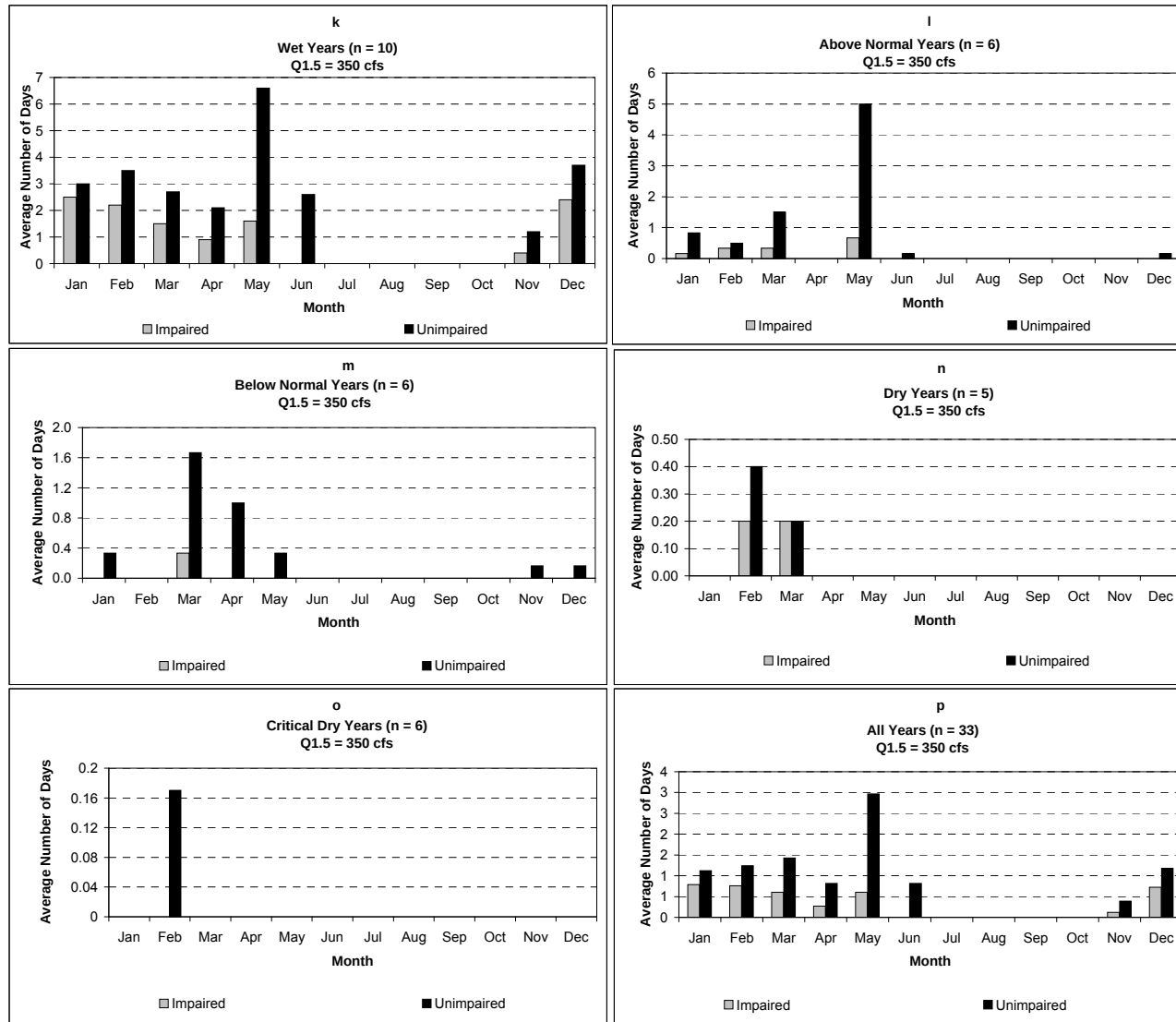


Figure A-31. Duncan Creek at Middle Fork American River Confluence D0.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

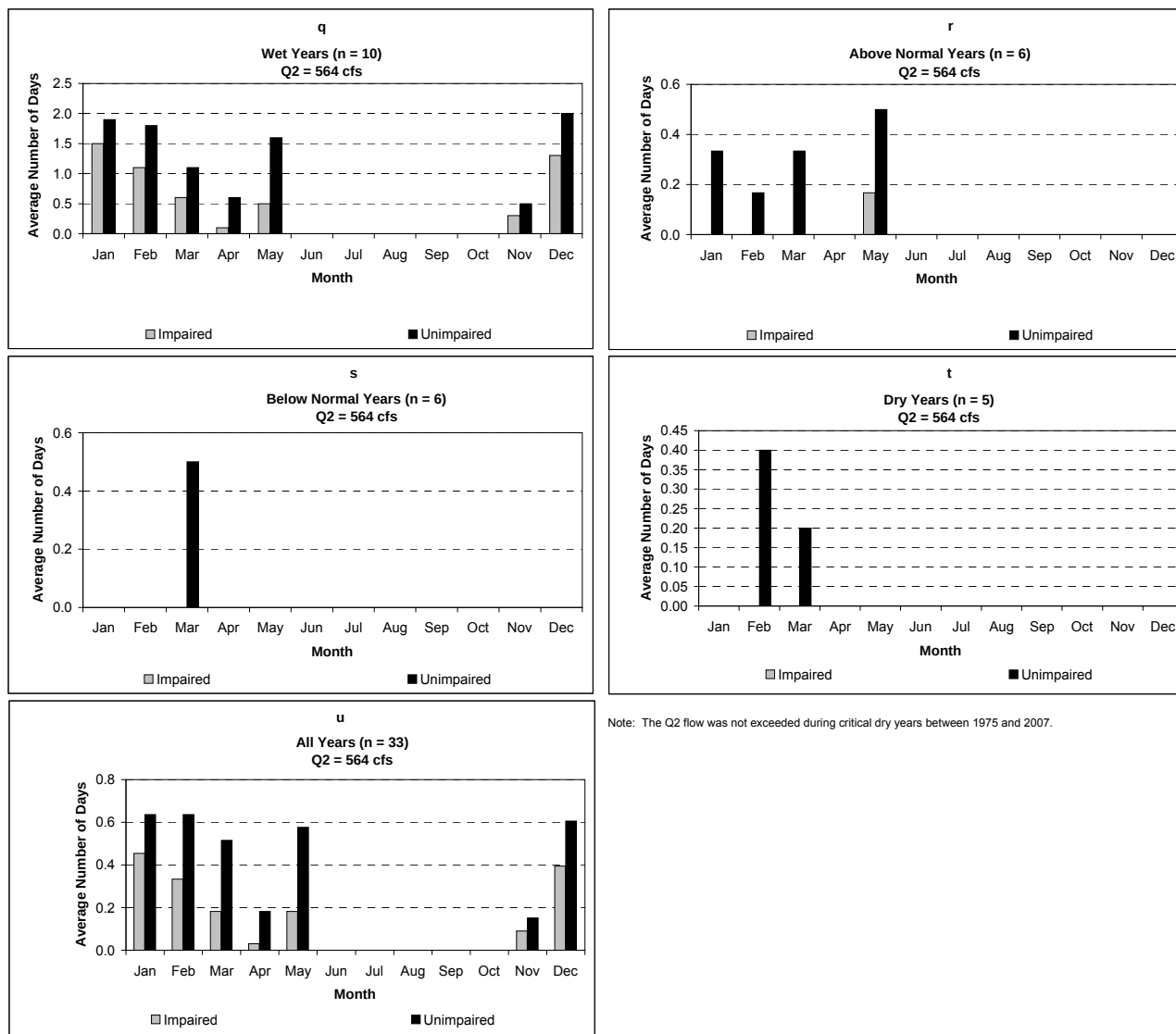
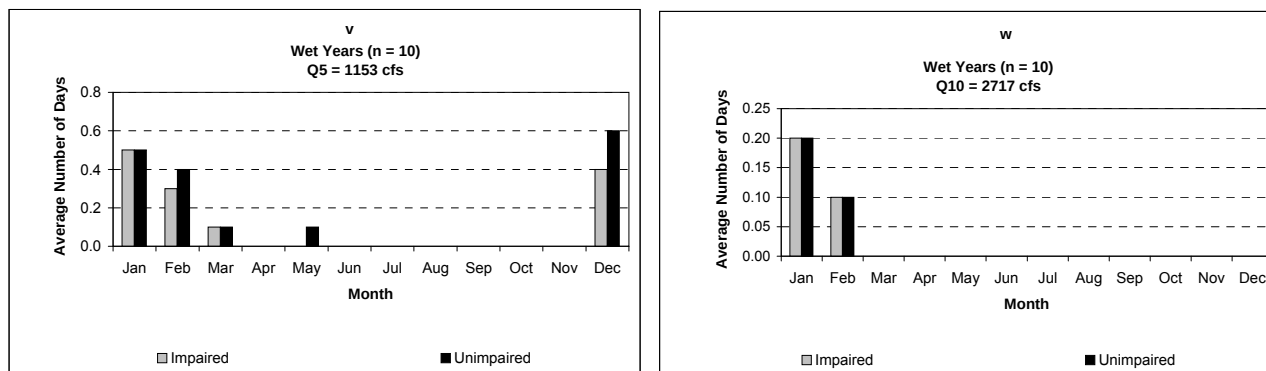


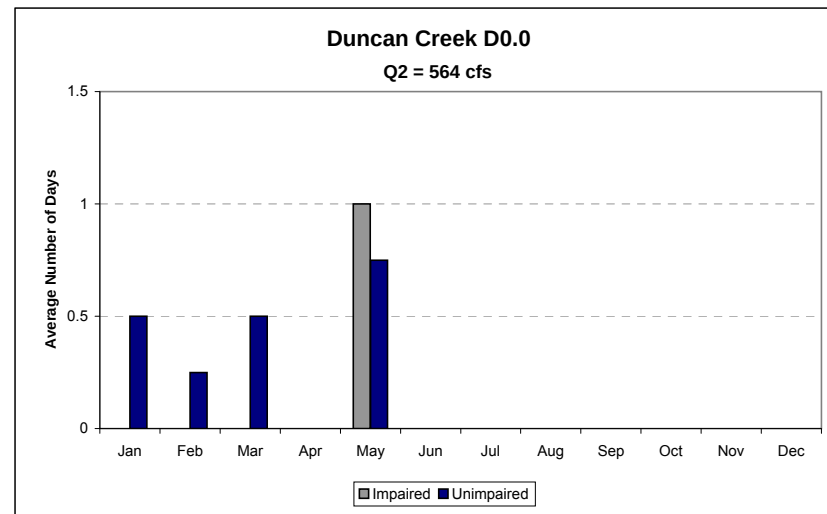
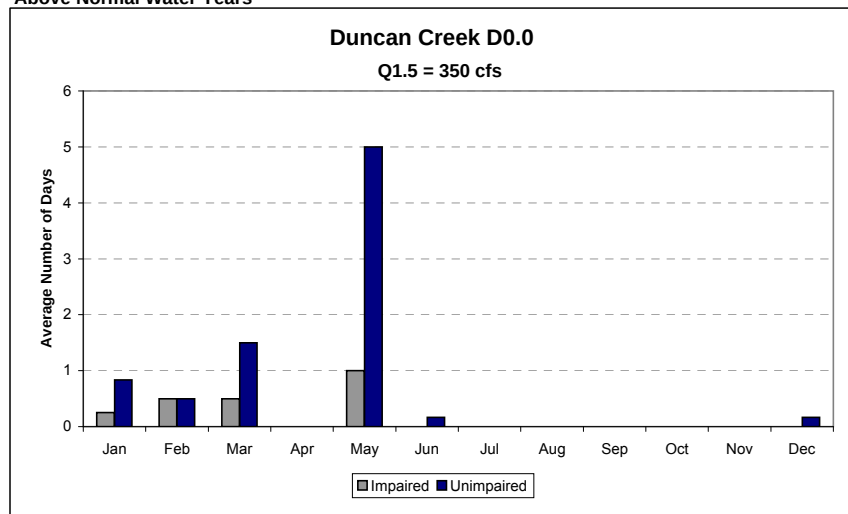
Figure A-31. Duncan Creek at Middle Fork American River Confluence D0.0: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q.5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-32. Duncan Creek at Middle Fork American River Confluence D0.0: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

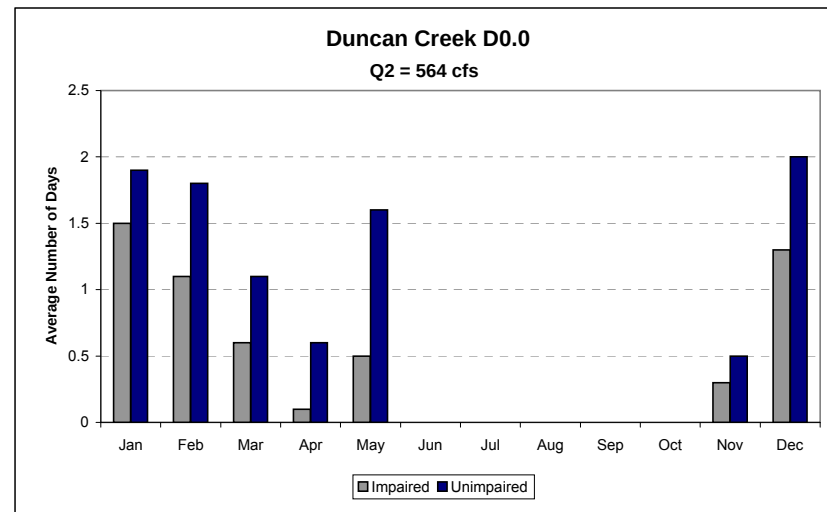
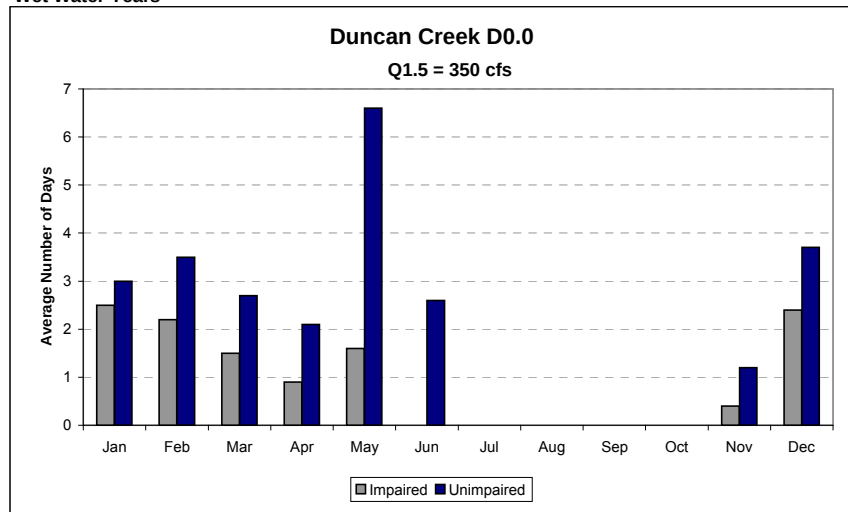


Figure A-33. North Fork of the Middle Fork American River NFMF2.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).

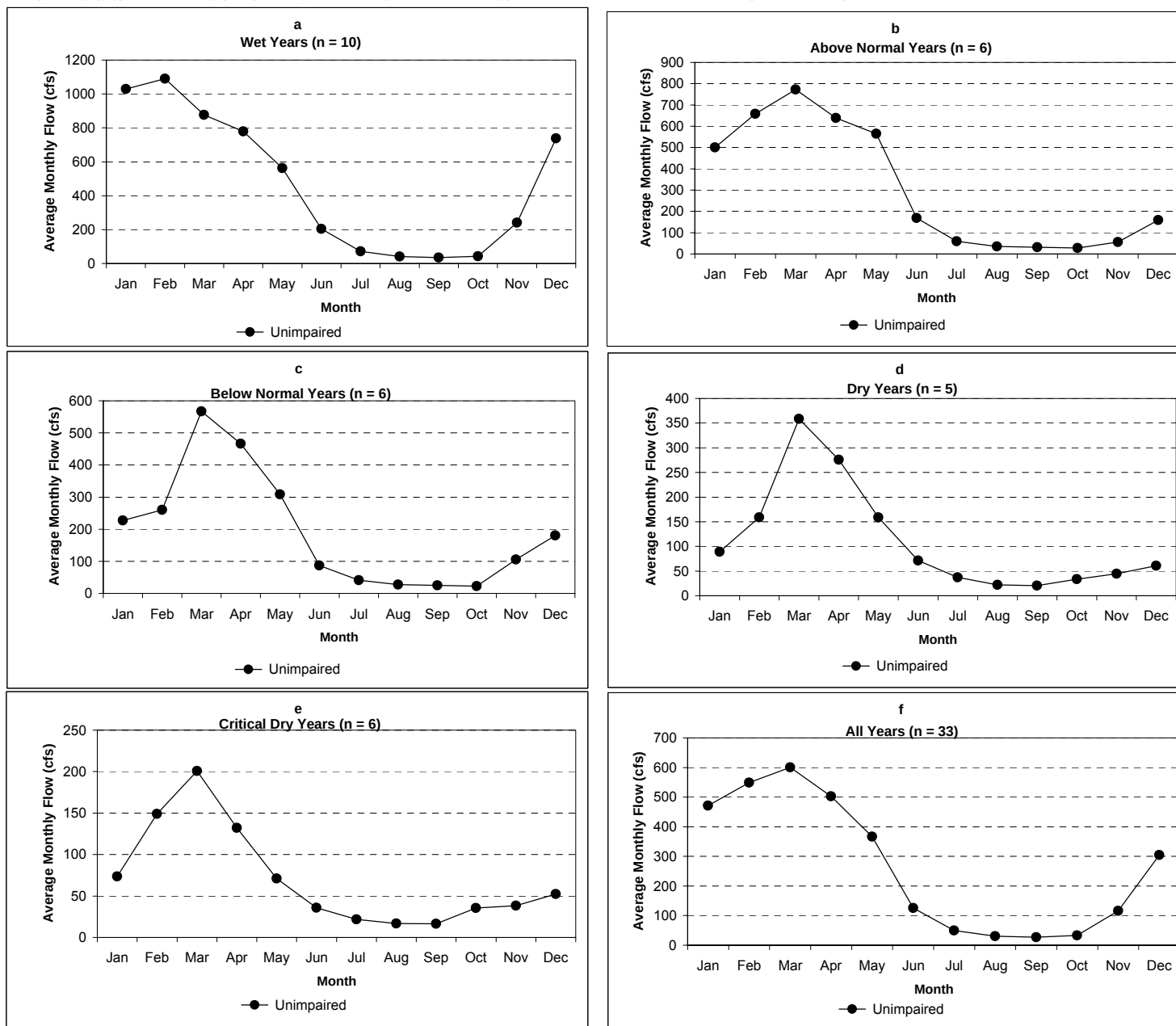


Figure A-33. North Fork of the Middle Fork American River NFMF2.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

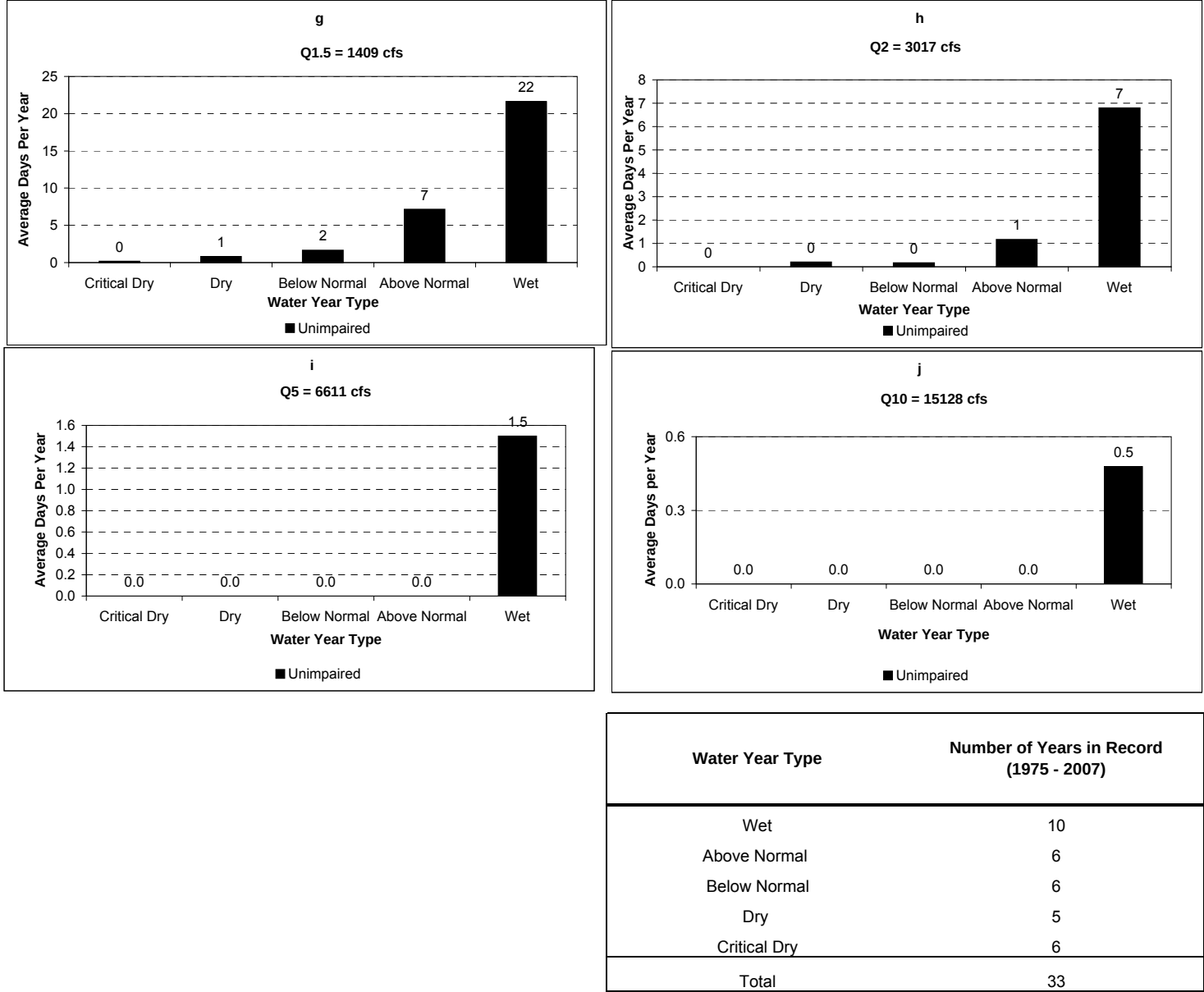


Figure A-33. North Fork of the Middle Fork American River NFMF2.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

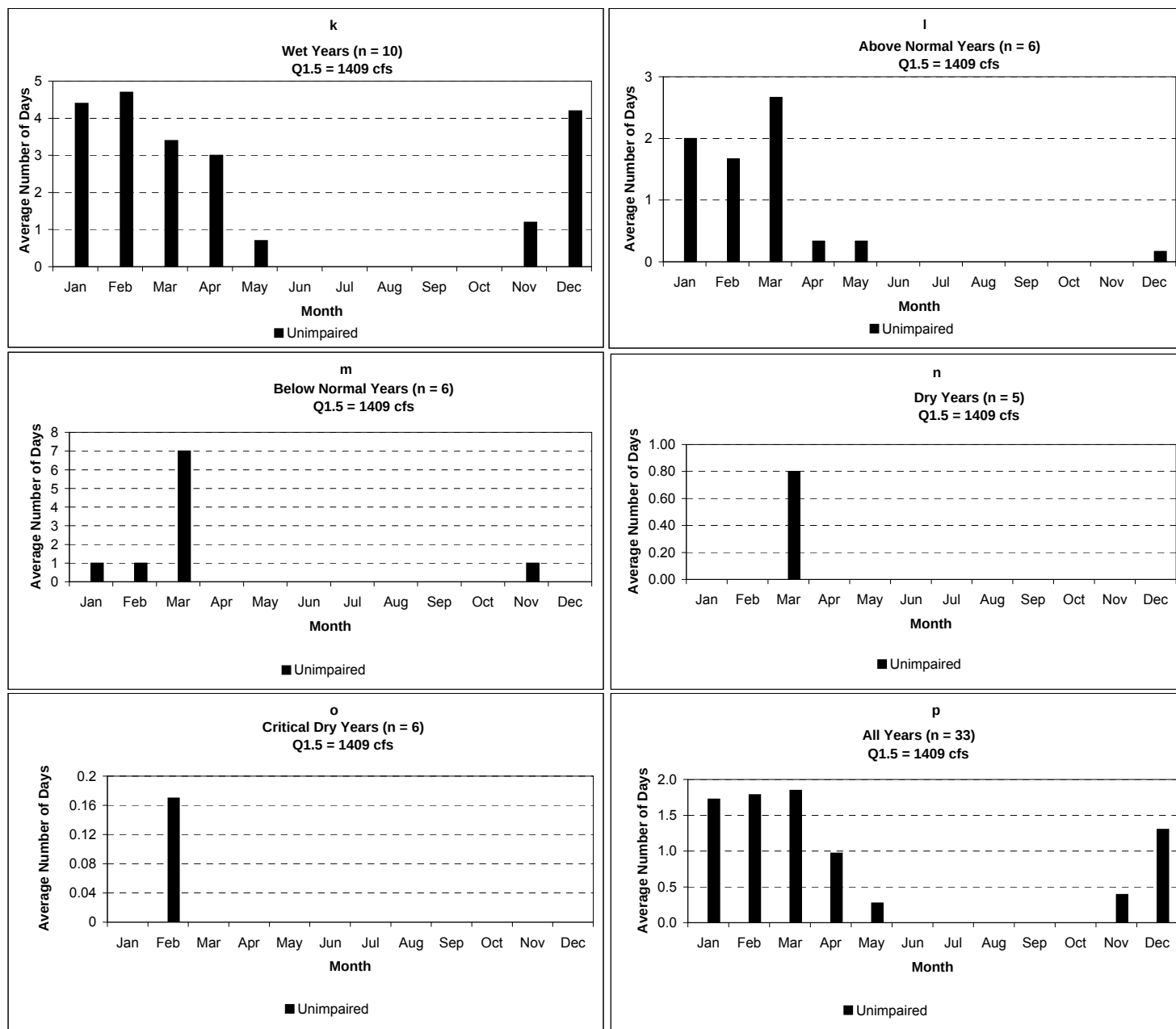


Figure A-33. North Fork of the Middle Fork American River NFMF2.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

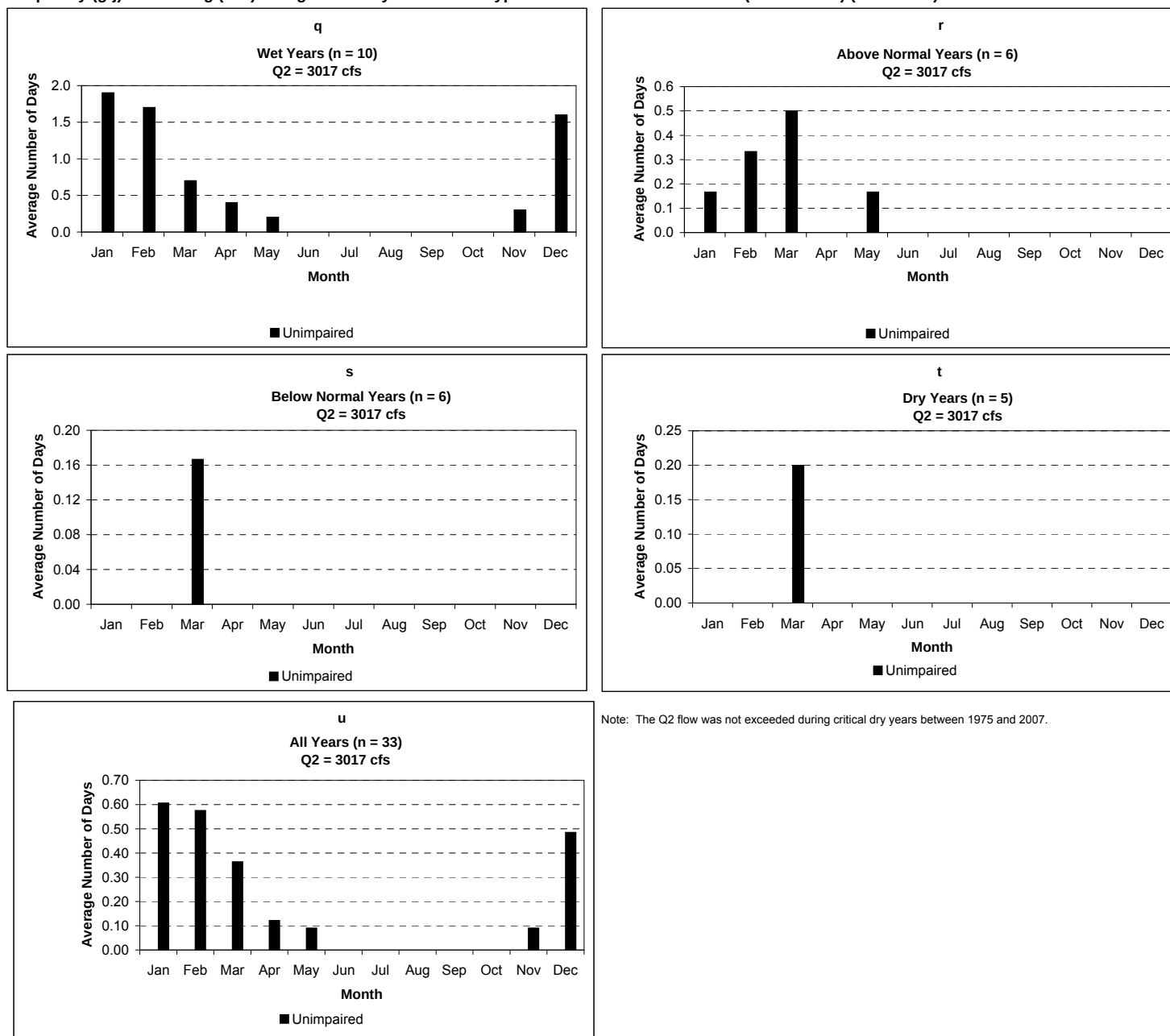
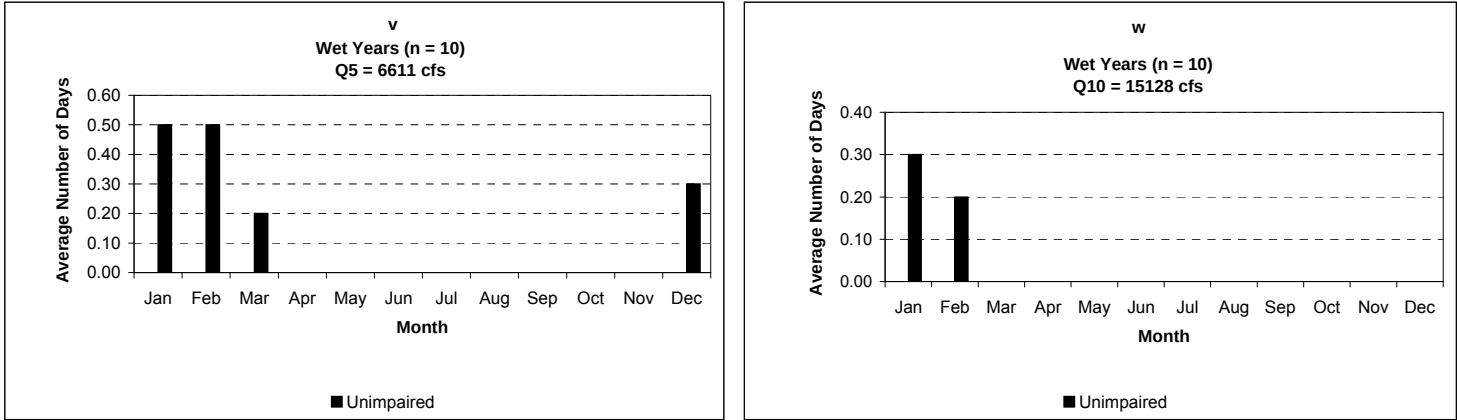


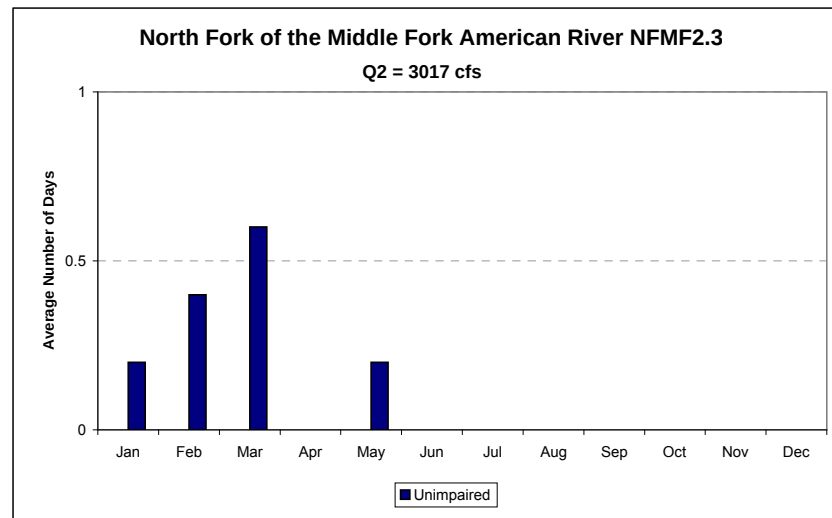
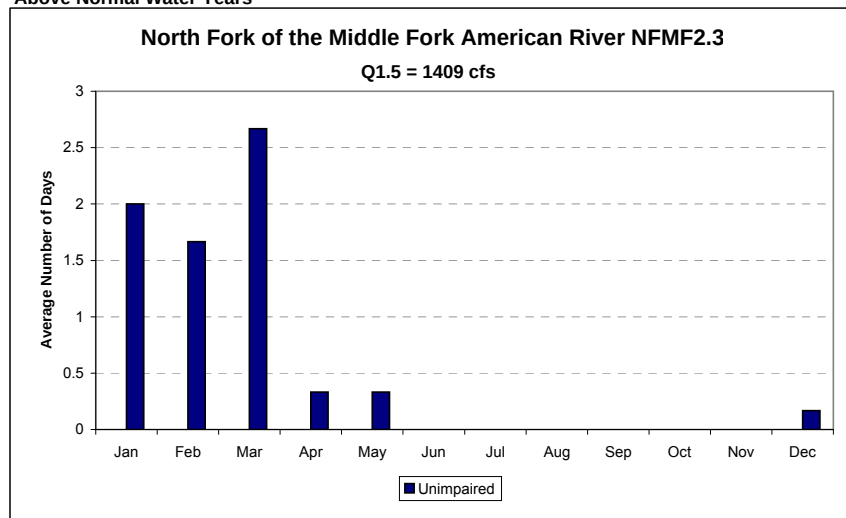
Figure A-33. North Fork of the Middle Fork American River NFMF2.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



The Q5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-34. North Fork of the Middle Fork American River NFMF2.3: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

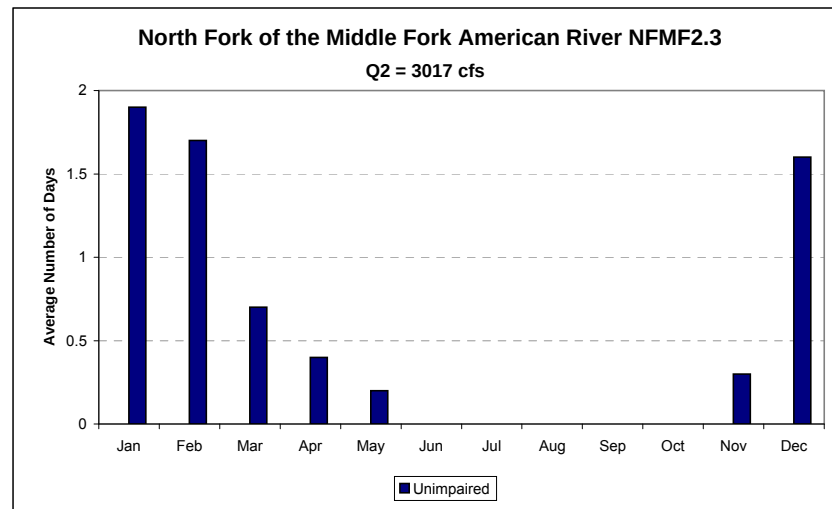
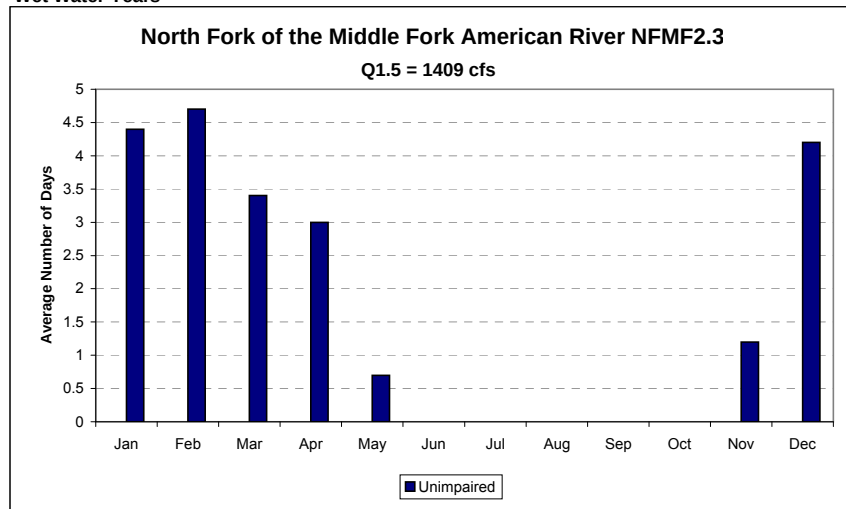


Figure A-35. North Fork American River NF31.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).

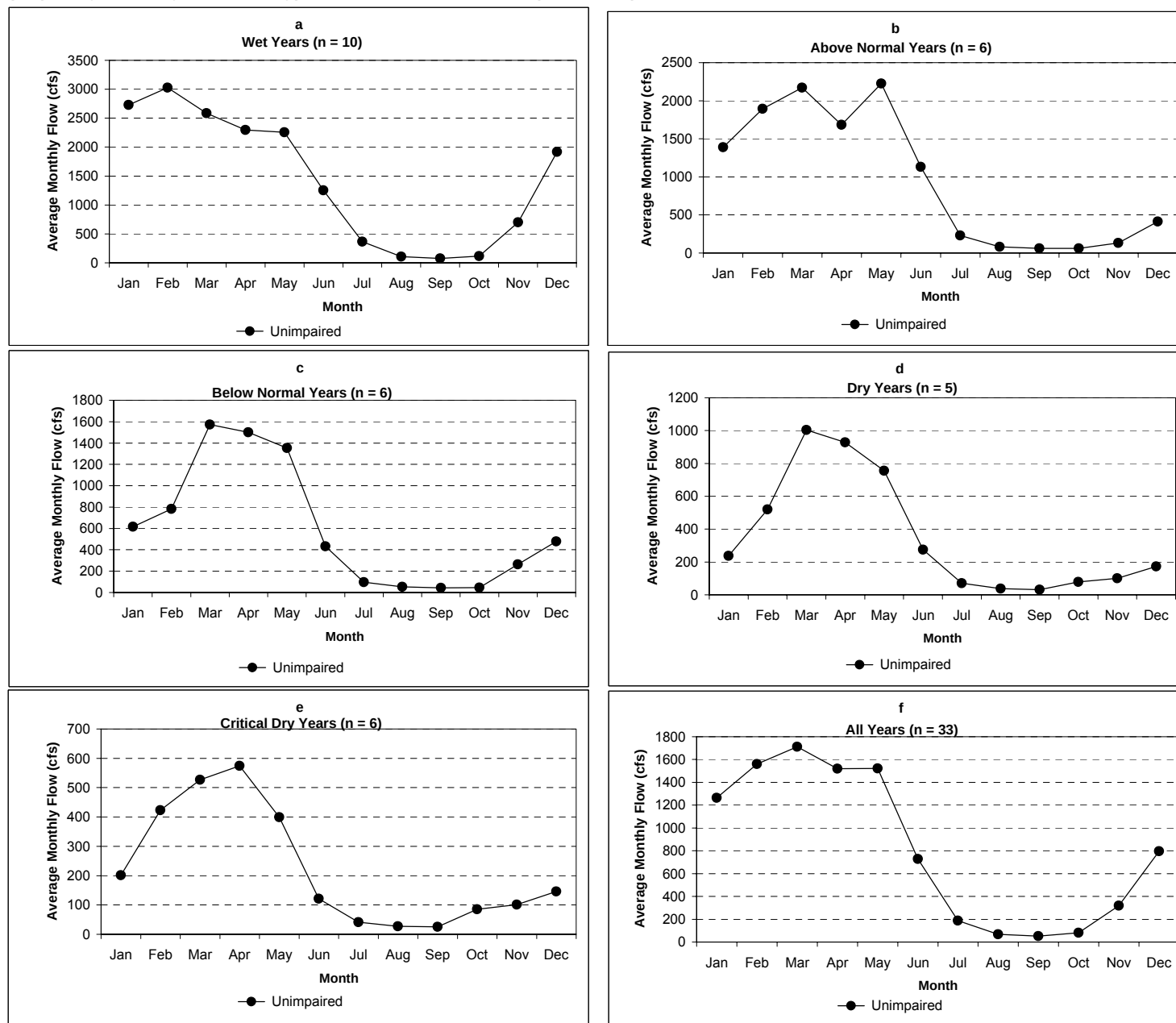
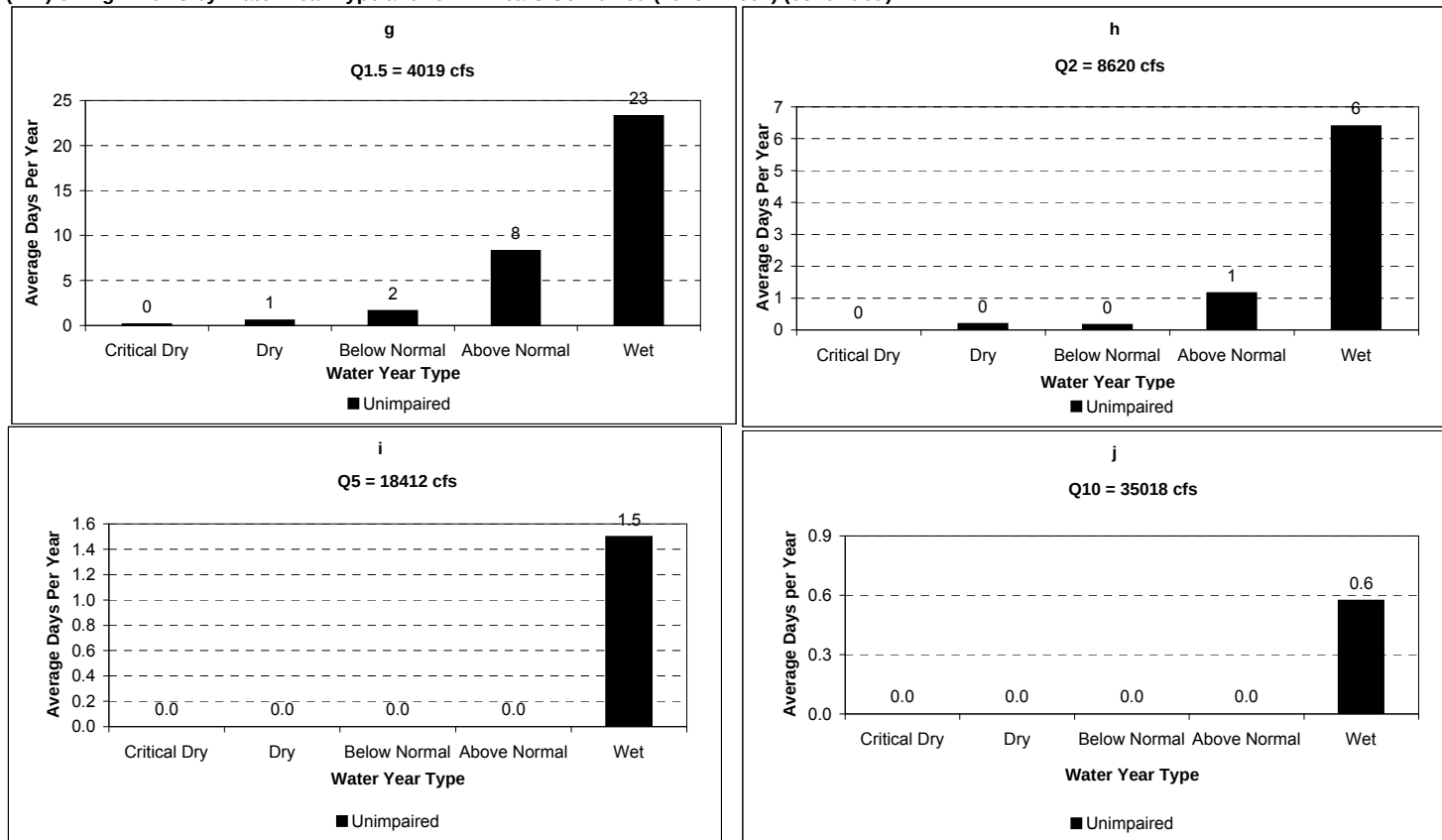


Figure A-35. North Fork American River NF31.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Water Year Type	Number of Years in Record (1975 - 2007)
Wet	10
Above Normal	6
Below Normal	6
Dry	5
Critical Dry	6
Total	33

Figure A-35. North Fork American River NF31.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

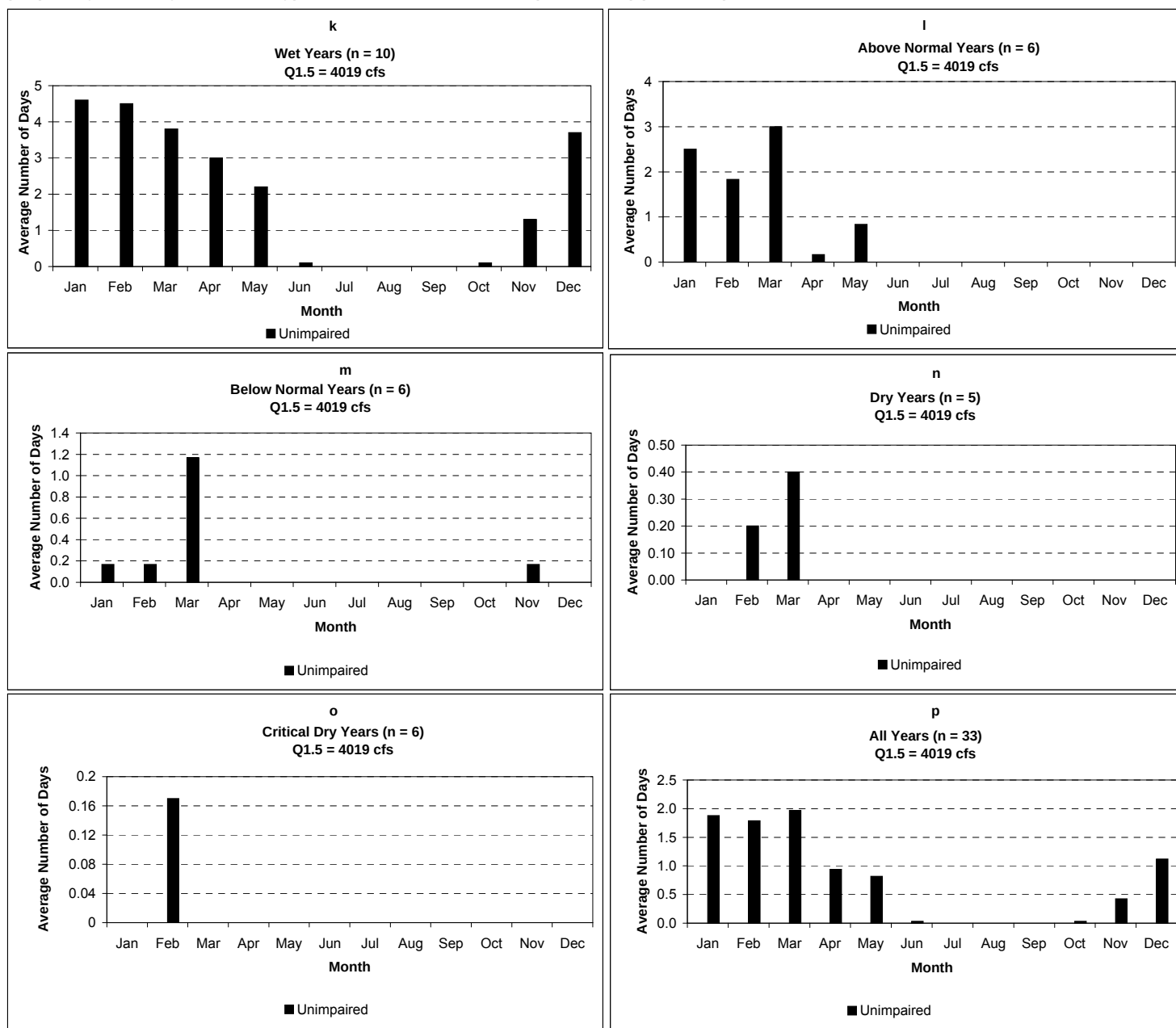


Figure A-35. North Fork American River NF31.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

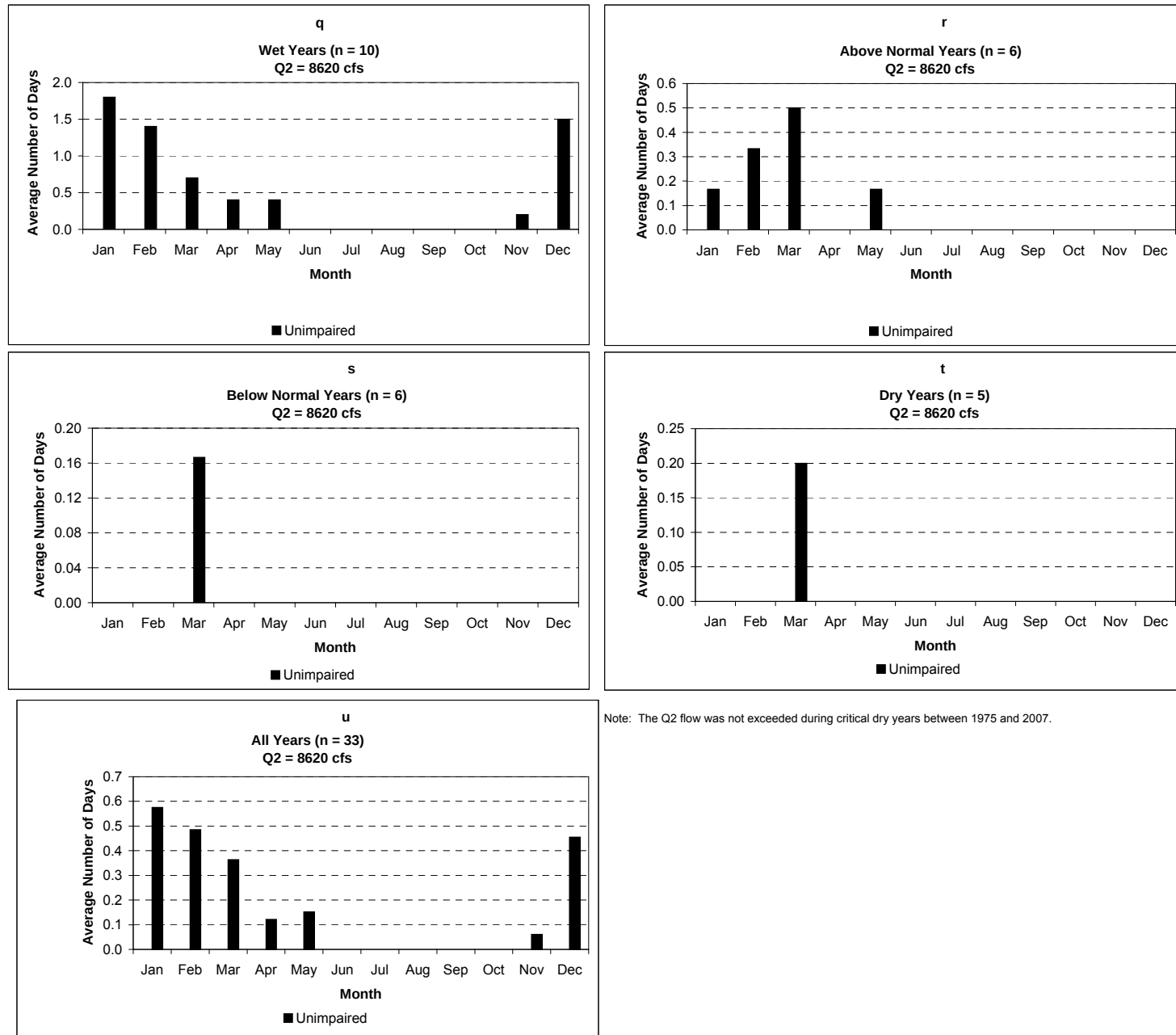
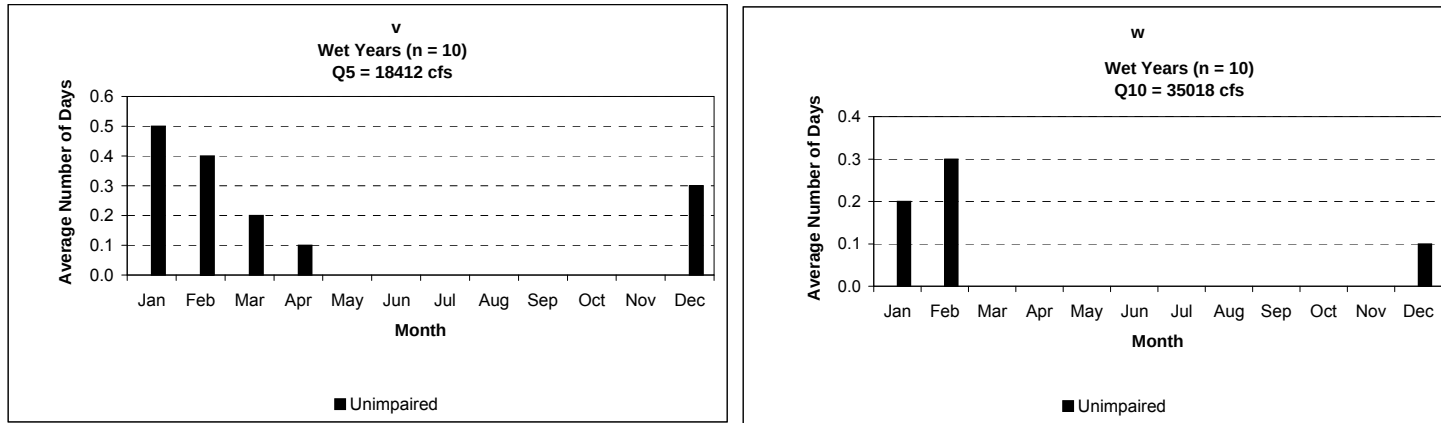


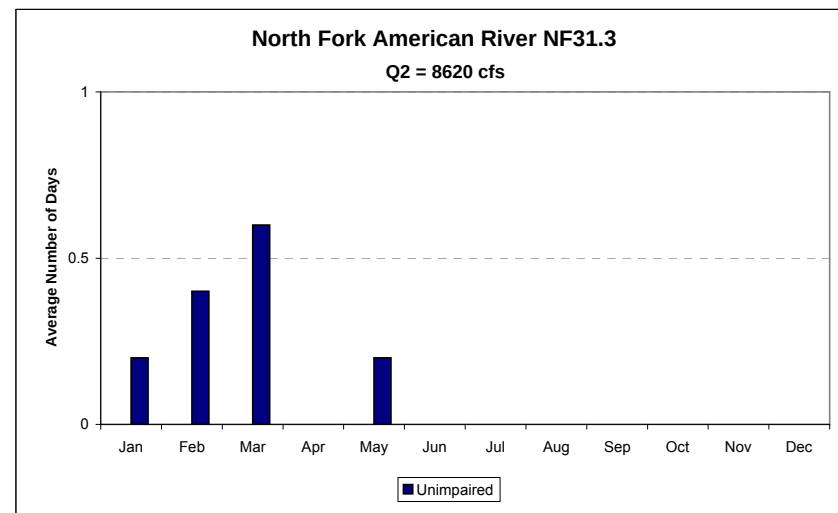
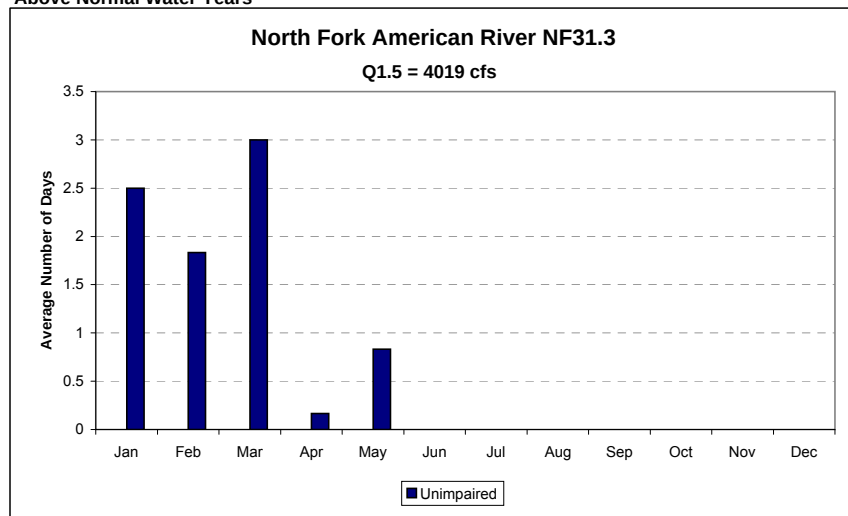
Figure A-35. North Fork American River NF31.3: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



The Q5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-36. North Fork American River NF31.3: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

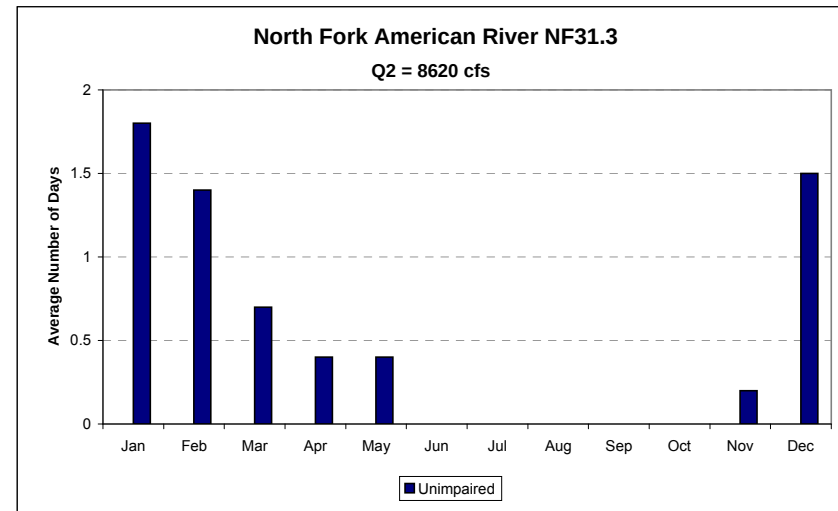
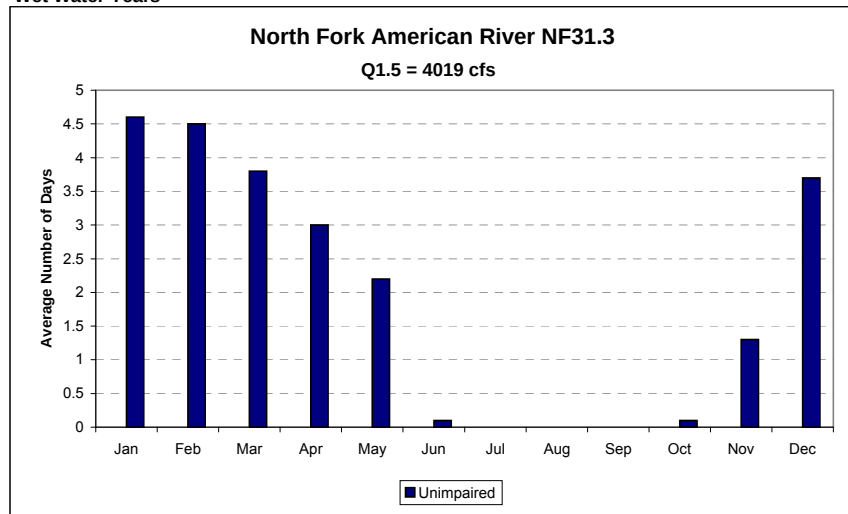


Figure A-37. North Fork American River NF53.7: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007).

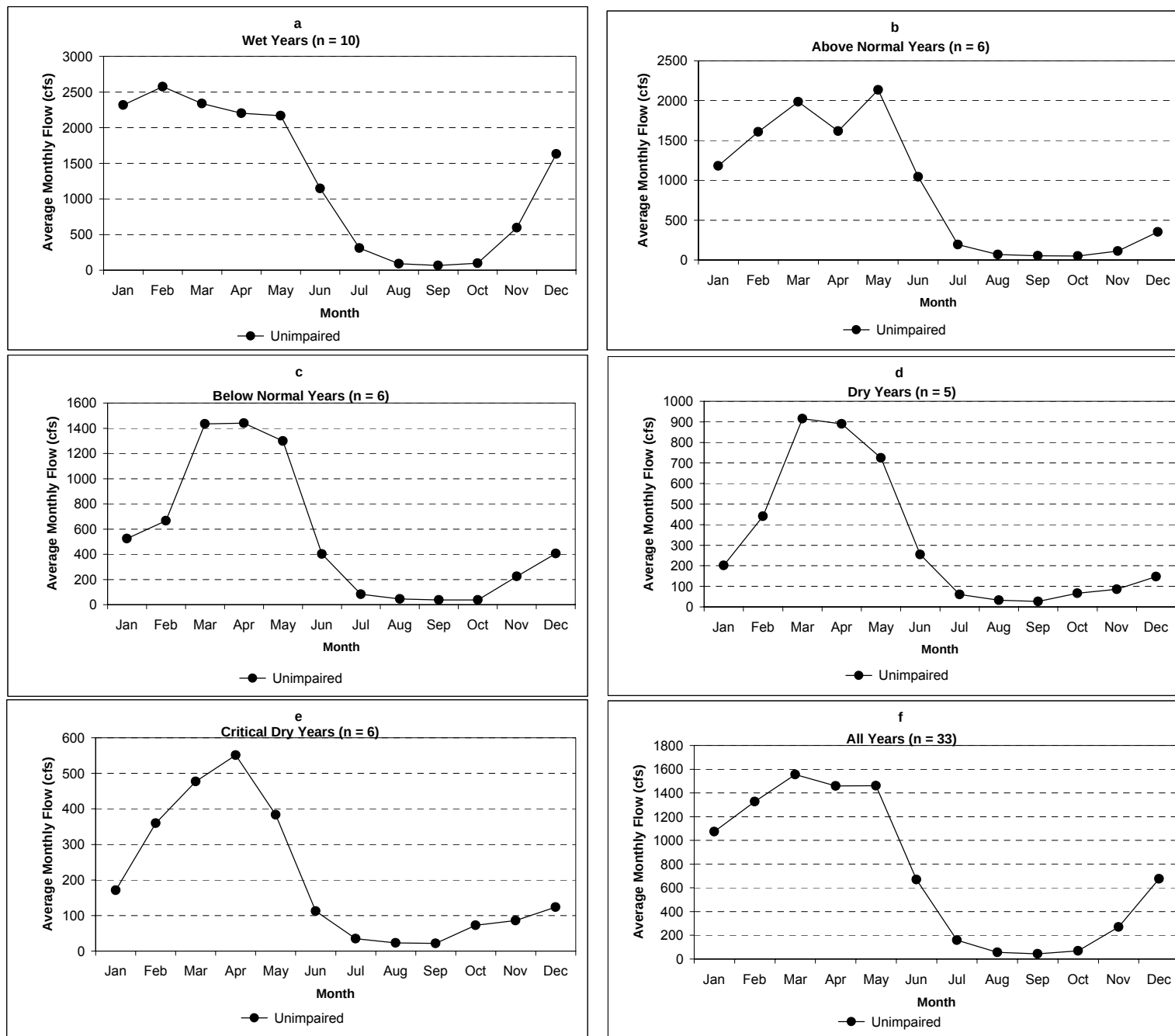
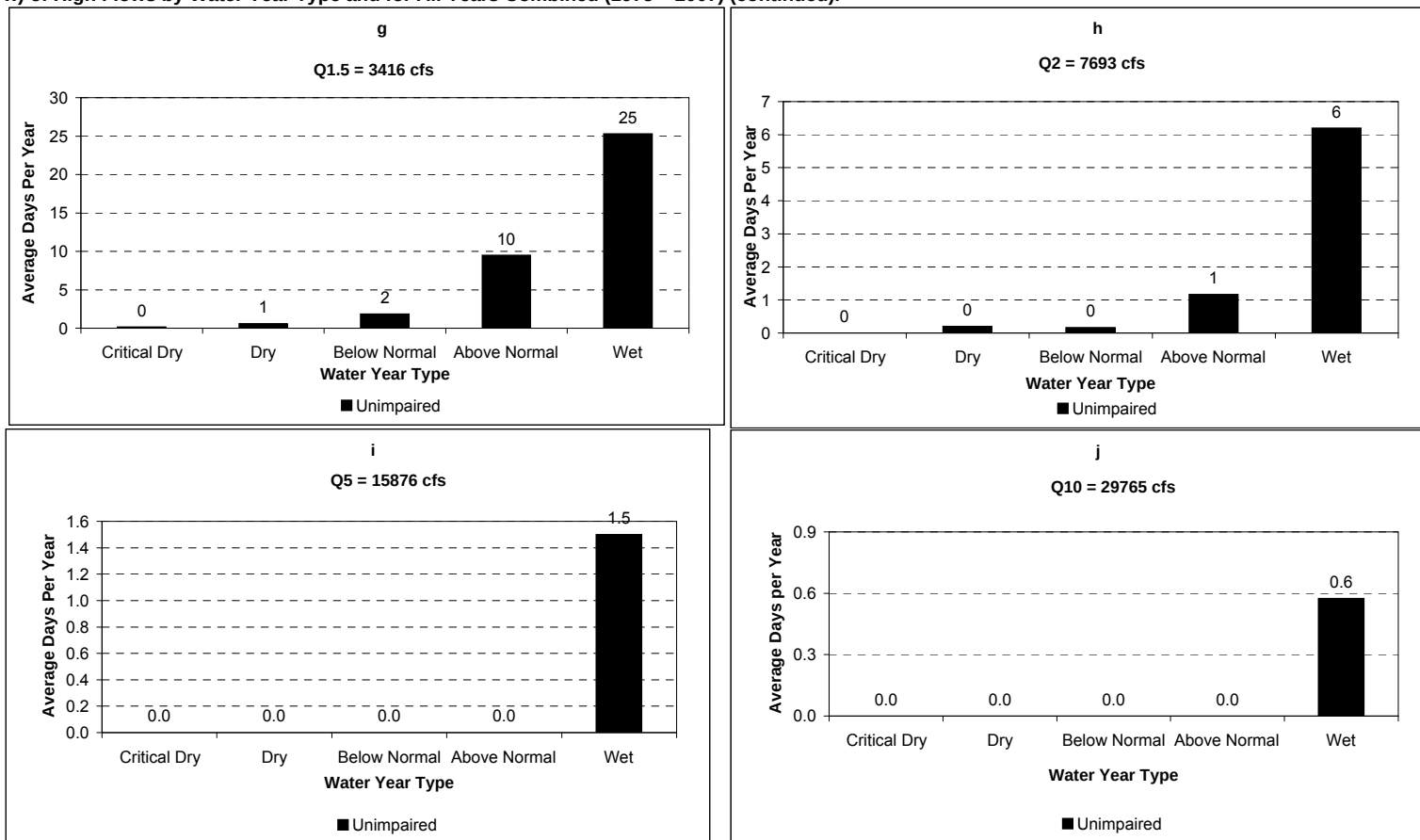


Figure A-37. North Fork American River NF53.7: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Water Year Type	Number of Years in Record (1975 - 2007)
Wet	10
Above Normal	6
Below Normal	6
Dry	5
Critical Dry	6
Total	33

Figure A-37. North Fork American River NF53.7: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).

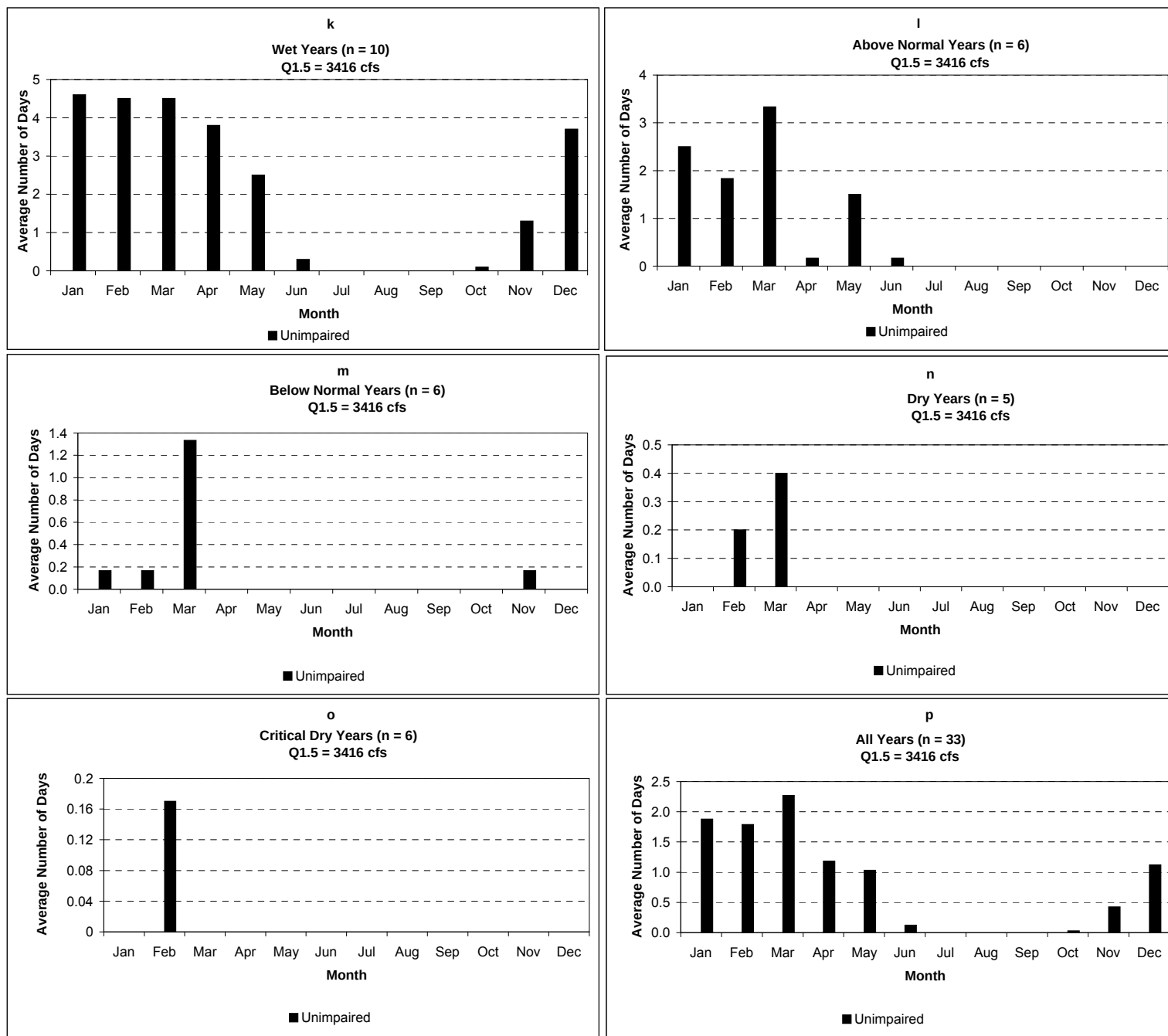
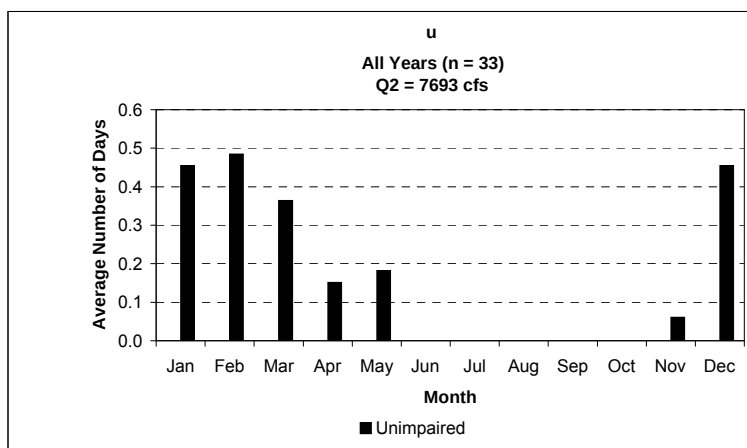
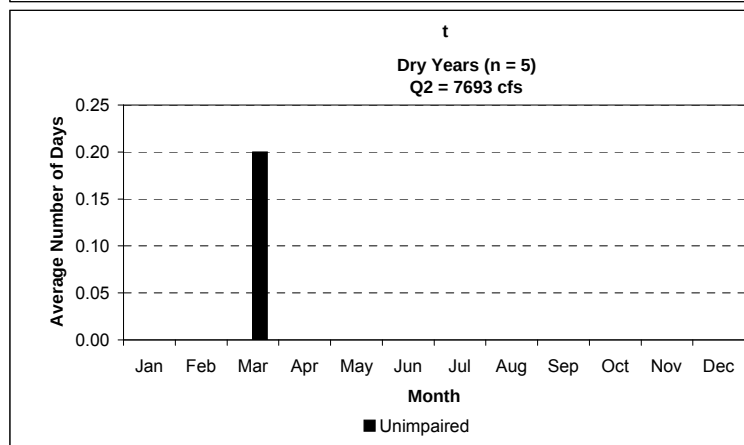
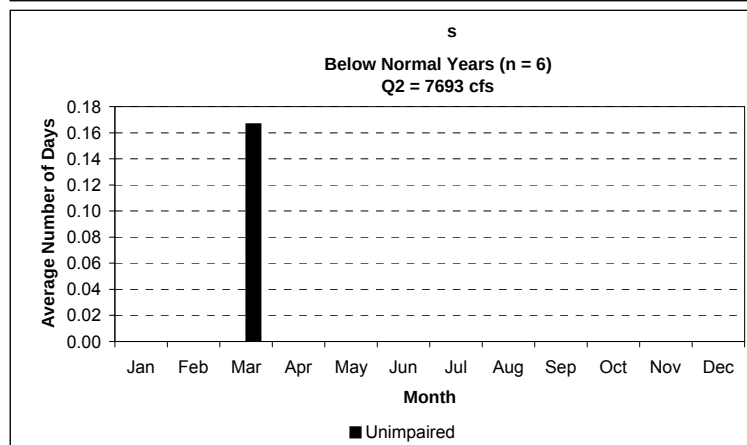
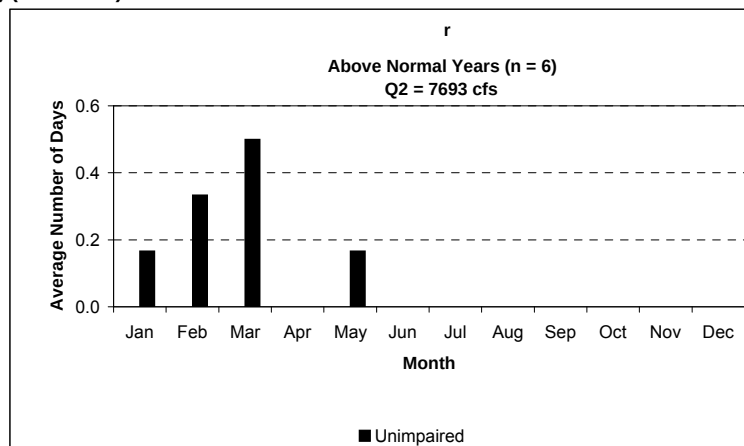
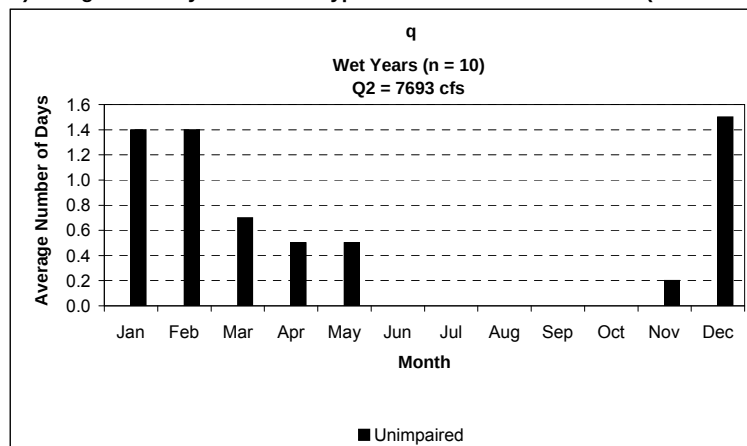
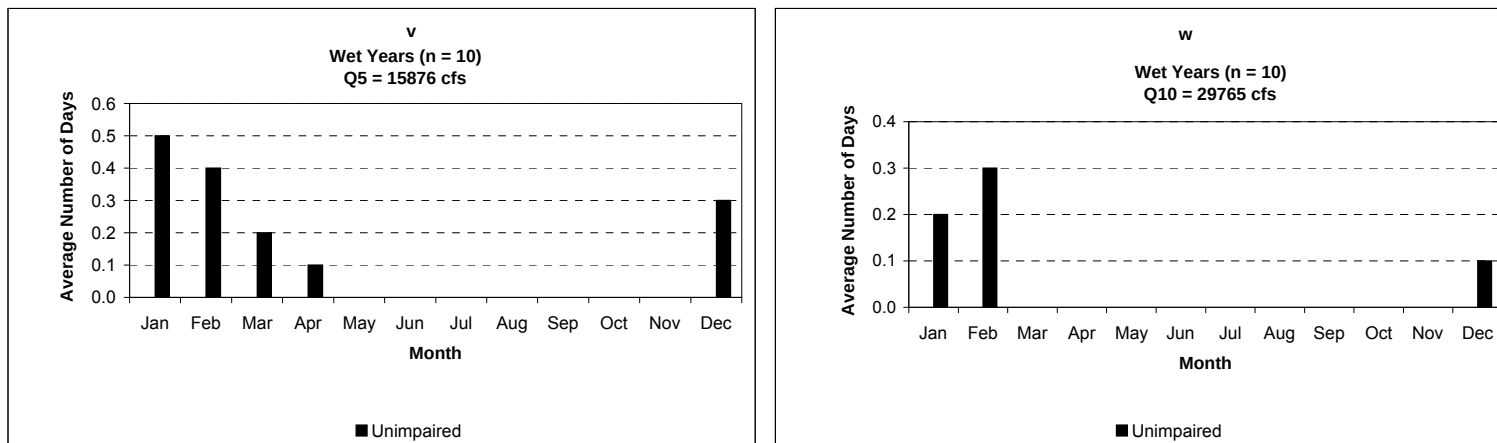


Figure A-37. North Fork American River NF53.7: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-i) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



Note: The Q2 flow was not exceeded during critical dry years between 1975 and 2007.

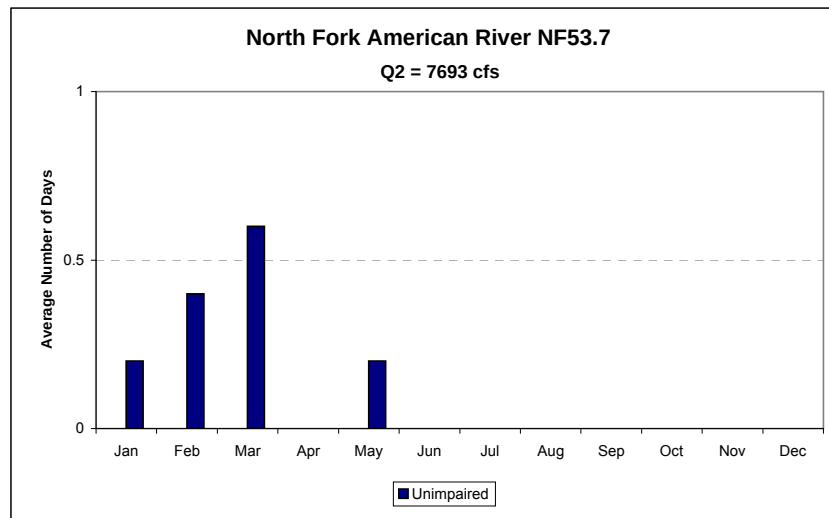
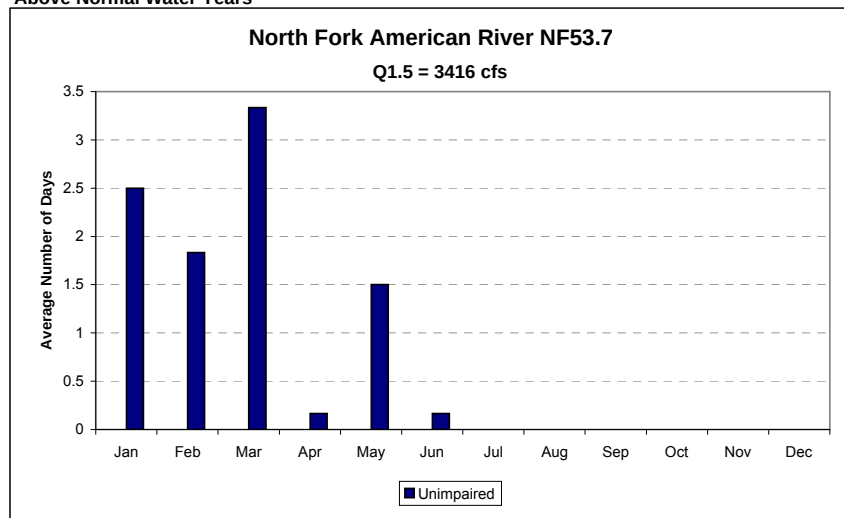
Figure A-37. North Fork American River NF53.7: Comparisons of Impaired and Unimpaired Average Monthly Flows (a-f) and Frequency (g-j) and Timing (k-w) of High Flows by Water Year Type and for All Years Combined (1975 – 2007) (continued).



The Q5 and Q10 flows were only exceeded during wet years between 1975 and 2007.

Figure A-38. North Fork American River NF53.7: Average Number of Days per Month per Wet and Above Normal Water Year when Flows Exceeded the Q1.5 and Q2 Flow.

Above Normal Water Years



Wet Water Years

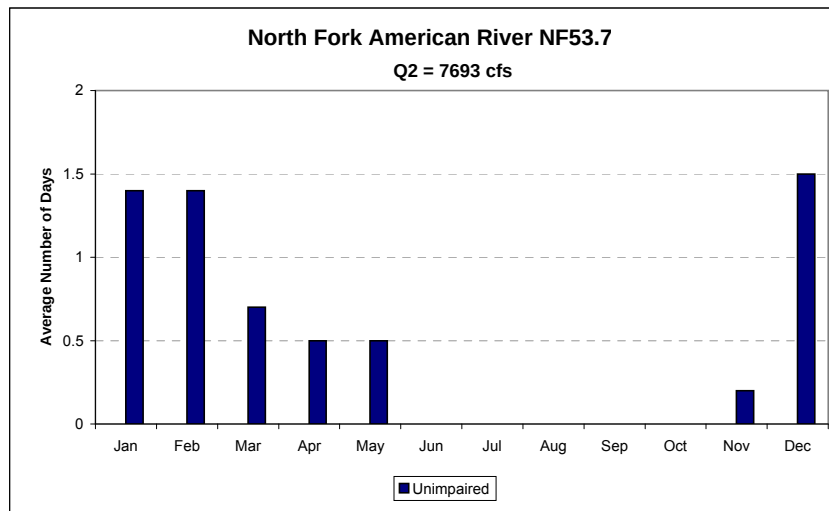
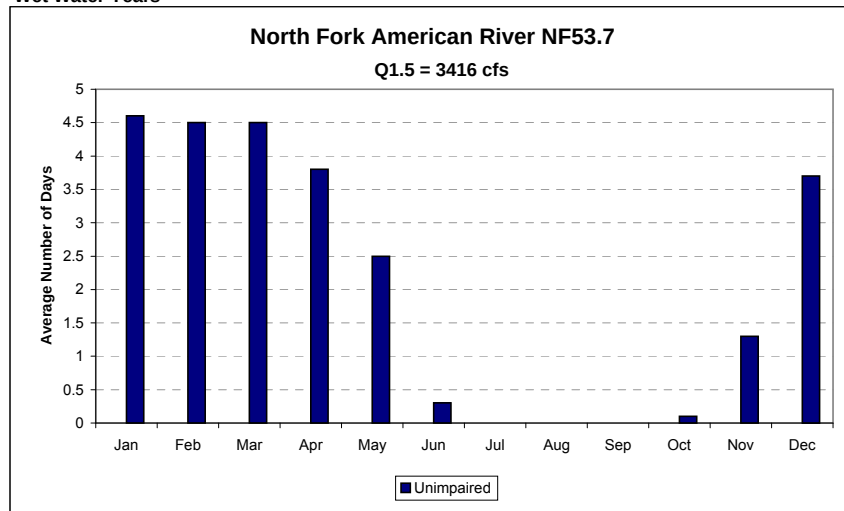


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches.

Middle Fork American River MF 44.7 – Wet Water Years

No tree cores were collected from this site. Recession rates were evaluated for all years with flows potentially suitable for recruitment.

The black curves on the recession rate graphs are an average recession rate based on the stage-discharge relationships for all low gradient riffle and run transects at the instream flow site.

A range of recession rate curves were developed for each site (1 inch, 1.6 inches, 2 inches, and 3 inches per day). Rates greater than 3 inches per day were not evaluated as they would typically be too fast compared to riparian tree root growth rates.

The 'best fit' recession rate curve for each set of hydrographs (impaired and unimpaired) is shown for each study site.

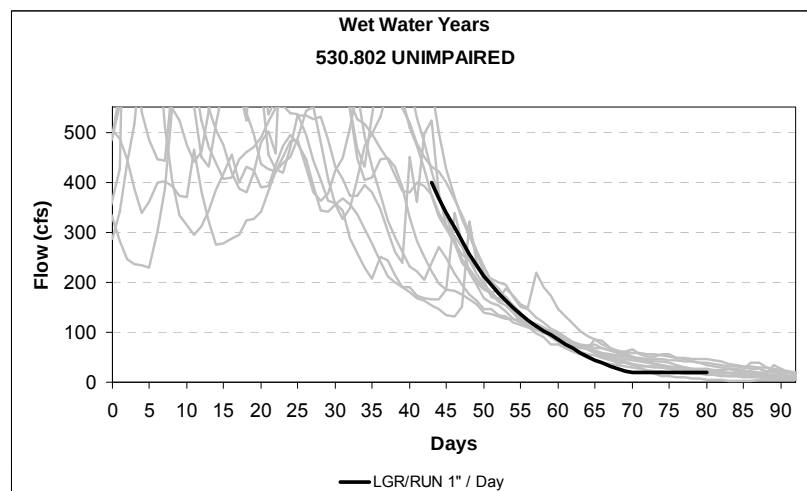
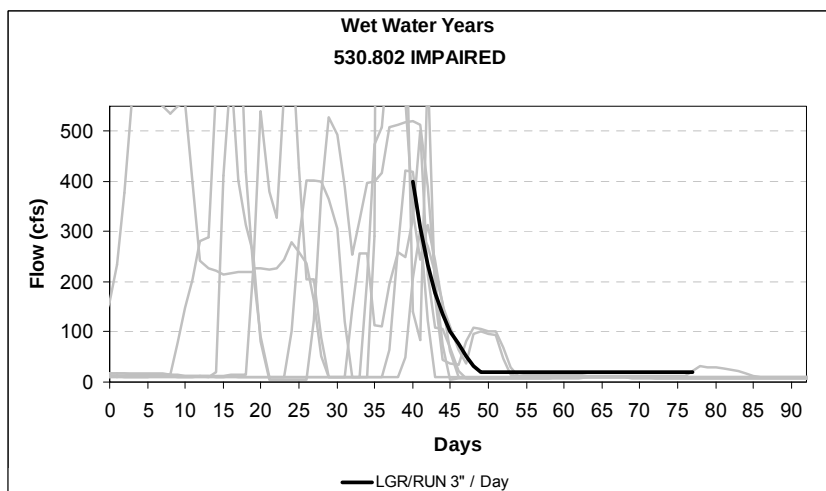
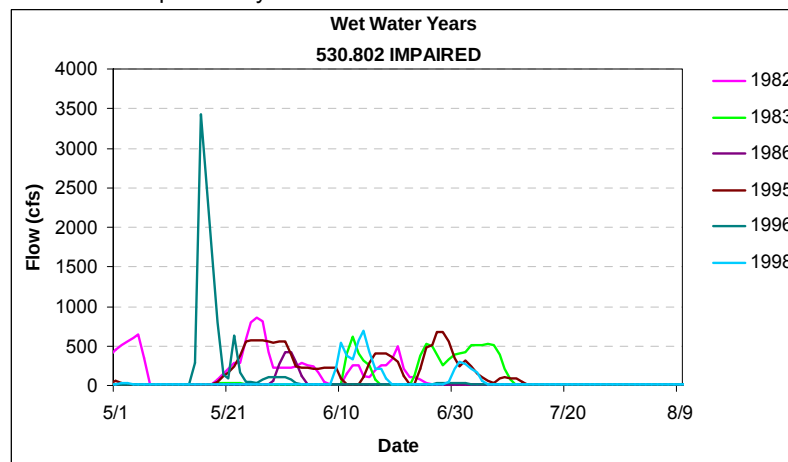


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).

Middle Fork American River MF 44.7 – Above Normal Water Years

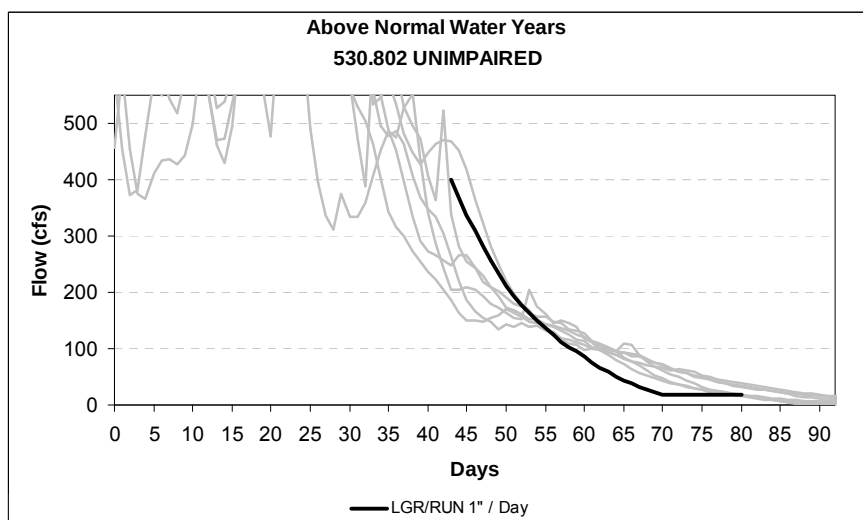
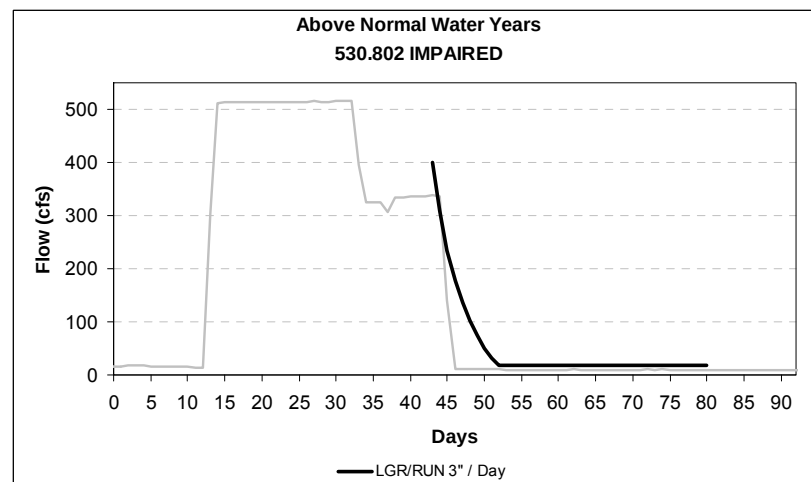
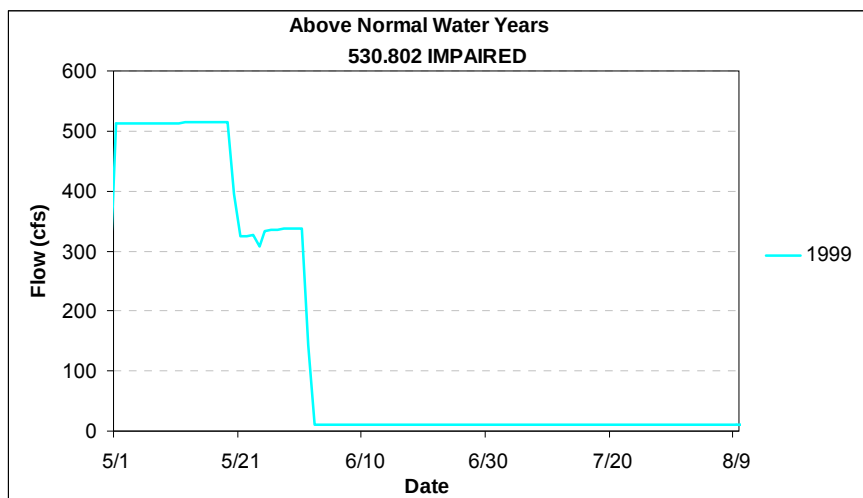


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).

Middle Fork American River – MF36.2 – Wet Water Years

No tree cores were collected from this site. Recession rates were evaluated for all years with flows potentially suitable for recruitment.

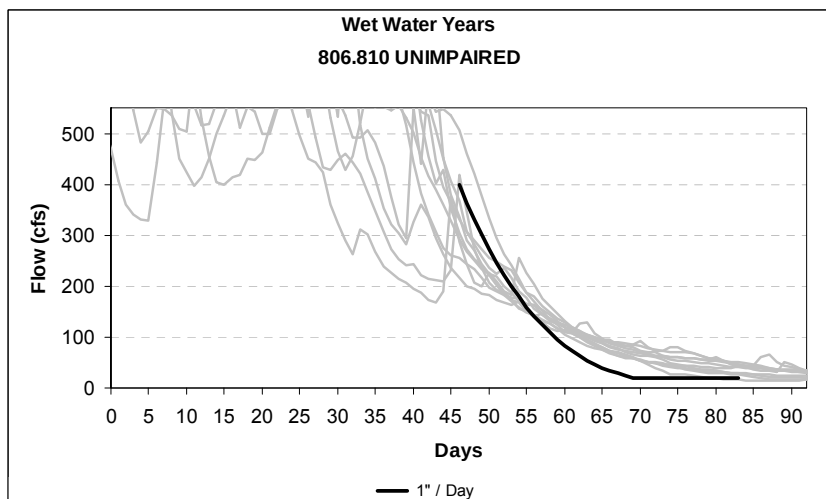
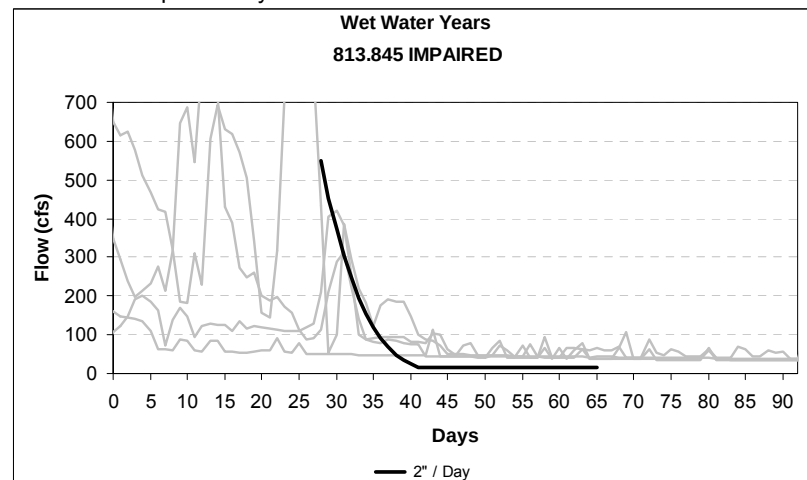
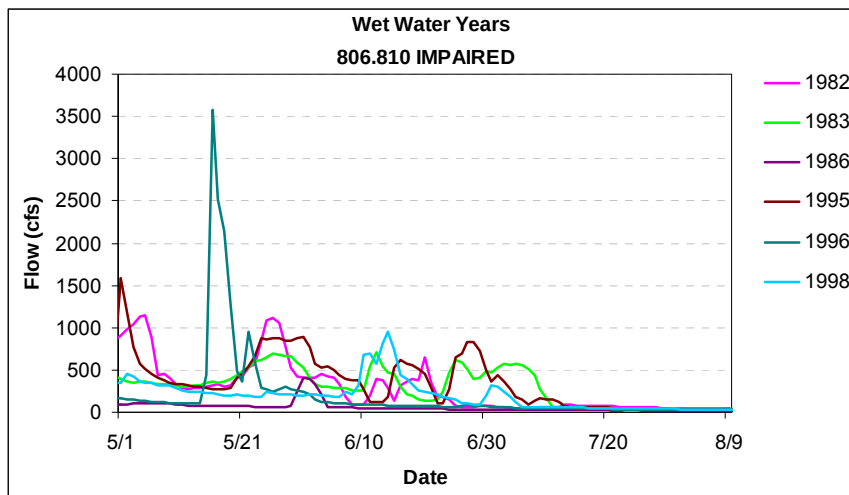


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).

Middle Fork American River – MF36.2 – Above Normal Water Years

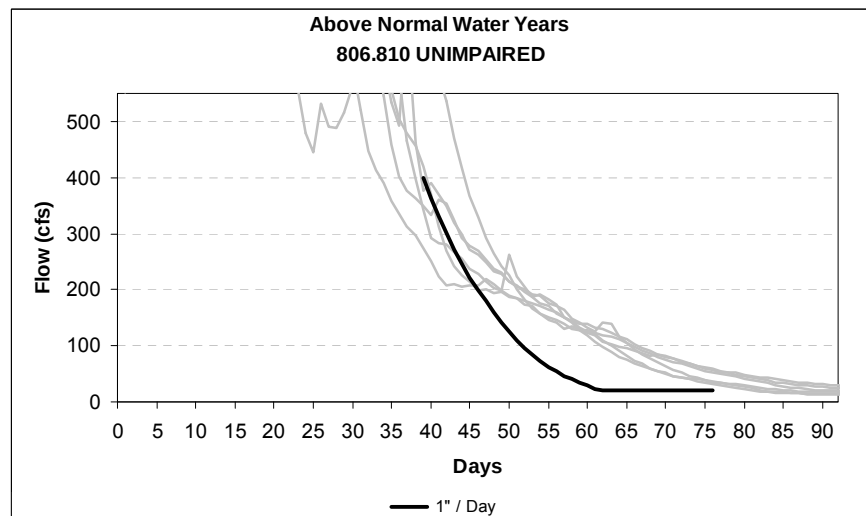
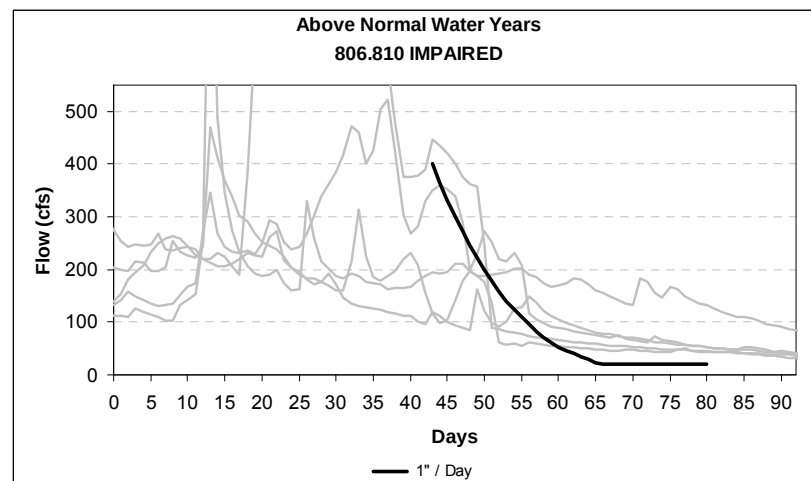
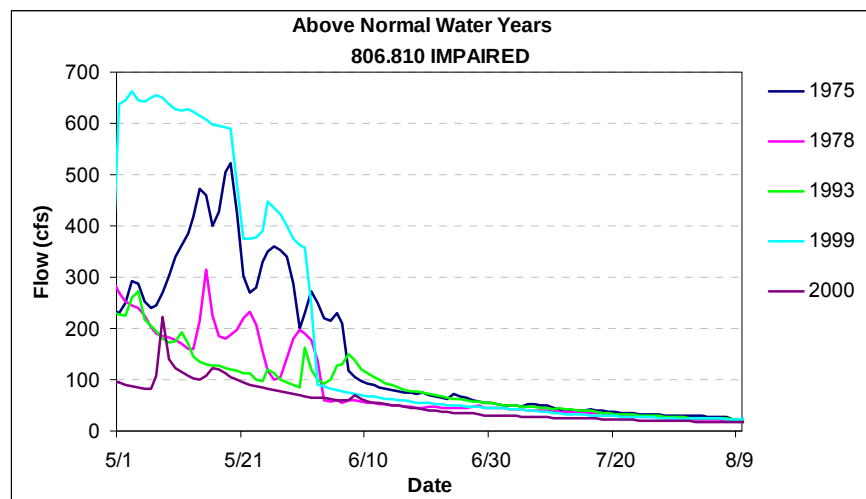


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).
Middle Fork American River MF26.2 - Wet Water Years

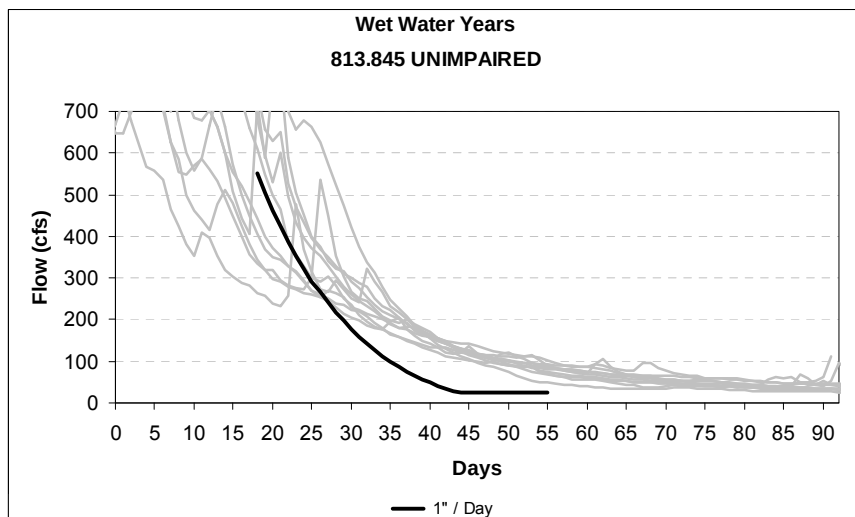
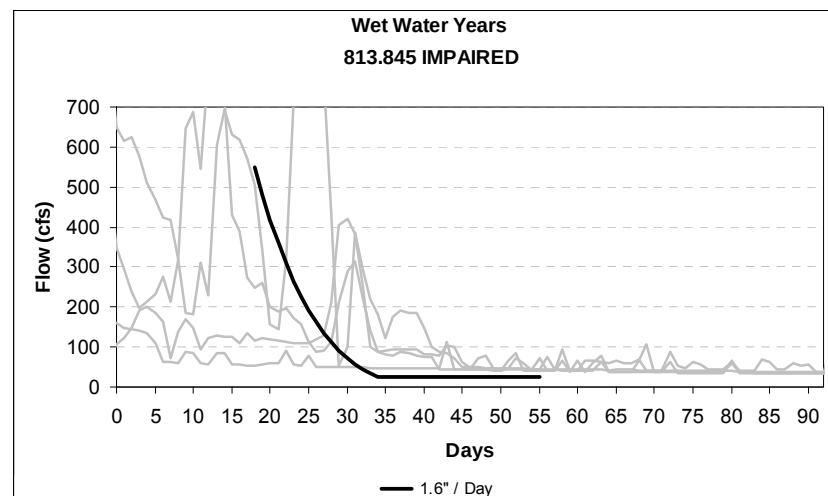
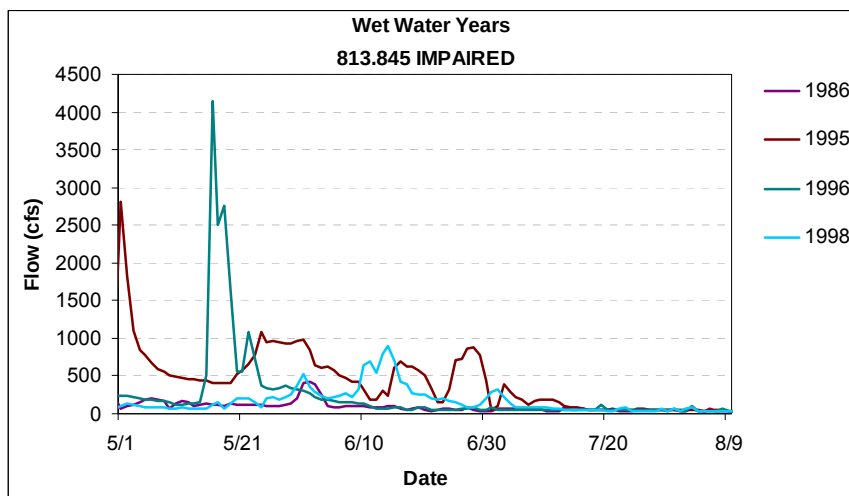


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).

Middle Fork American River – MF26.2 – Above Normal Water Years

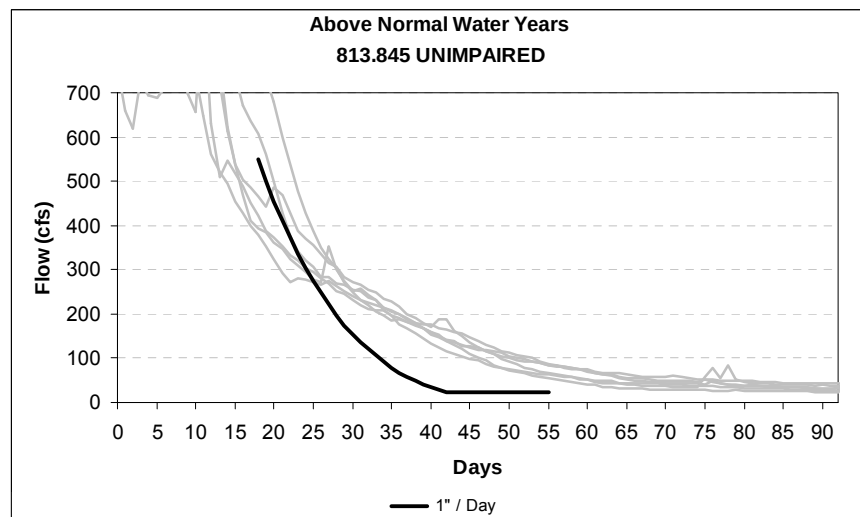
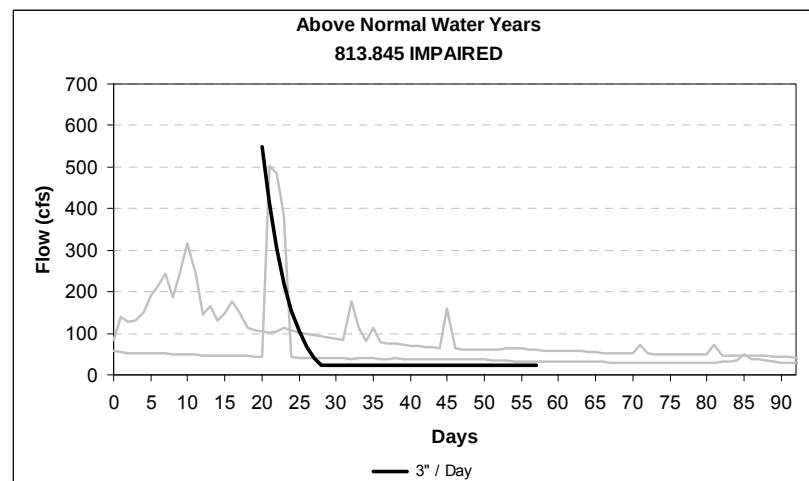
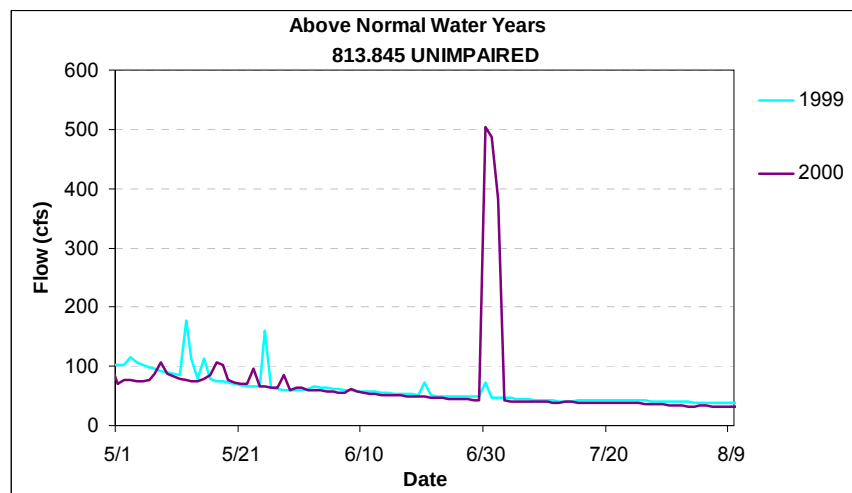


**Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).
Rubicon River – R25.7 – Wet Water Years**

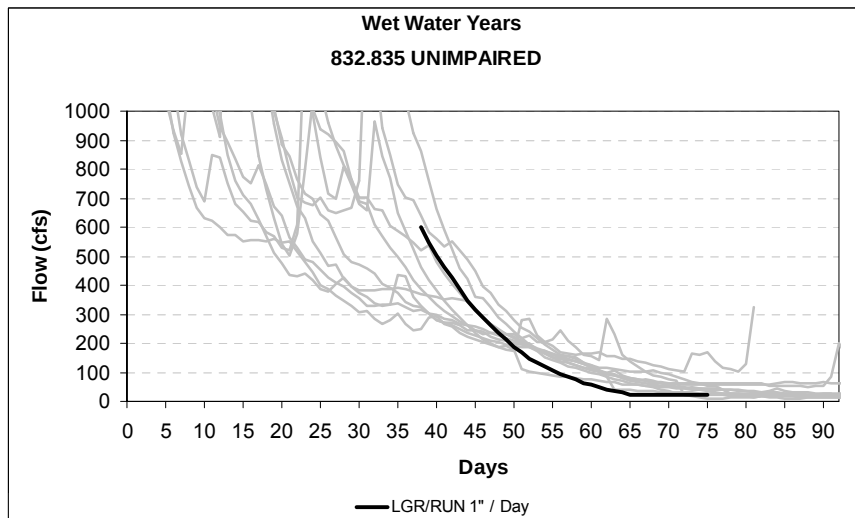
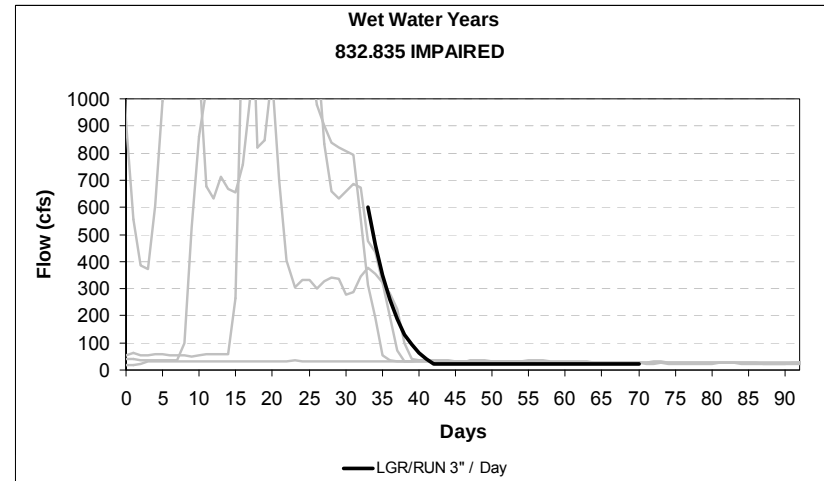
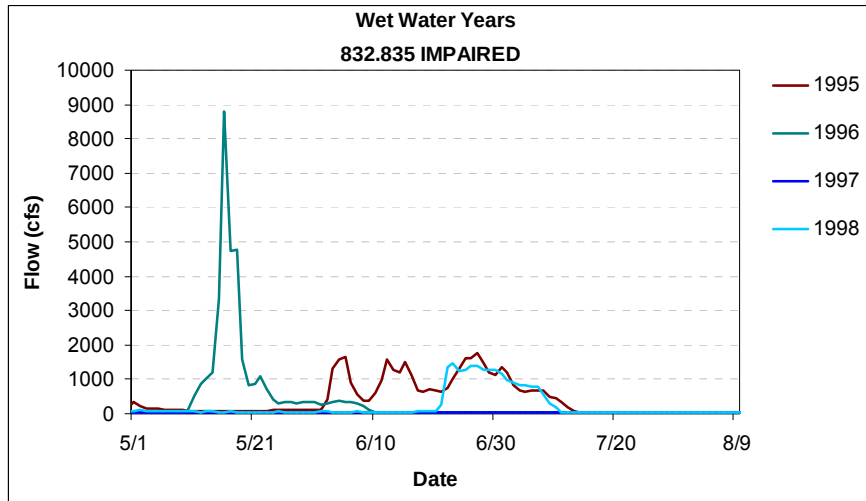
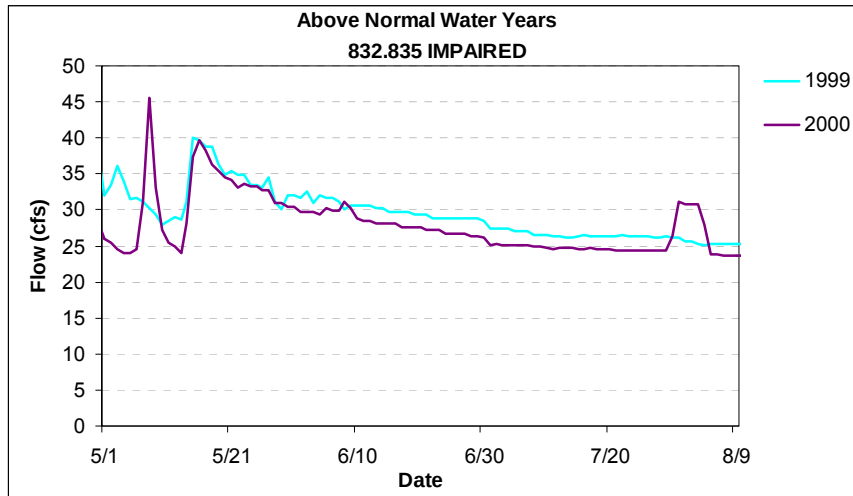


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).
Rubicon River – R25.7 – Above Normal Water Years



No 'high' flows occurred during the time of spring seed release.

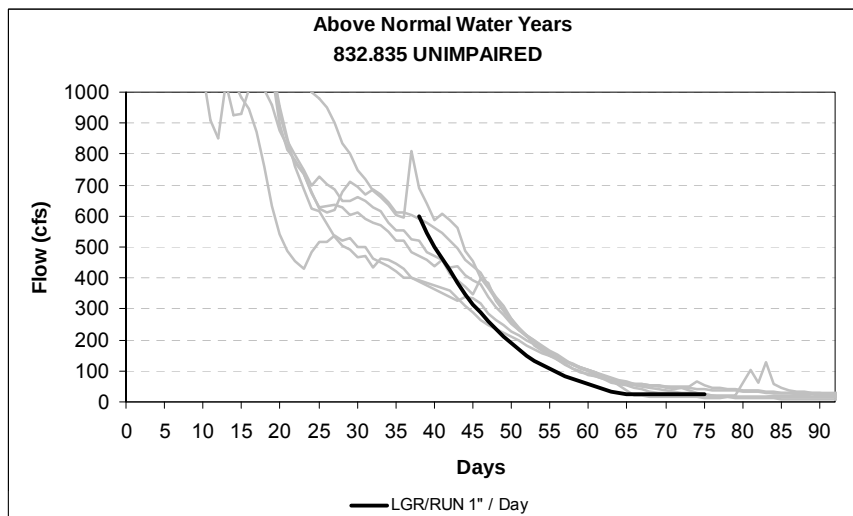


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).
Rubicon River – R20.9 – Wet Water Years

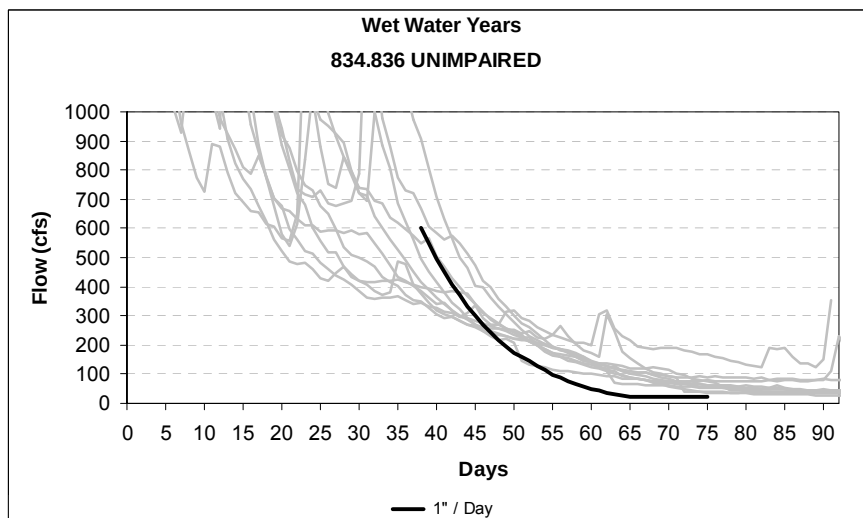
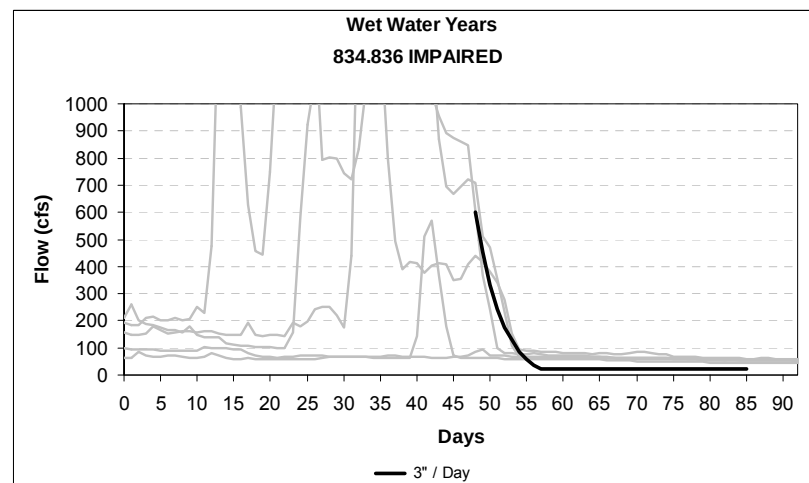
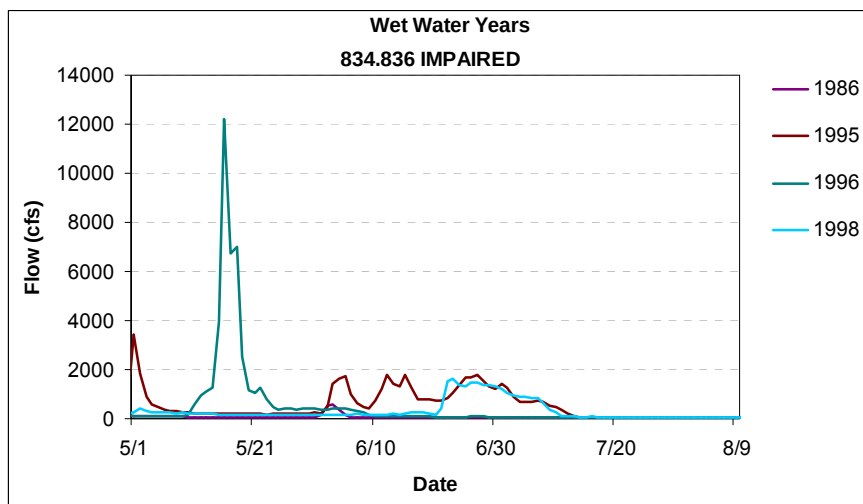


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).
Rubicon River – R20.9 – Above Normal Water Years

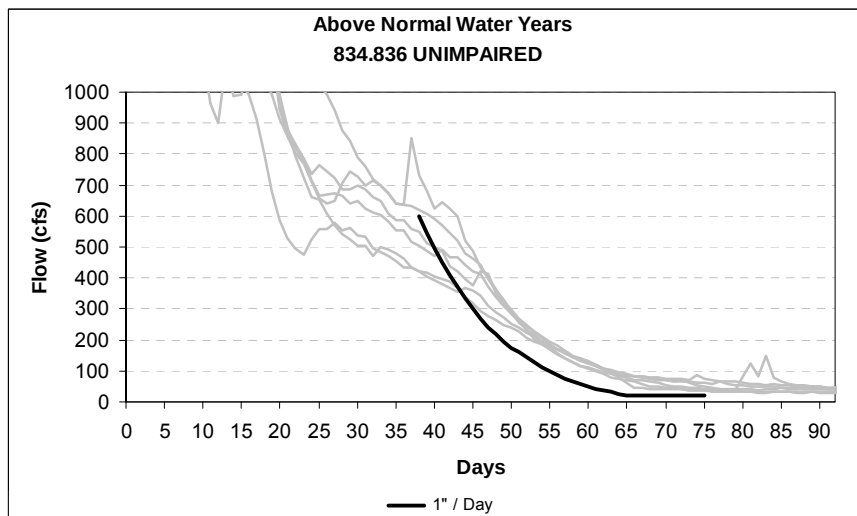
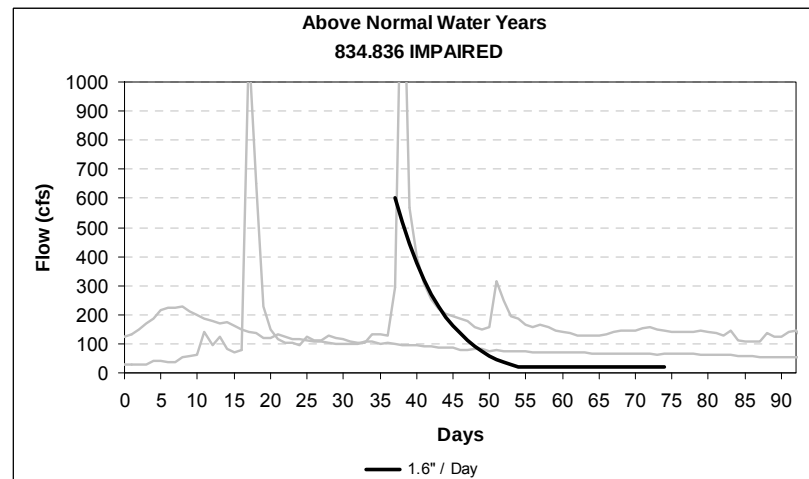
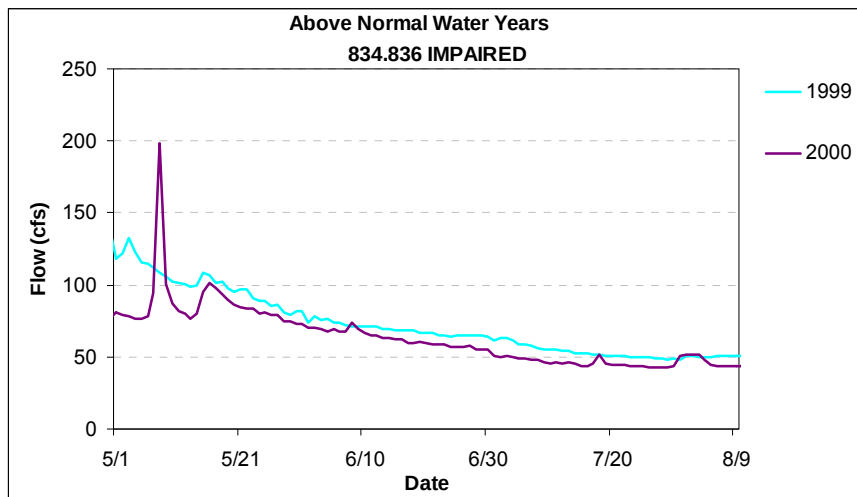


**Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).
Rubicon River – R3.5 – Wet Water Years**

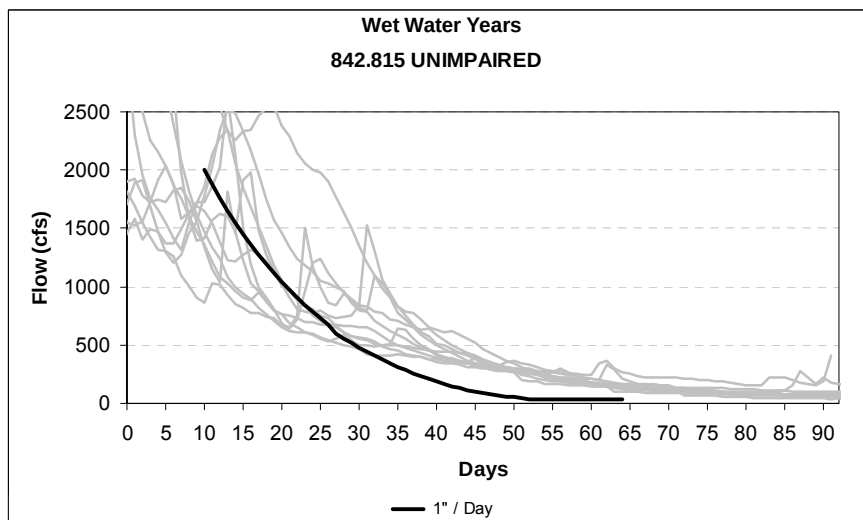
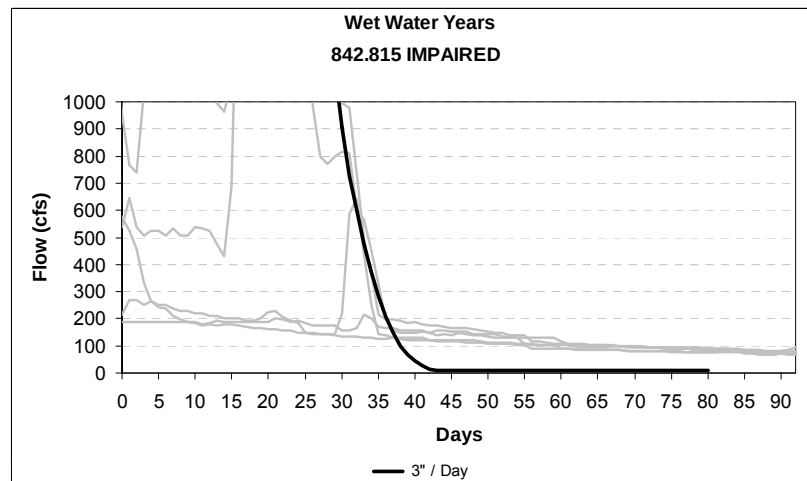
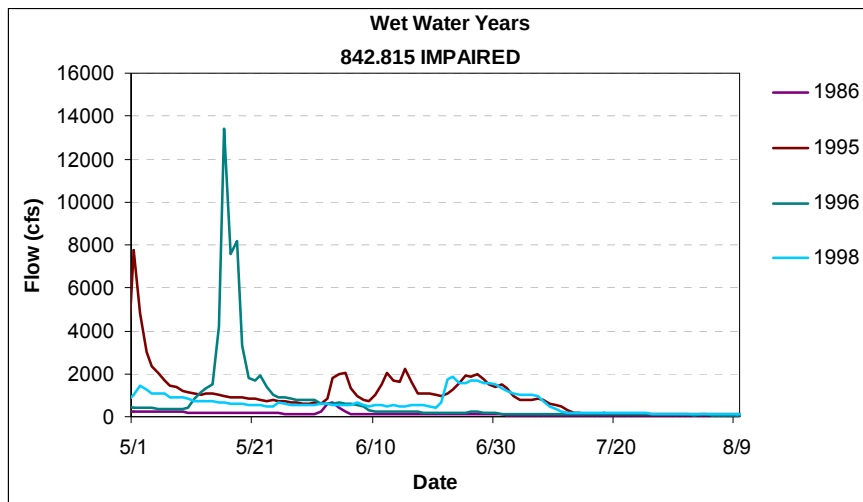


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).
Rubicon River – R3.5 – Above Normal Water Years

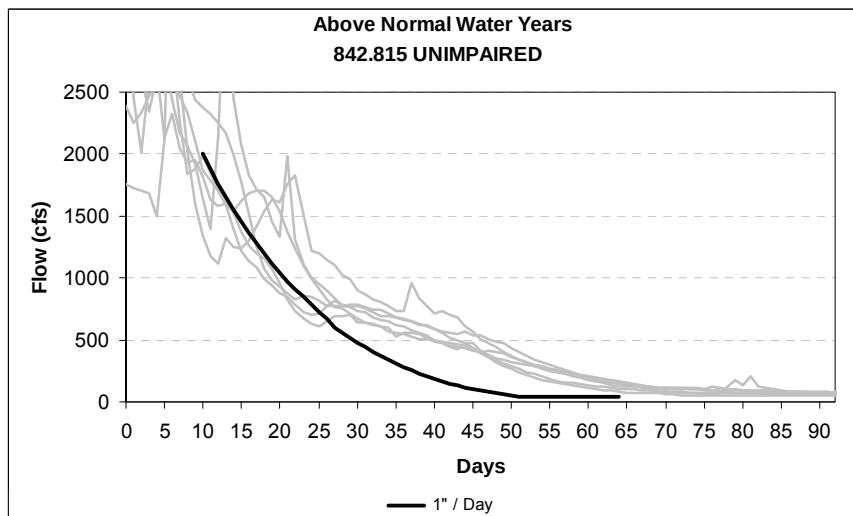
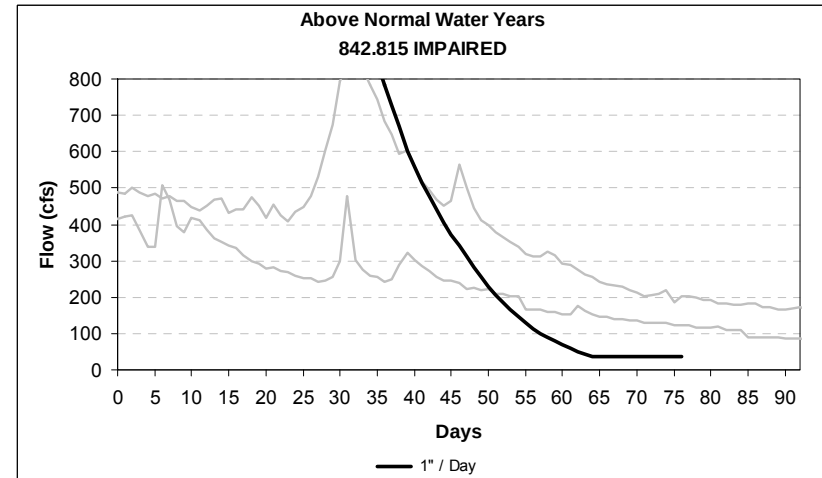
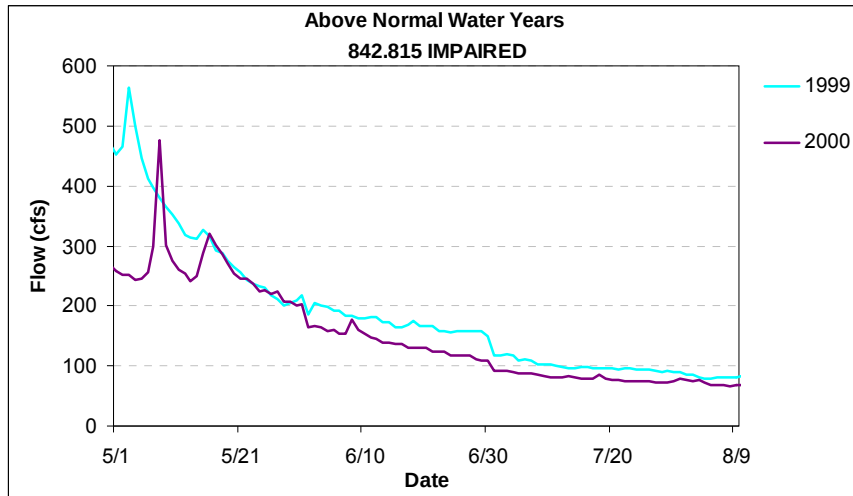


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).

Duncan Creek – D6.3 – Wet Water Years

No tree cores were collected from this site. Recession rates were evaluated for all years with flows potentially suitable for recruitment.

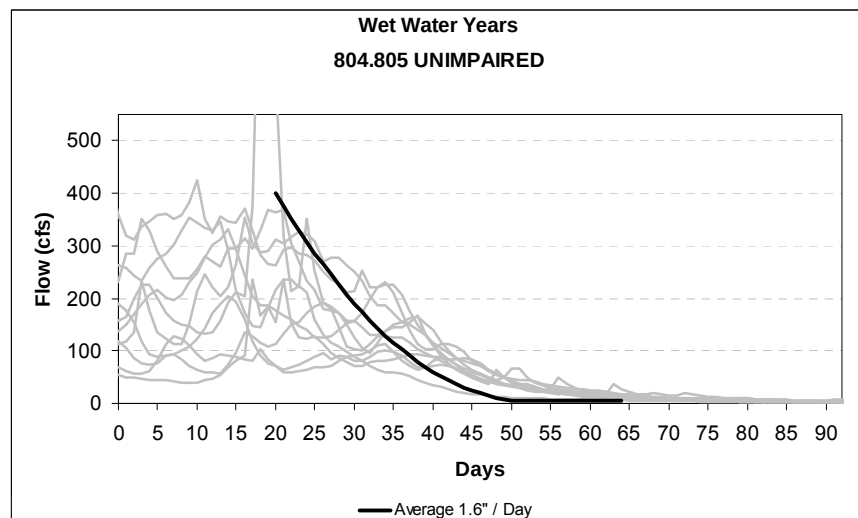
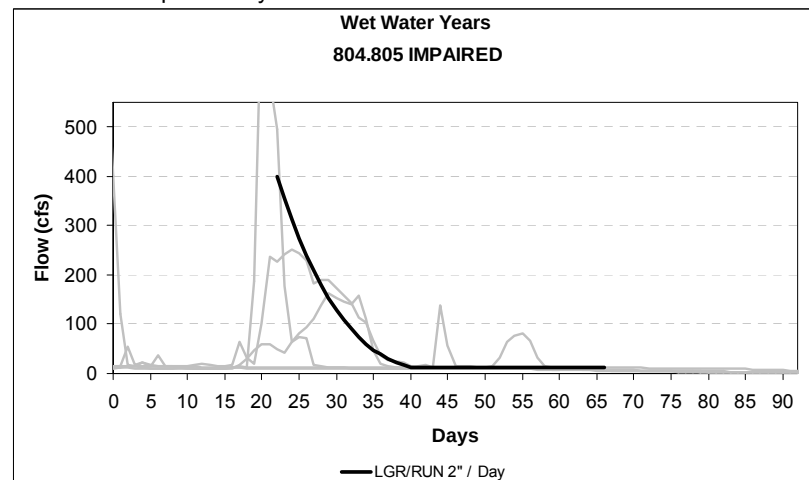
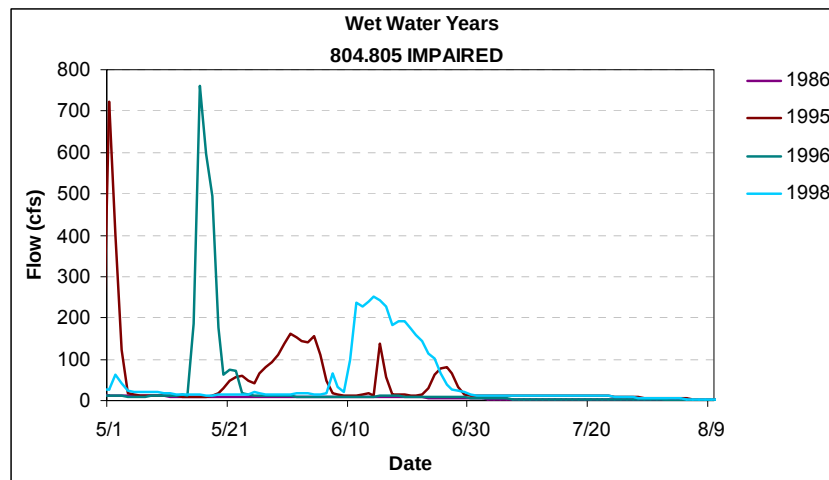


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).
Duncan Creek – D6.3 – Above Normal Water Years

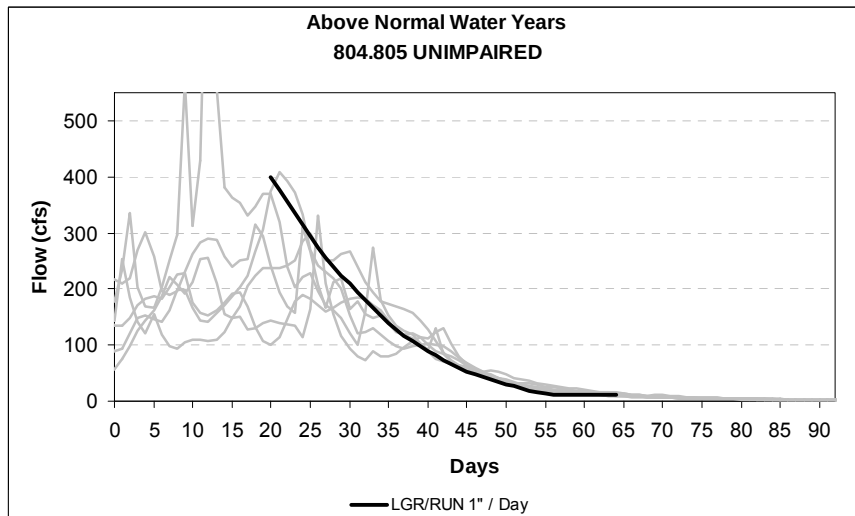
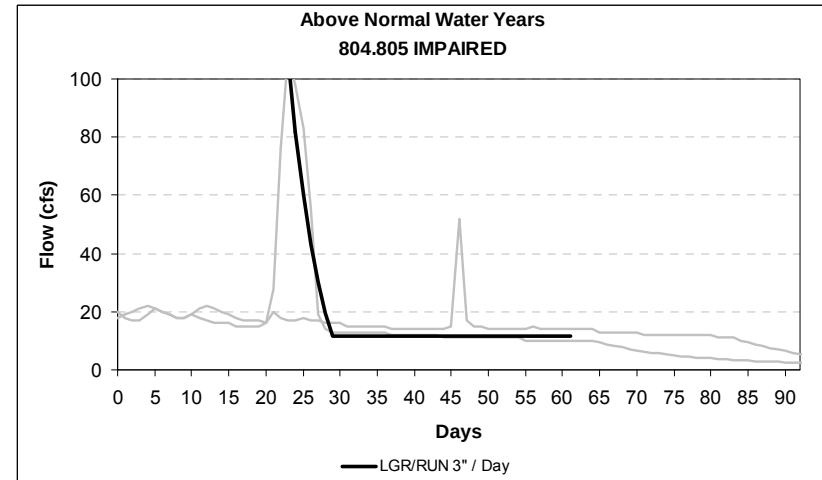
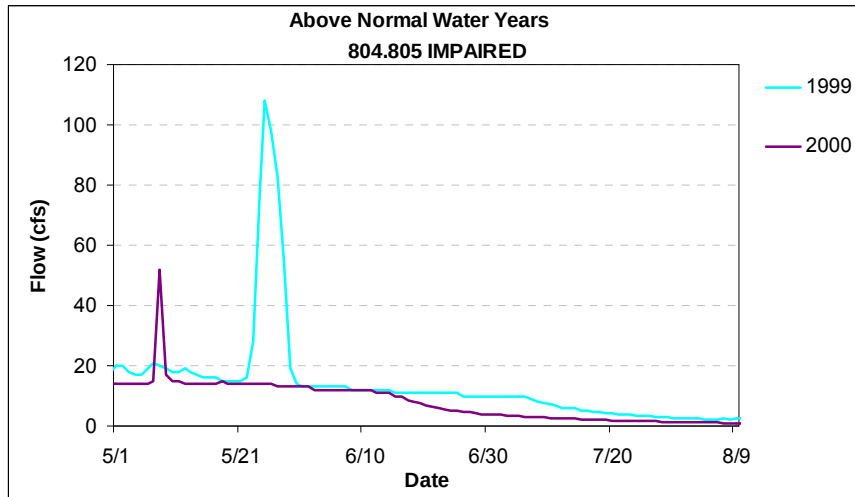


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).

Duncan Creek - D0.1 – Wet Water Years

No tree cores were collected from this site. Recession rates were evaluated for all years with flows potentially suitable for recruitment.

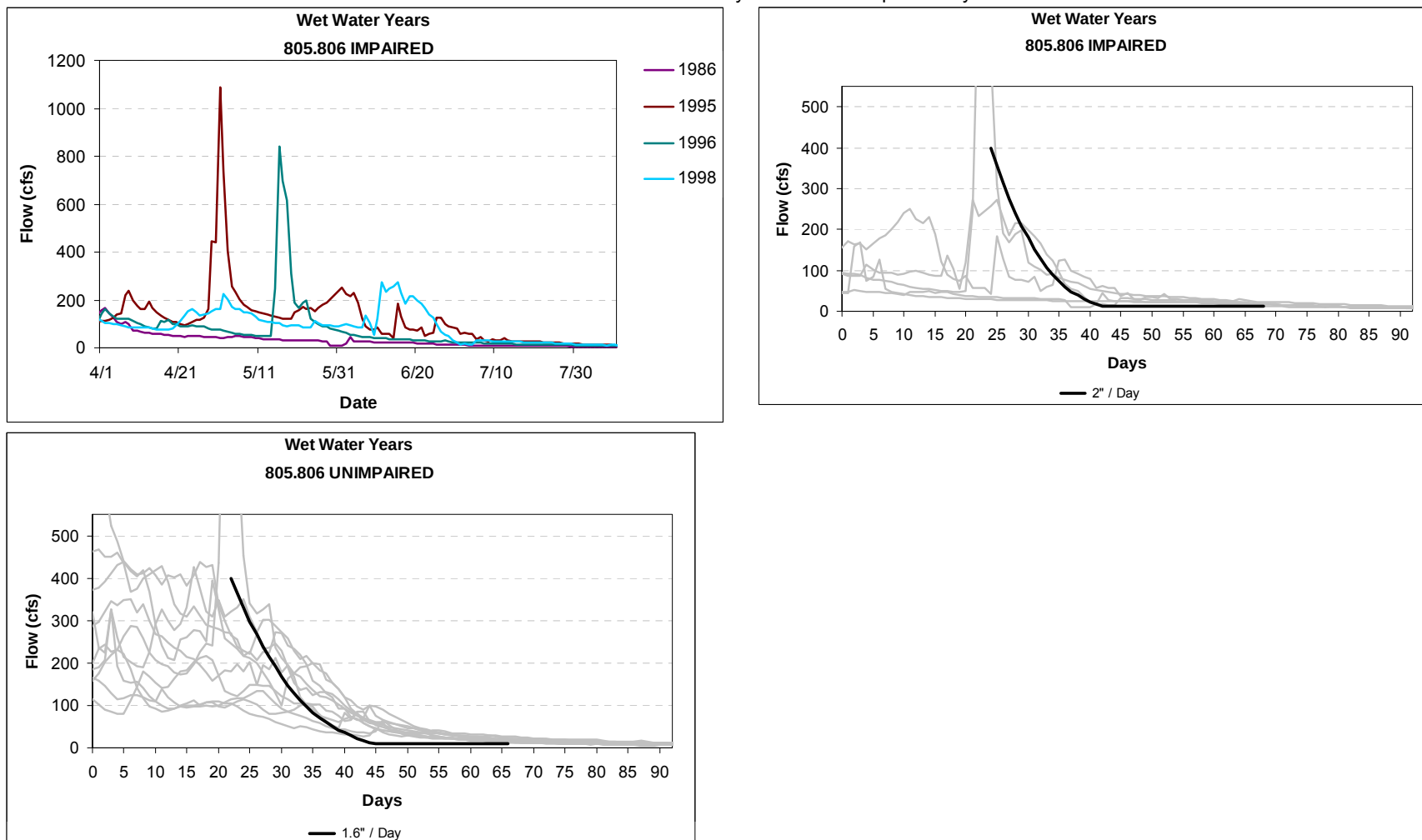


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).

Duncan Creek - D0.1 – Above Normal Water Years

No tree cores were collected from this site. Recession rates were evaluated for all years with flows potentially suitable for recruitment.

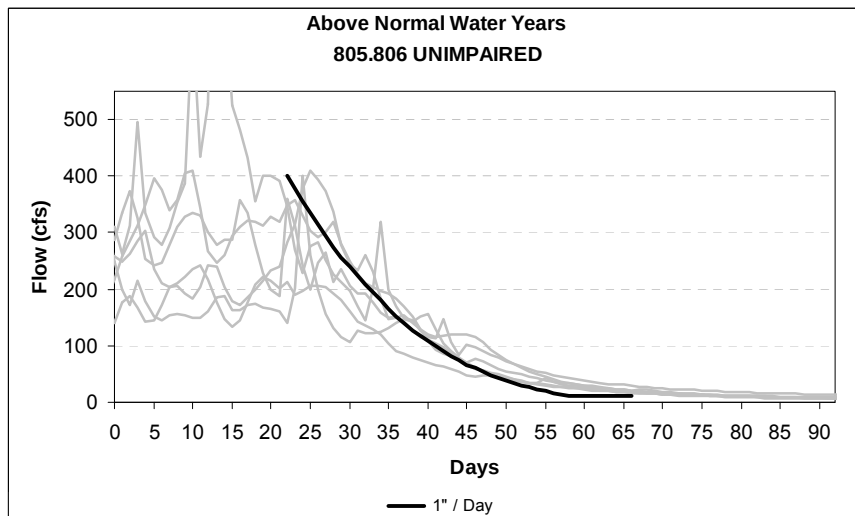
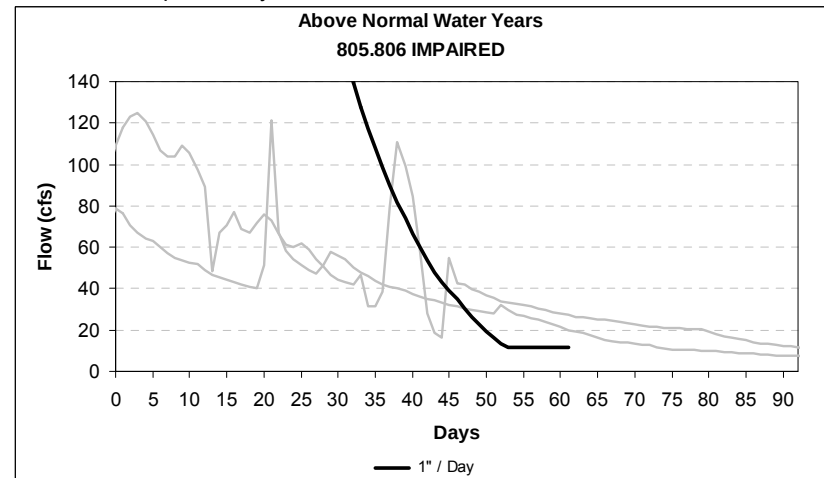
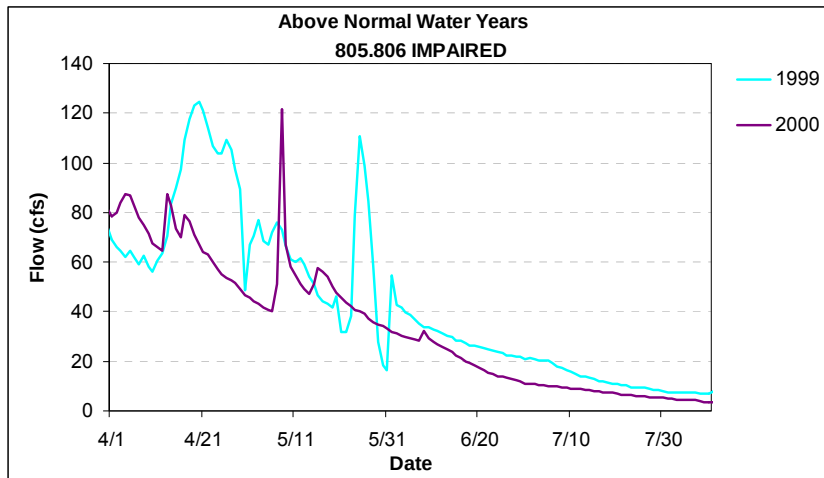
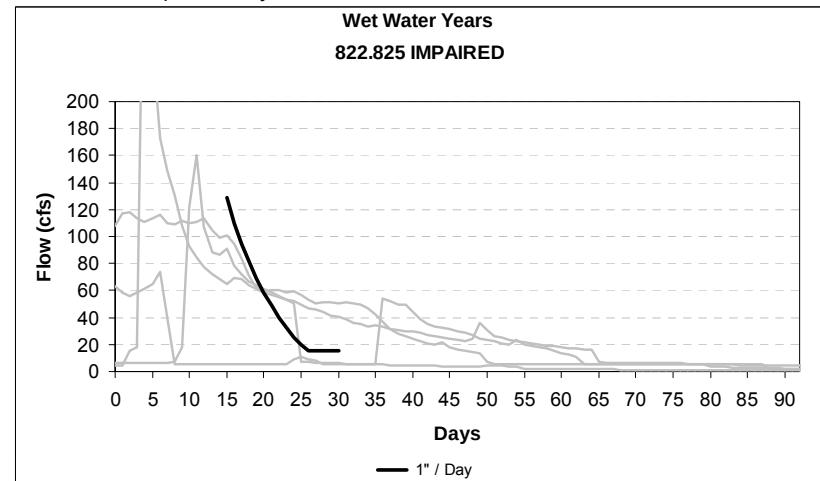
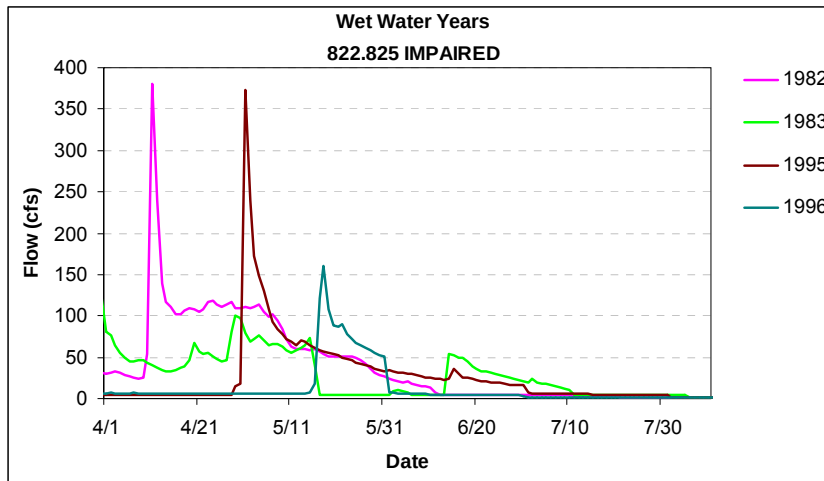


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).

South Fork Long Canyon Creek – SFLC2.3 – Wet Water Years

No tree cores were collected from this site. Recession rates were evaluated for all years with flows potentially suitable for recruitment.



No potentially suitable flows occurred under impaired flow conditions during above normal water years.

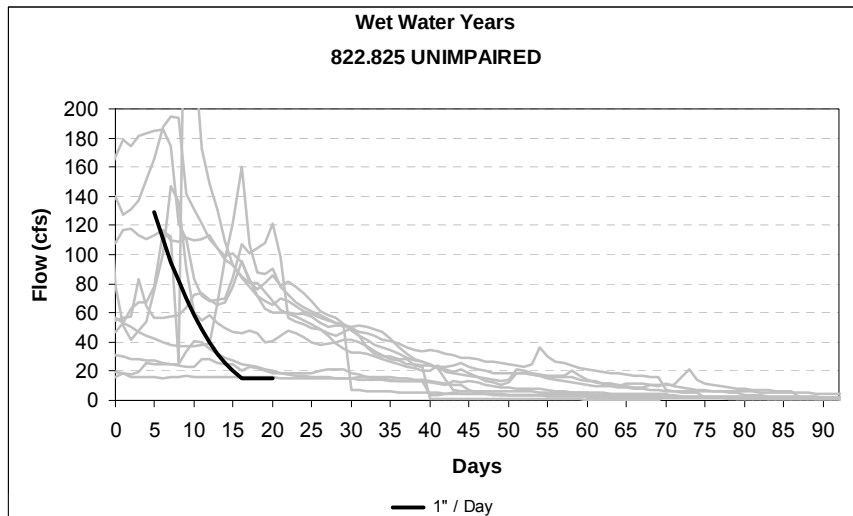
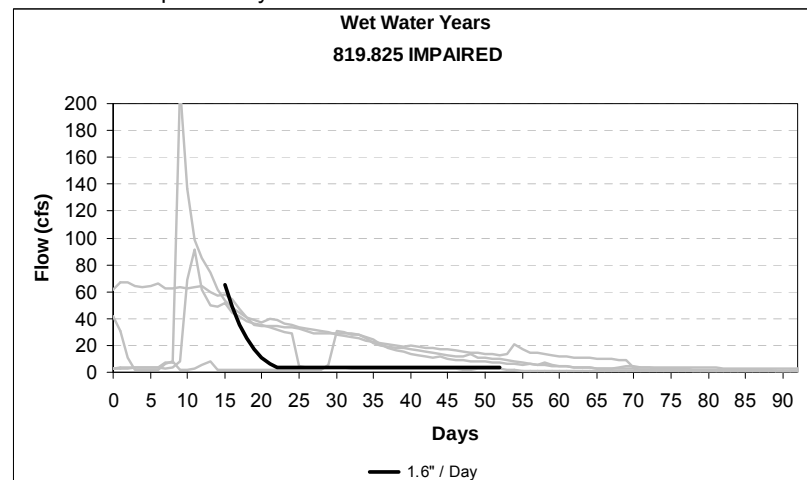
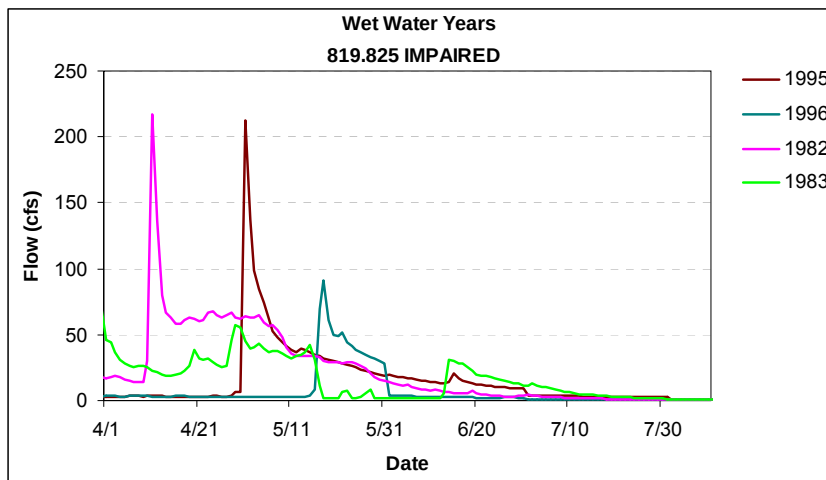


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).

North Fork Long Canyon Creek – NFLC1.9 – Wet Water Years

No tree cores were collected from this site. Recession rates were evaluated for all years with flows potentially suitable for recruitment.



No potentially suitable flows occurred under impaired flow conditions during above normal water years.

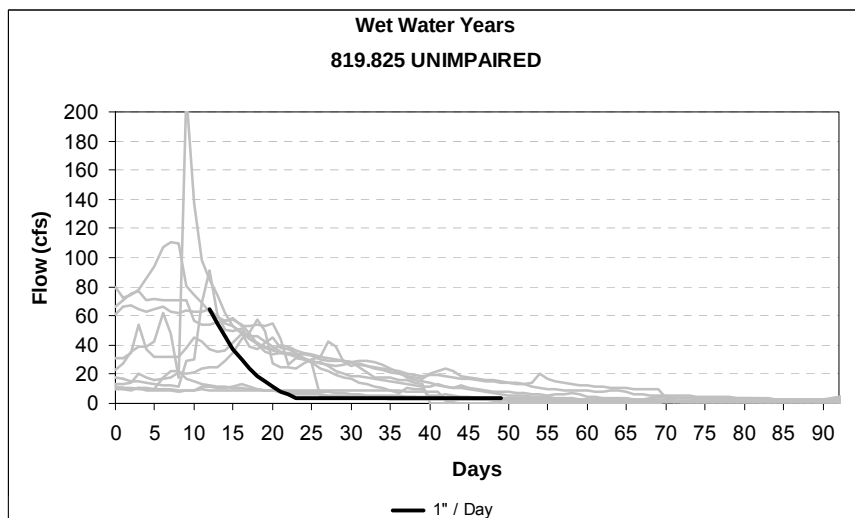


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).

Long Canyon Creek – LC9.0 – Wet Water Years

No tree cores were collected from this site. Recession rates were evaluated for all years with flows potentially suitable for recruitment.

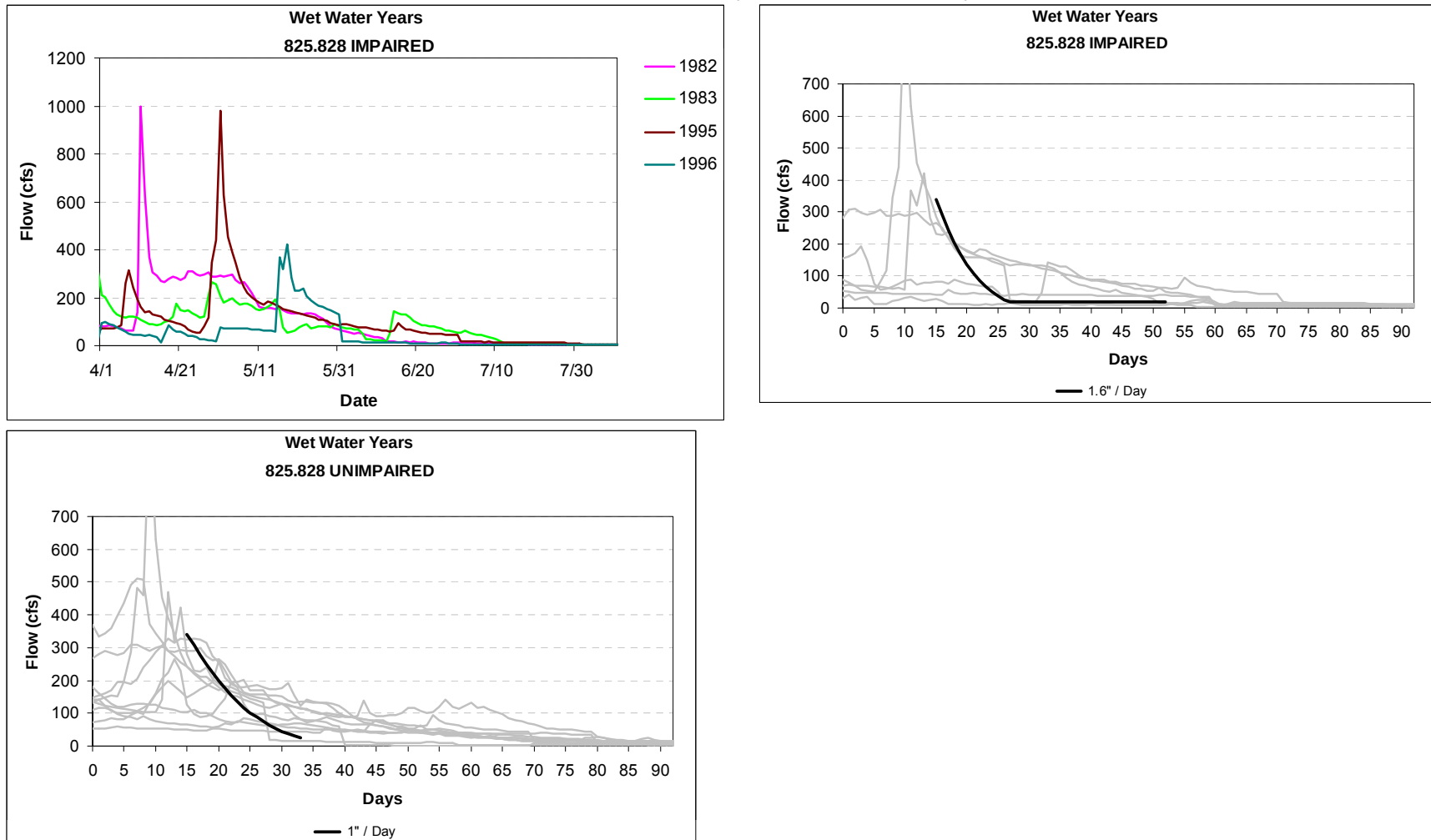


**Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).
Long Canyon Creek – LC9.0 – Above Normal Water Years**

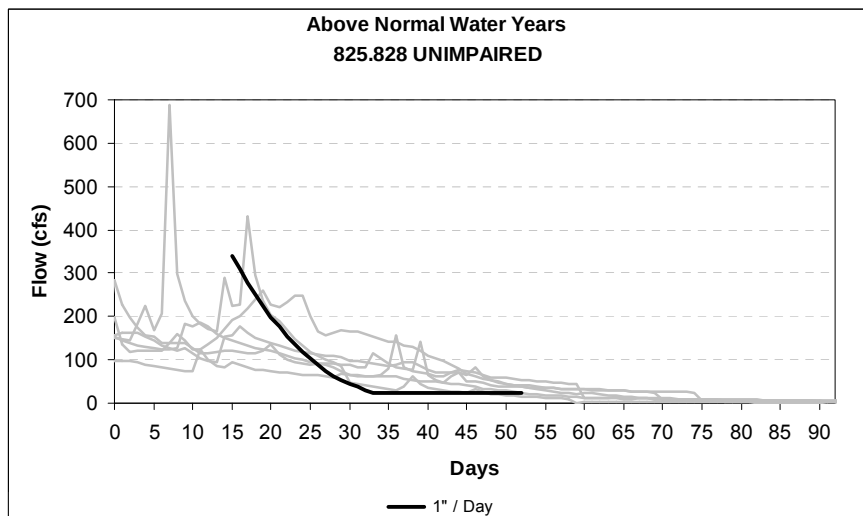
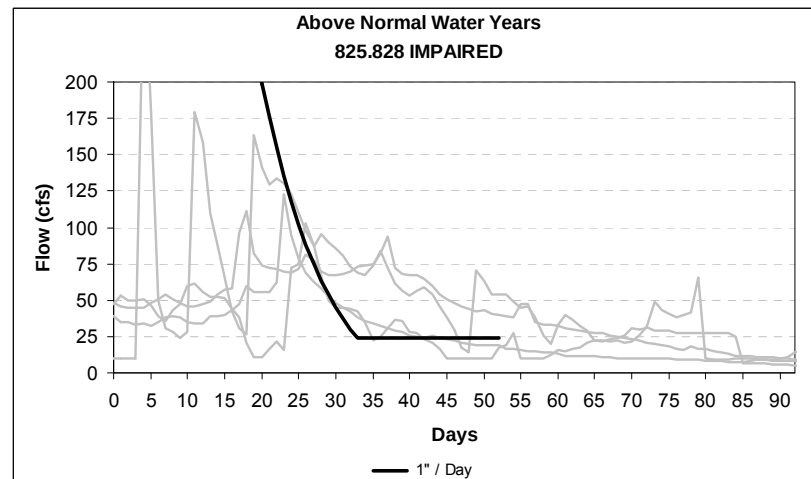
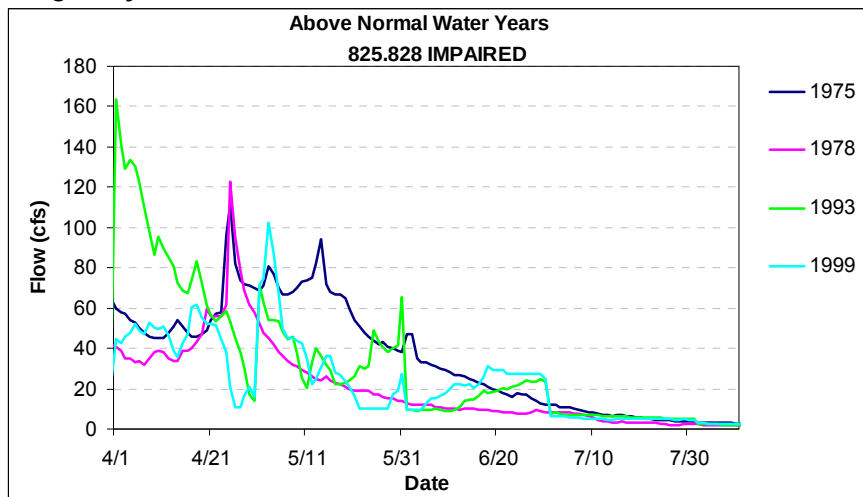


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).

Peaking Reach – MF14.1 – Wet Water Years

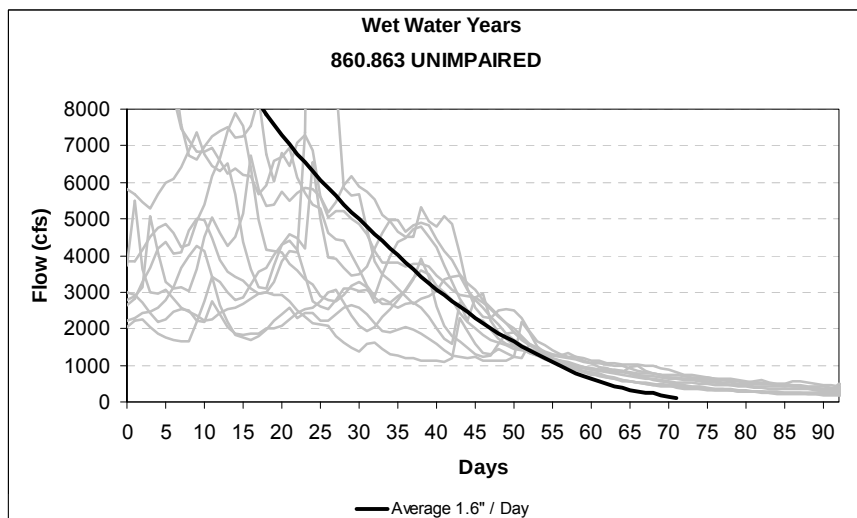
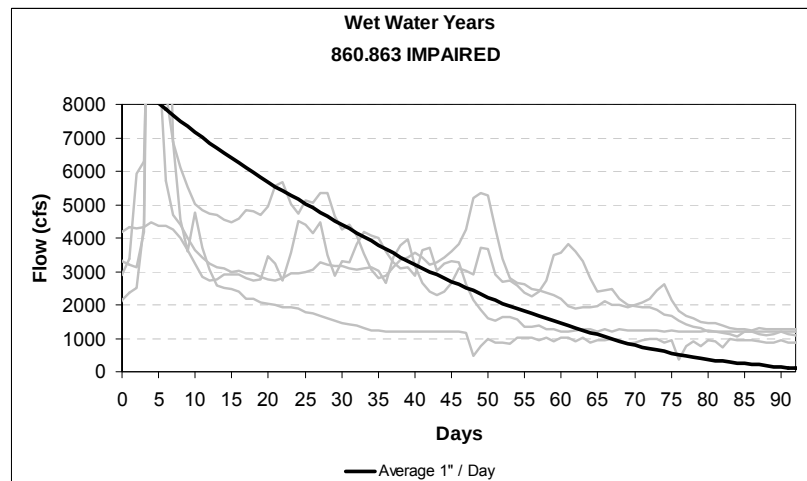
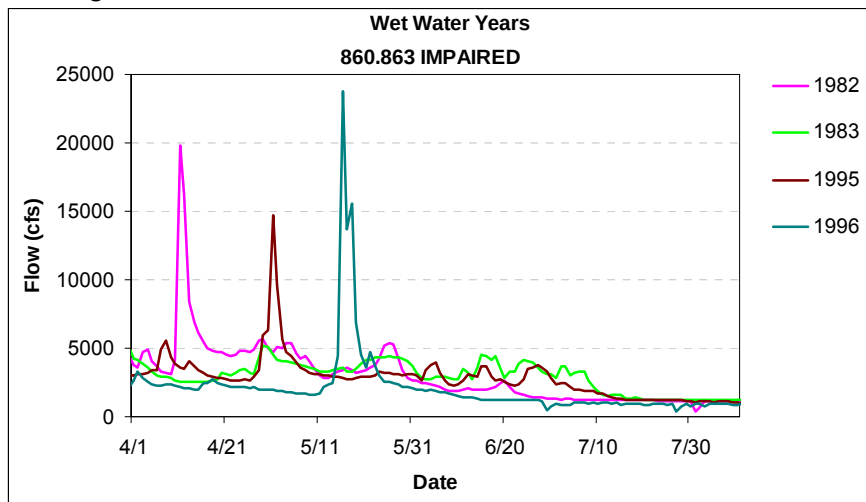


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).
Peaking Reach – MF14.1 – Above Normal Water Years

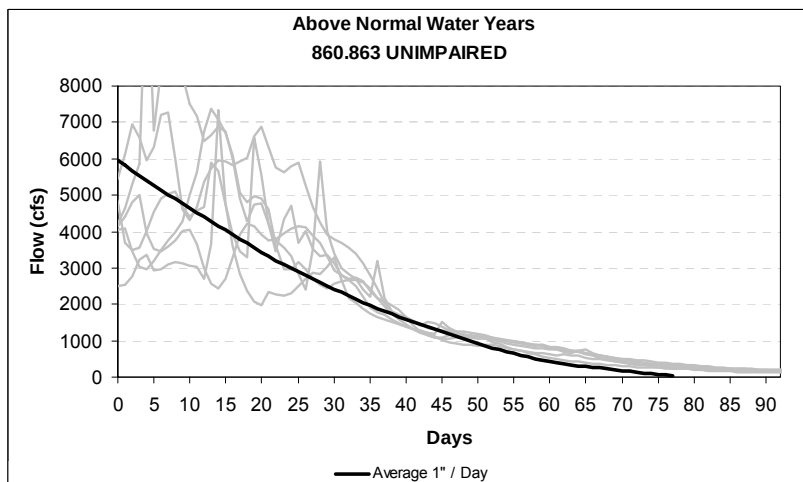
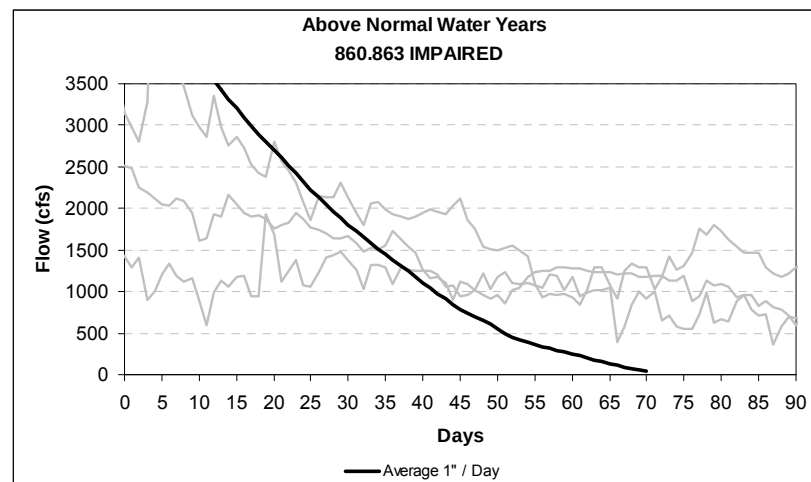
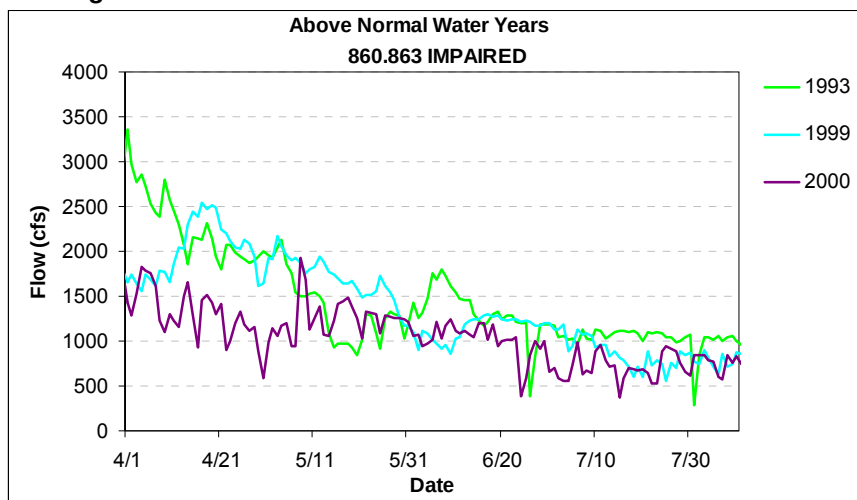


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).

Peaking Reach – MF4.8 – Wet Water Years

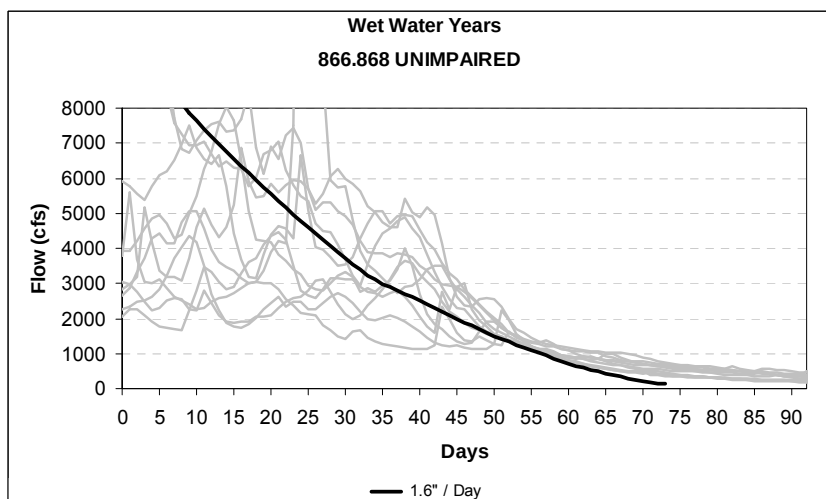
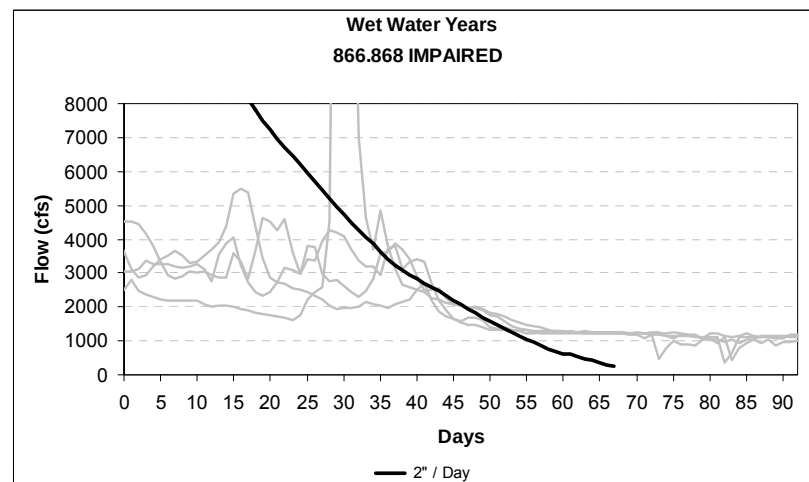
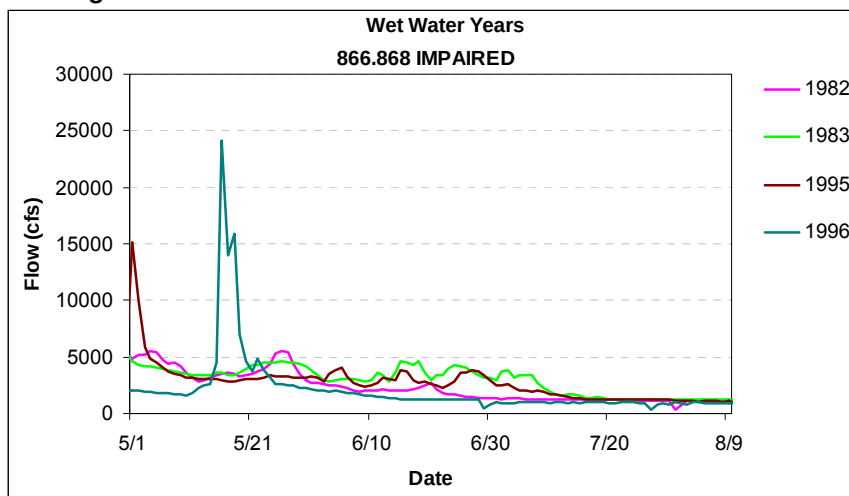
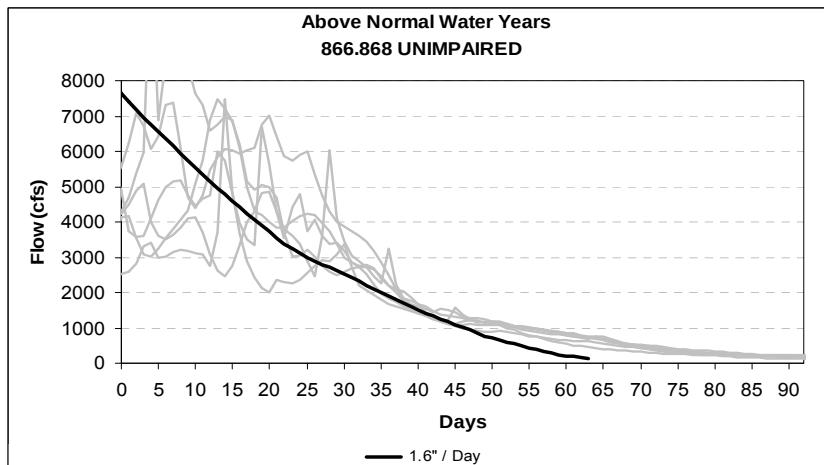
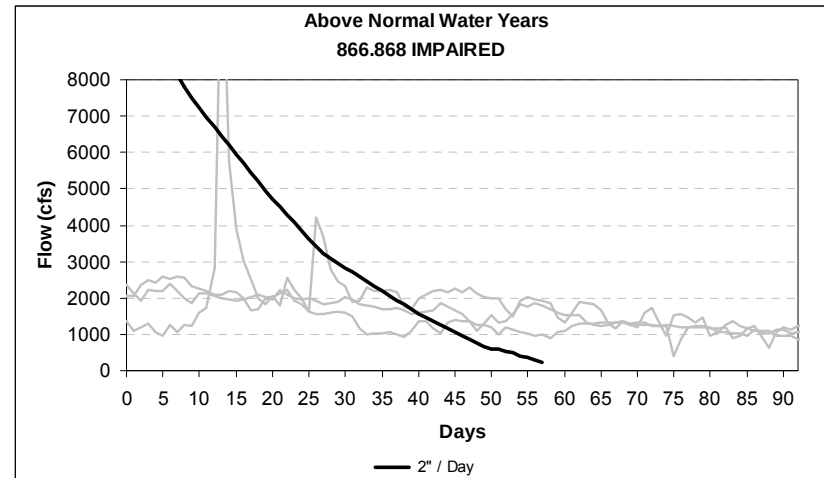
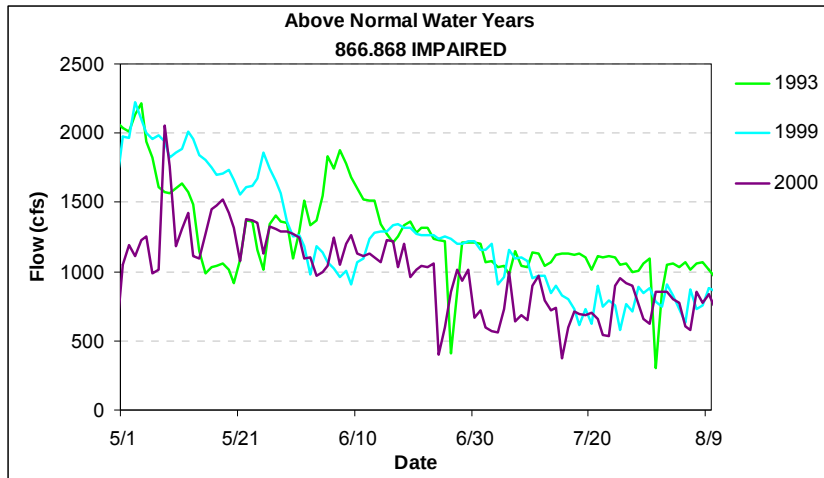


Figure A-39. Recession Rates during the Time of Spring Seed Release for Selected Years with High Flow Events on the Bypass and Peaking Reaches (continued).
Peaking Reach – MF4.8 – Above Normal Water Years



APPENDIX B

Riparian Vegetation and Hydrology Relationships – Bypass, Peaking, and Comparison Stream Reaches

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TABLES

Table B-1. Summary of Stage-Discharge Transects Used for Riparian Hydrology Analyses.

Site	Riparian Transect No.	AQ 1 Transect No.	Comments
Middle Fork American River from French Meadows Reservoir to Middle Fork Interbay			
MF44.7	0	1	The transects were not located at the same location. The transects were located in similar habitat types and had similar channel geometries.
	1	6	The transects were not located at the same location. The transects were located in similar habitat types and had similar channel geometries. For flows greater than 470 cfs, the modeled stage is over-estimated as the flow extended beyond the surveyed topography.
	2	6	The transects were not located at the same location. The transects were located in similar habitat types and had similar channel geometries. For flows greater than 470 cfs, the modeled stage is over-estimated as the flow extended beyond the surveyed topography.
MF36.2	1	16	Transects were located in the same location.
	2	15	The transects were not located at the same location. The transects were located in similar habitat types and had similar channel geometries.
	3	8	The transects were not located at the same location. The transects were located in similar habitat types and had similar channel geometries.
Middle Fork American River from Middle Fork Interbay to Ralston Afterbay			
MF26.2	1	3	The transects were not located at the same location. The transects were located in similar habitat types and had similar channel geometries.
	2	2D, Transect 8	Located within the 2-D site. The transects were located in similar habitat types and had similar channel geometries.
	3	1	The transects were not located at the same location. The transects were located in similar habitat types and had similar channel geometries.
Middle Fork American River Downstream of Ralston Afterbay			
MF14.1	No 2006 riparian transects were located in these 2-D AQ 1 - TSP instream flow modeling sites. All the riparian vegetation was mapped within the sites in 2008. The 2-D modeling results show inundation for the entire site and transects were selected to illustrate a profile view of the vegetation and inundation.		
MF4.8			
Rubicon River			
R25.7	1	13	The transects were not in the exact same location; but were located very close to one another.
	2	6	Transects were located in the same location.
	3	1	The transects were not located in the same location; but were located in close proximity to one another and had similar channel geometries. For flows greater than 1,987 cfs, the modeled stage is over-estimated as the flow extended beyond the surveyed topography.
R20.9	1	22	Riparian transect is located downstream from the AQ 1 - TSP instream flow reach. Transect 22 is the closest transect to the riparian transect, and is located in a similar habitat type. For flows greater than 3,000 cfs, the modeled stage is over-estimated as the flow extended beyond the surveyed topography.
	2	15	Riparian transect is not located in close proximity to any of the AQ 1 - TSP instream flow transects. Transect 15 is the closest transect to the riparian transect and is in a similar habitat type with a similar channel geometry.
	3	6	The transects were not located in the same location; but were located in close to one another in the same type of habitat and had similar channel geometries.

Table B-1. Summary of Stage-Discharge Transects Used for Riparian Hydrology Analyses (continued).

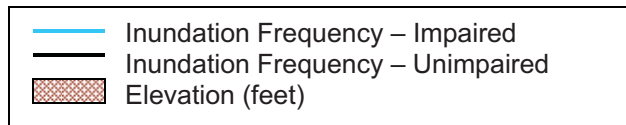
Site	Riparian Transect No.	AQ 1 Transect No.	Comments
R3.8	3		Transect selected within 2D site.
R3.5	2	19	The transects were not located at the same location. The transects were located in similar habitat types and had similar channel geometries.
R2.6	1	3	The transects were not located in the same location; but were located in close proximity to one another and had similar channel geometries. For flows greater than 5,000 cfs, the modeled stage is over-estimated as the flow extended beyond the surveyed topography.
South Fork Long Canyon Creek			
SFLC2.3	1	5	The transects were not located in the same location; but the transects were located close to one another and had similar channel geometries.
	2	8	Transects were located in the same location.
	3	19	The transects were not located in the same location. The transects were located in similar habitat types and had reasonably similar channel geometries.
SFLC4.2	1	1	The same transects were used for both the riparian and AQ 1 - TSP instream flow modeling.
	2	2	
	3	3	
North Fork Long Canyon Creek			
NFLC1.9	0	4	Transects were located in the same location.
	1	1	Transects were not located in the same location; but AQ 1 - TSP T1 was the nearest transect to the riparian transect. Channel geometries were similar for the two transects.
	2	1	Transects were located in the same location.
Long Canyon Creek			
LC9.0	1	16	The transects were not at the exact same location; but were located very close to one another.
	2	10	The transects were not at the exact same location; but were located very close to one another.
	3	2	The transects were not located at the same location. The transects were located in similar habitat types and had similar channel geometries.
Duncan Creek			
D6.3	1	16	Riparian transect was not located in the AQ 1 - TSP instream flow modeling site. Transect 16 was located in a similar mesohabitat type and had similar channel geometry to the riparian transect.
	2	15	Riparian transect and AQ 1 - TSP instream flow modeling site are located in the same step-pool mesohabitat unit, but are in different locations. Transect 15 was located nearest to the riparian transect and had a similar channel geometry to the riparian transect.
	3	4	Transects were located in the same location.
D9.0	1	1	The same transects were used for both the riparian and AQ 1 - TSP instream flow modeling.
	2	2	
	3	3	
North Fork of the Middle Fork American River			
NFMF2.3	1	1	The same transects were used for both the riparian and AQ 1 - TSP instream flow modeling. For flows greater than 2,500 cfs on Transect 2, the modeled stage is over-estimated as the flow extended beyond the surveyed topography.
	2	2	
	3	3	
North Fork American River			
NF31.3	1	1	The same transects were used for both the riparian and AQ 1 - TSP instream flow modeling.
	2	2	
	3	3	
	4	4	
NF53.7	1	1	The same transects were used for both the riparian and AQ 1 - TSP instream flow modeling.
	2	2	
	3	3	

FIGURES

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches.

Legend

Inundation¹



Vegetation

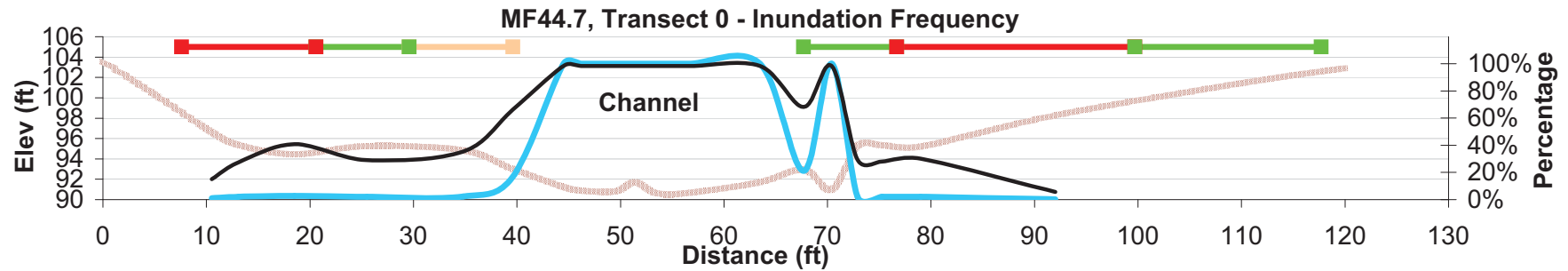
Only dominant species are included in vegetation communities shown on graphs. Sub-dominant species are listed in the tables below the first transect graph for each study site.



¹ All flows were modeled up to the unimpaired Q2 magnitude flow. Inundation frequencies are only shown for the elevations that are inundated by flows less than or equal to the unimpaired Q2 magnitude flow. Refer to Table A-1 for recurrence interval flows for each study site.

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Middle Fork American River MF44.7



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, PSME, CADE27		Boulder, bedrock	Riparian vegetation is supported by a seep.
ALRH2	CADE27	Sand	
MICA3	DAPE, LOOB2, ROCU, ALRH2, MIGU	Sand	
ALRH2	DAPE, CHBO2, Mimulus spp.	Cobble, gravel	
ALRH2, CADE27, COSE16	PSME, RUPA	Gravel, sand	
ALRH2, AQFO, Ribes sp.	BOMA3, MICA3, RUPA	Gravel, cobble	

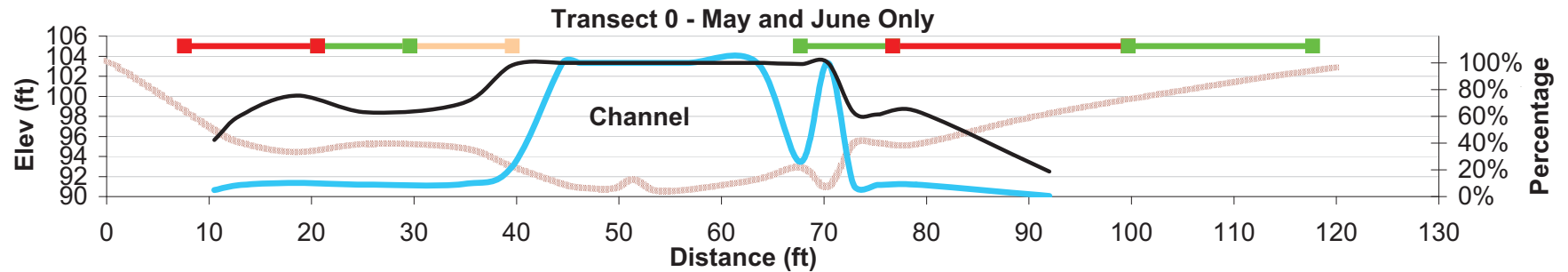
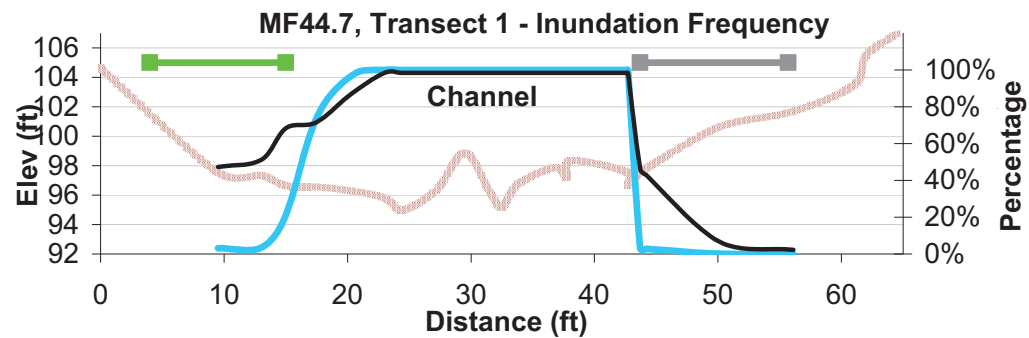
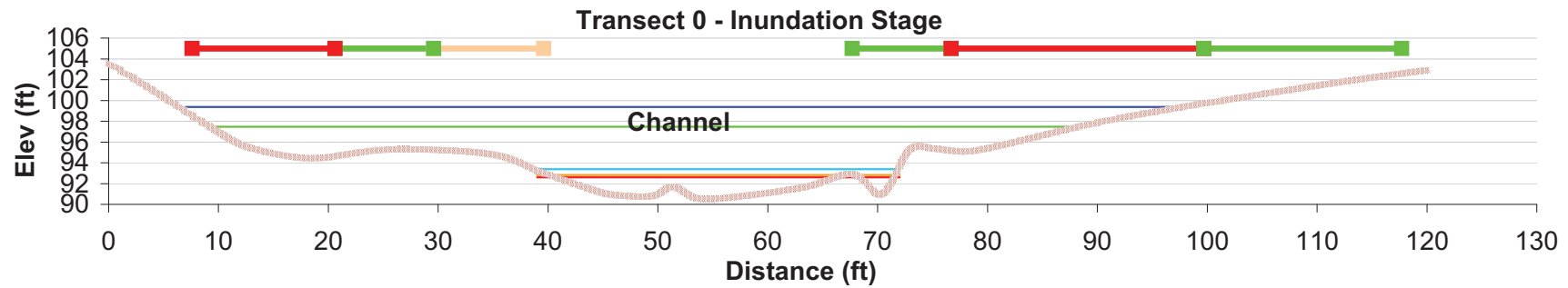


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2	MICA3, Carex spp., PSME/CADE27 (seedlings)	Cobble, boulder	
-	moss	Bedrock	

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Middle Fork American River MF44.7

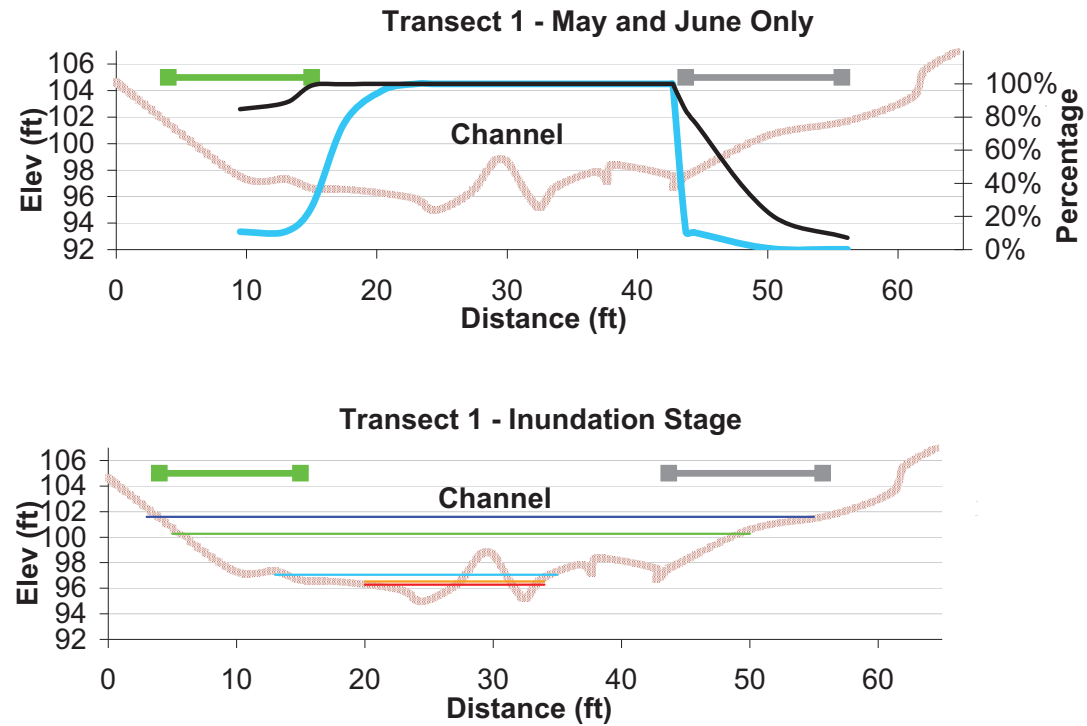
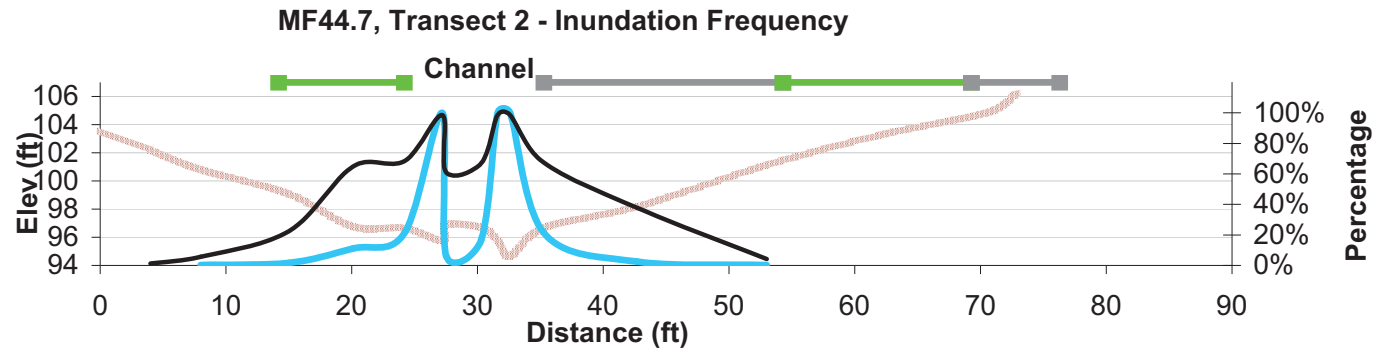


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Middle Fork American River MF44.7



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2	DAPE, MICA3, Carex spp., CADE27	Boulder, gravel	
-	-	Bedrock	
ALRH2	PSME, CADE27, MICA3, Carex spp.	Bedrock	
-	EPCA3, EPC1, PRVU, STAJ, CONU4	Bedrock	

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Middle Fork American River MF44.7

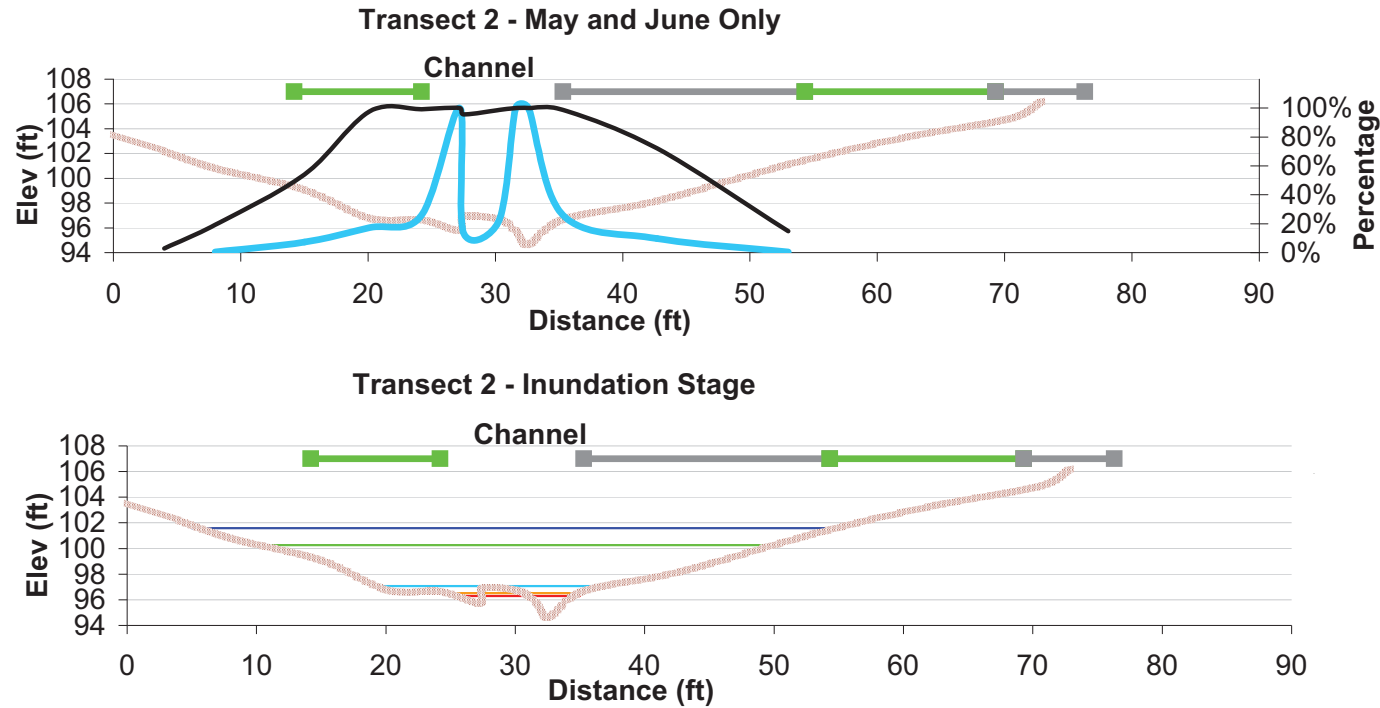


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Middle Fork American River MF44.7

Dominant and Sub-dominant Species Codes, Common Names, and Scientific Names Found Along Surveyed Transects.

Transect 0

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder		MICA3	<i>Mimulus cardinalis</i>	crimson monkeyflower
AQFO	<i>Aquilegia formosa</i>	western columbine		MIGU	<i>Mimulus guttatus</i>	seep monkeyflower
BOMA3	<i>Boykinia major</i>	large boykinia		Mimulus spp.	-	monkeyflower
CADE27	<i>Calocedrus decurrens</i>	incense cedar		PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir
CHBO2	<i>Chenopodium botrys</i>	Jerusalem oak		Ribes sp.	-	currant
COSE16	<i>Cornus sericea</i> ssp. <i>sericea</i>	redosier dogwood, American dogwood		ROCU	<i>Rorippa curvisiliqua</i>	curvepod yellowcress
DAPE	<i>Darmera peltata</i>	Indian rhubarb		RUPA	<i>Rubus parviflorus</i>	thimbleberry
LOOB2	<i>Lotus oblongifolius</i> var. <i>oblongifolius</i>	streambank trefoil				

Transect 1

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder		MICA3	<i>Mimulus cardinalis</i>	crimson monkeyflower
CADE27	<i>Calocedrus decurrens</i>	incense cedar		PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir
Carex spp.	-	sedge				

Transect 2

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder		EPCI	<i>Epilobium ciliatum</i>	hairy willow herb
CADE27	<i>Calocedrus decurrens</i>	incense cedar		MICA3	<i>Mimulus cardinalis</i>	crimson monkeyflower
Carex spp.	-	sedge		PRVU	<i>Prunella vulgaris</i>	self-heal
CONU4	<i>Cornus nuttallii</i>	mountain dogwood		PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir
DAPE	<i>Darmera peltata</i>	Indian rhubarb		STAJ	<i>Stachys ajugoides</i>	hedge nettle
EPCA3	<i>Epilobium canum</i> ssp. <i>latifolium</i>	California fuchsia				

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Middle Fork American River MF44.7

Relationship of Stage and Inundation Frequency (a) and Wetted Width and Inundation Frequency (b) with Flow.

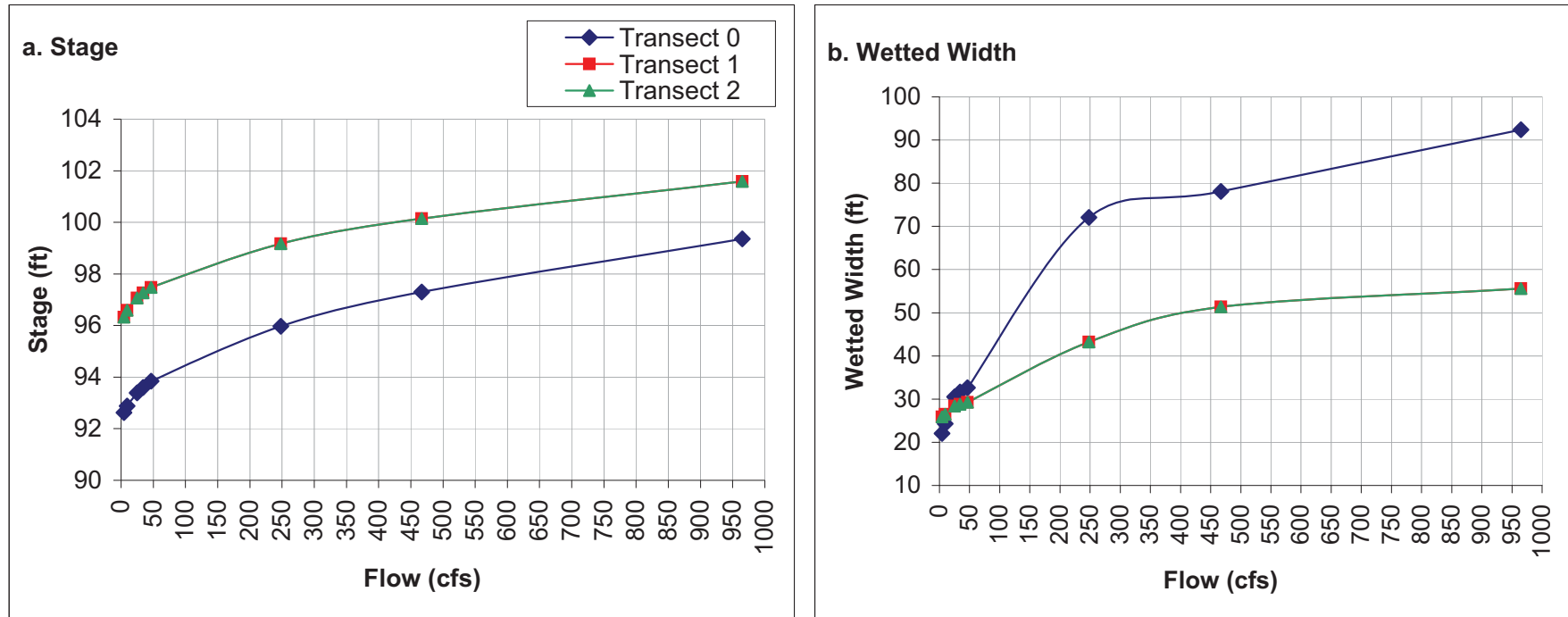
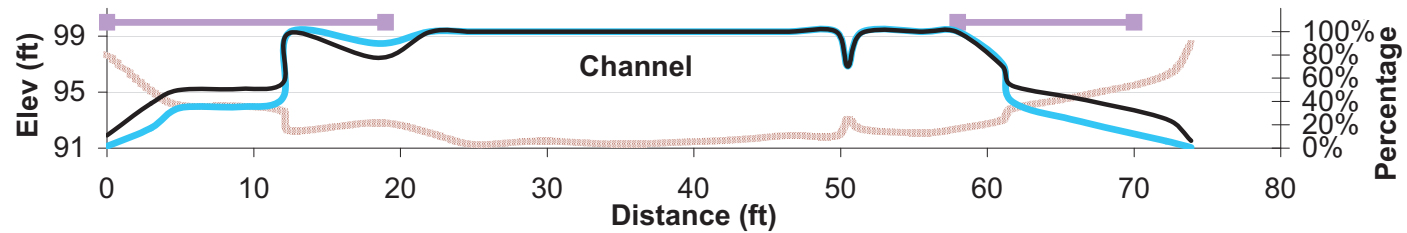


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Middle Fork American River MF36.2

MF36.2, Transect 1 - Inundation Frequency



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, SALU, SAME2/SAEX	SALA6, COSE16	Cobble, bedrock	
DAPE, ALRH2, SALA6	SALU, TODI, GNPA	Cobble, boulder	

Transect 1 - May and June Only

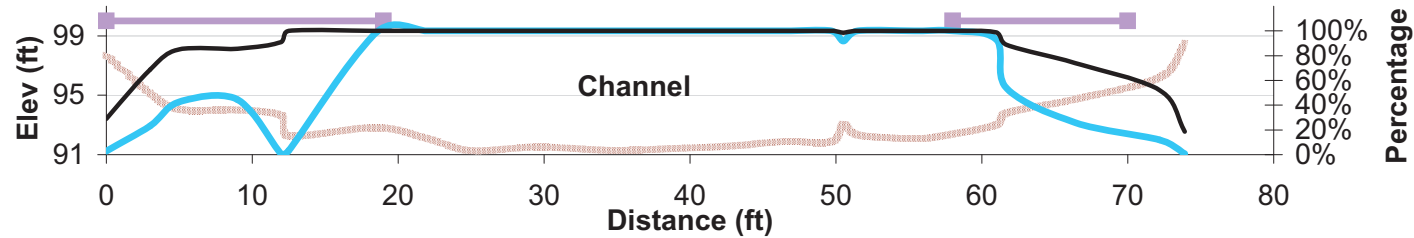
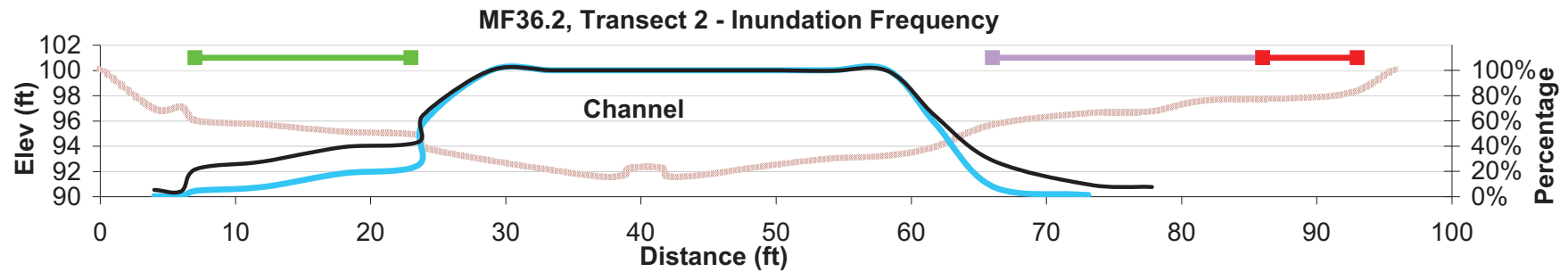
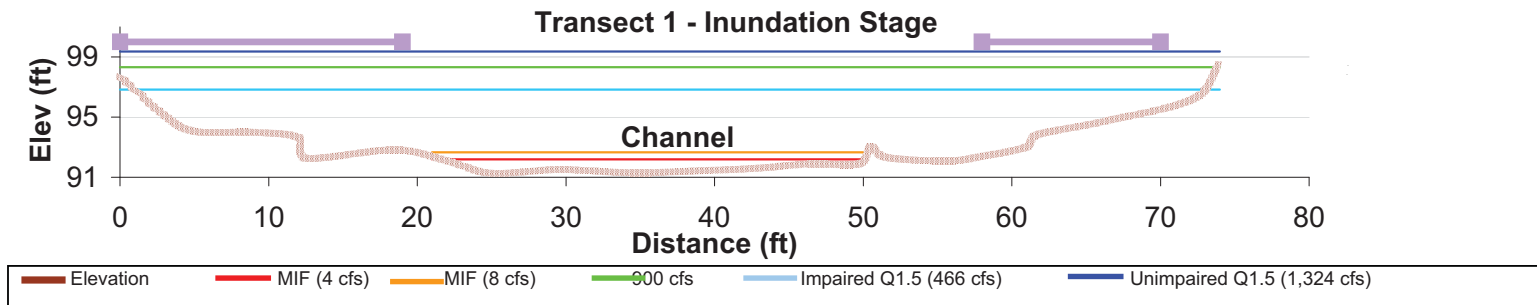


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Middle Fork American River MF36.2



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, BOMA3	DAPE, SALA6, MIGU	Boulder, cobble	
ALRH2, SALU		Boulder	
CADE27, ALRH2	ELGLG, MIGU	Cobble, bedrock	

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Middle Fork American River MF36.2

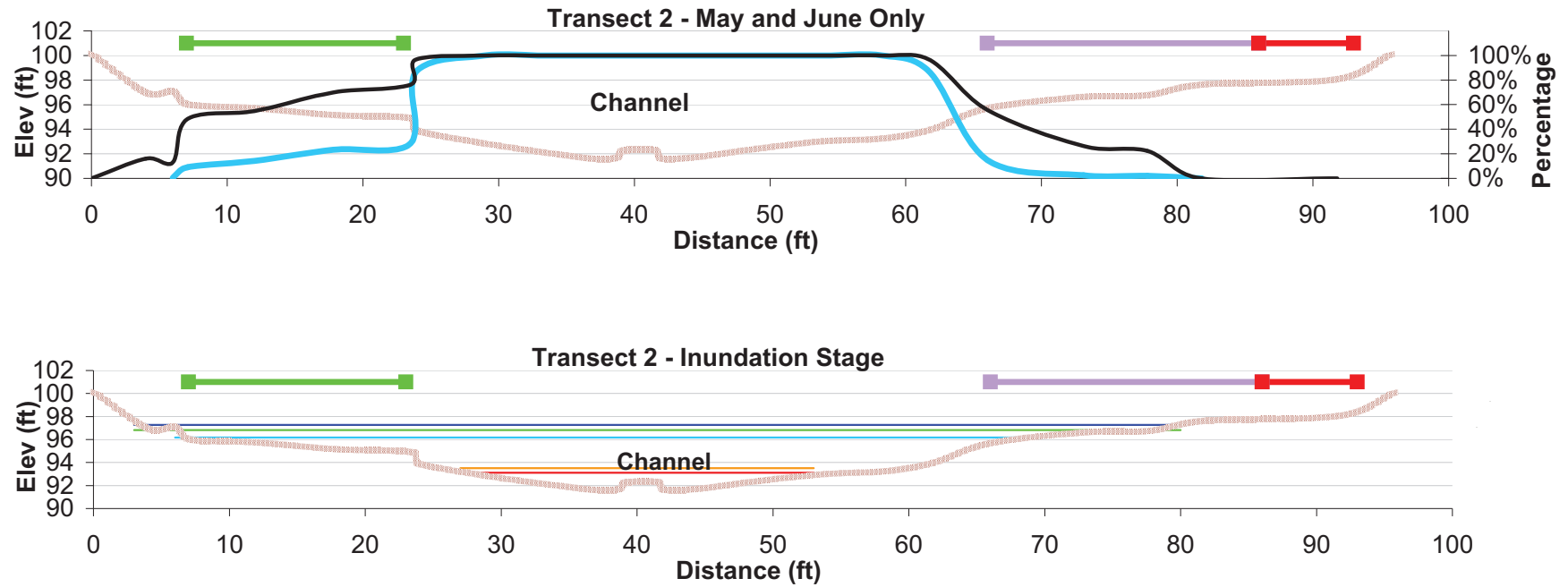
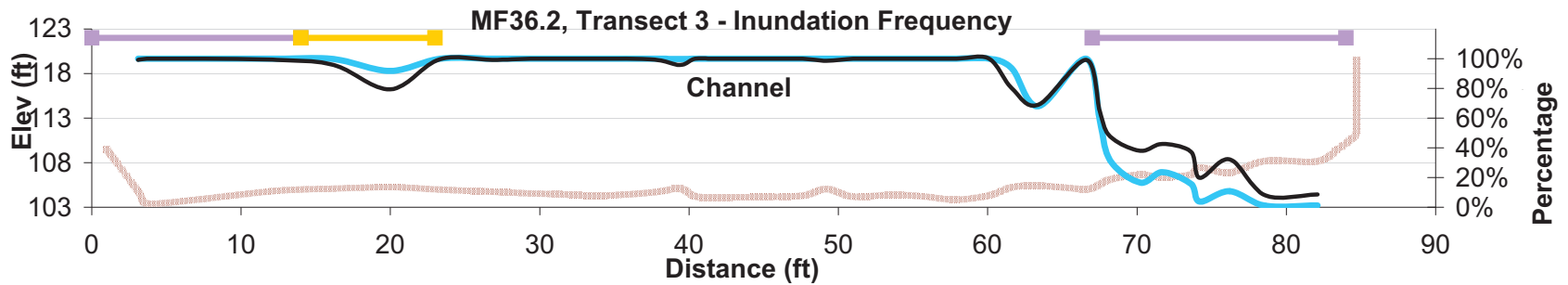


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Middle Fork American River MF36.2



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, SALA6	ROCU, CHBO2, Carex spp.	Boulder, cobble	
SALA6, DAPE	Mimulus spp.	Cobble, gravel	
ALRH2, SALU	SALA6, DIAC2, MIFL2, MIGU, GNPA	Boulder, cobble	

Transect 3 - May and June Only

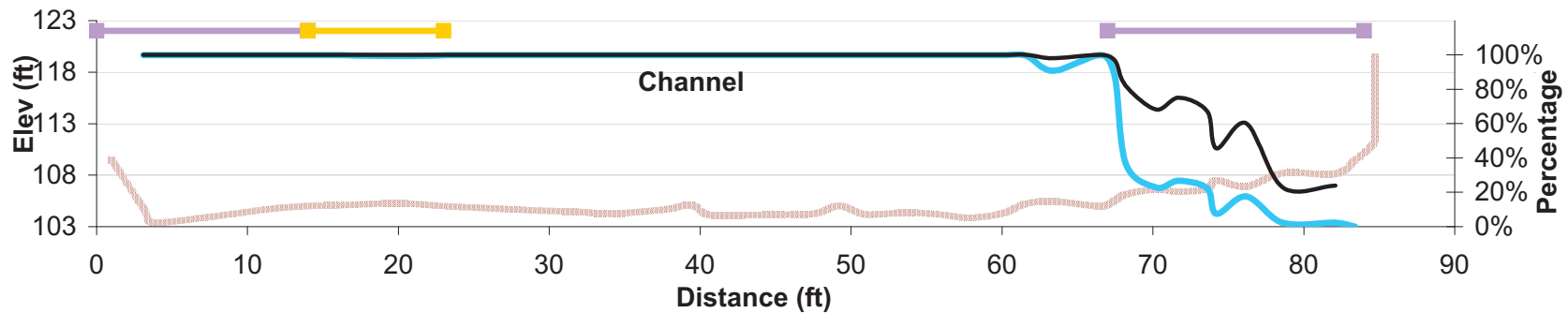
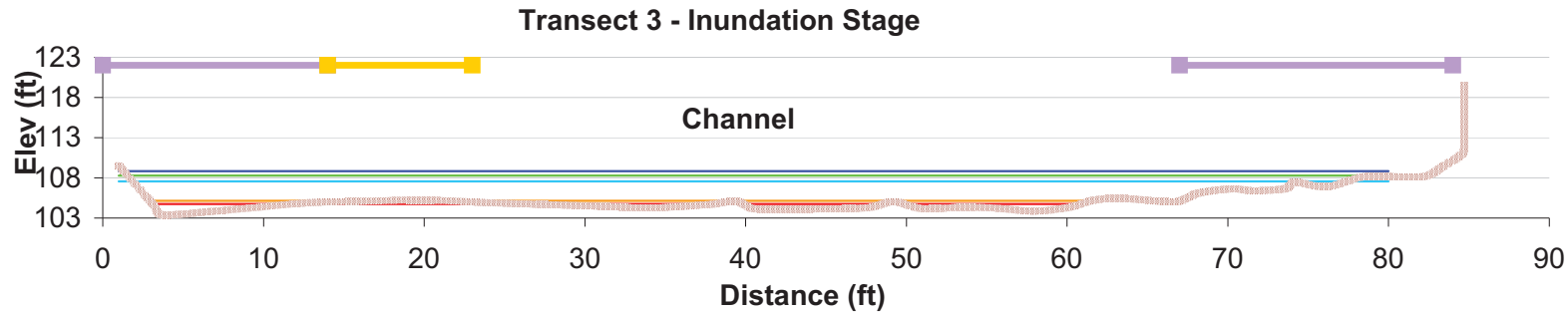


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Middle Fork American River MF36.2



Dominant and Sub-dominant Species Codes, Common Names, and Scientific Names Found Along Surveyed Transects.

Transect 1

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder		SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
COSE16	<i>Cornus sericea</i> ssp. <i>sericea</i>	redosier dogwood, American dogwood		SALU	<i>Salix lucida</i>	shining willow
DAPE	<i>Darmera peltata</i>	Indian rhubarb		SAME2/ SAEX	-	willow
GNPA	<i>Gnaphalium palustre</i>	western marsh cudweed		TODI	<i>Toxicodendron diversilobum</i>	poison oak

Transect 2

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder		ELGLG	<i>Elymus glaucus</i> ssp <i>glaucus</i>	blue wildrye
BOMA3	<i>Boykinia major</i>	large boykinia		MIGU	<i>Mimulus guttatus</i>	seep monkeyflower
CADE27	<i>Calocedrus decurrens</i>	incense cedar		SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
DAPE	<i>Darmera peltata</i>	Indian rhubarb		SALU	<i>Salix lucida</i>	shining willow

Transect 3

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder		MIFL2	<i>Mimulus floribundus</i>	manyflowered monkeyflower
Carex spp.	-	sedge		MIGU	<i>Mimulus guttatus</i>	seep monkeyflower
CHBO2	<i>Chenopodium botrys</i>	Jerusalem oak		Mimulus spp.	-	monkeyflower
DAPE	<i>Darmera peltata</i>	Indian rhubarb		ROCU	<i>Rorippa curvisiliqua</i>	curved yellowcress
DIAC2	<i>Dichanthelium acuminatum</i> var. <i>acuminatum</i>	western panicum		SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
GNPA	<i>Gnaphalium palustre</i>	western marsh cudweed		SALU	<i>Salix lucida</i>	shining willow

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Middle Fork American River MF36.2

Relationship of Stage and Inundation Frequency (a) and Wetted Width and Inundation Frequency (b) with Flow.

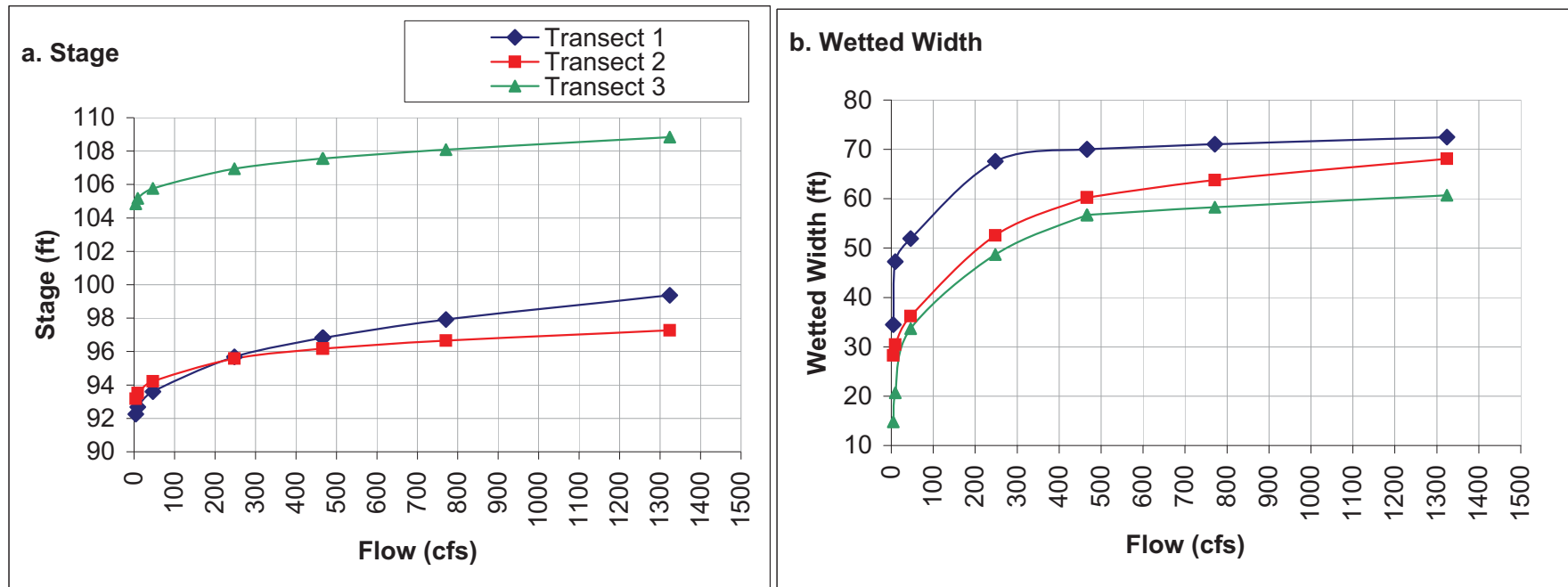
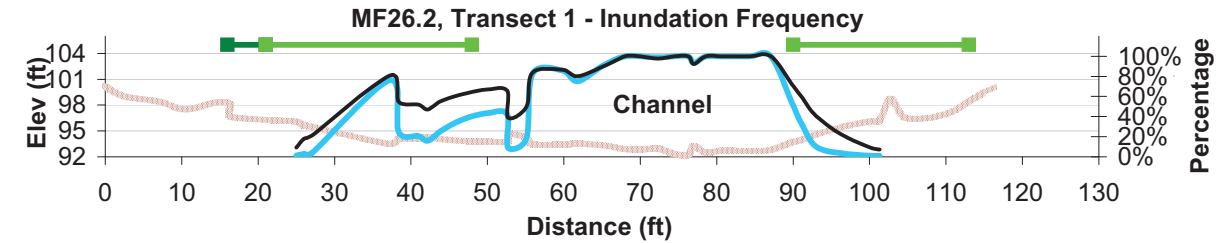


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Middle Fork American River MF26.2

Note vertical exaggeration



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ARME	Rubus spp., moss	Boulder, sand	
ALRH2, ARME	VICA5, SALU	Gravel, boulder	
ALRH2	CEOCC2, Carex spp. EQHYA	Boulder, sand	

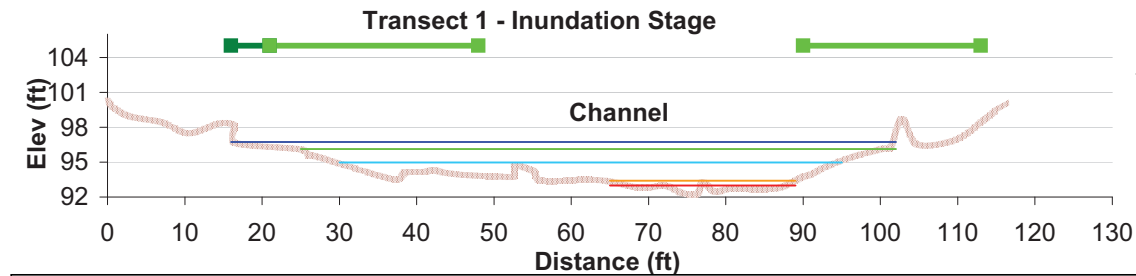
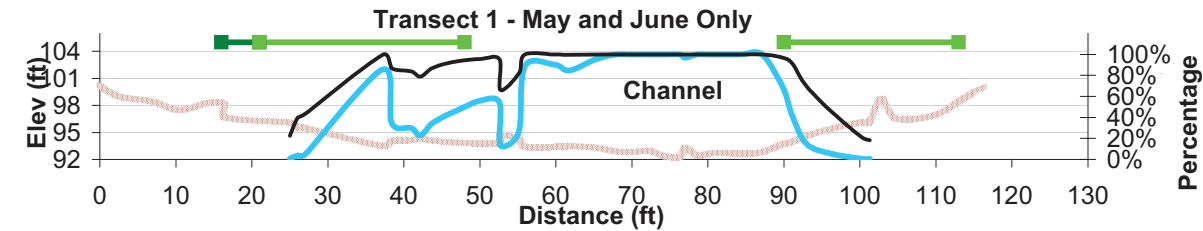
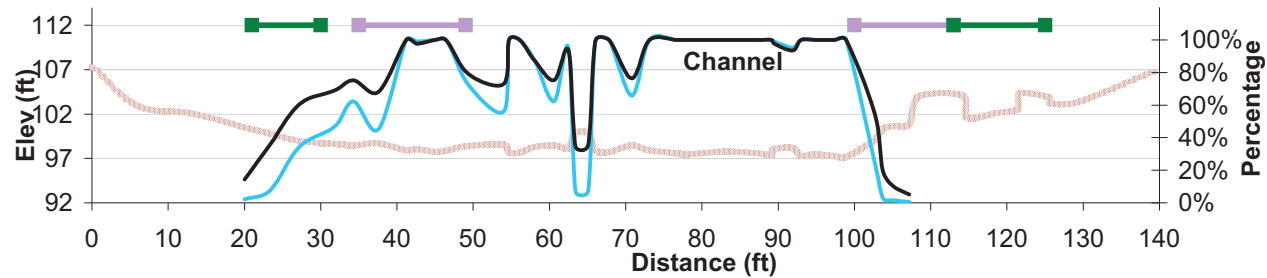


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Middle Fork American River MF26.2

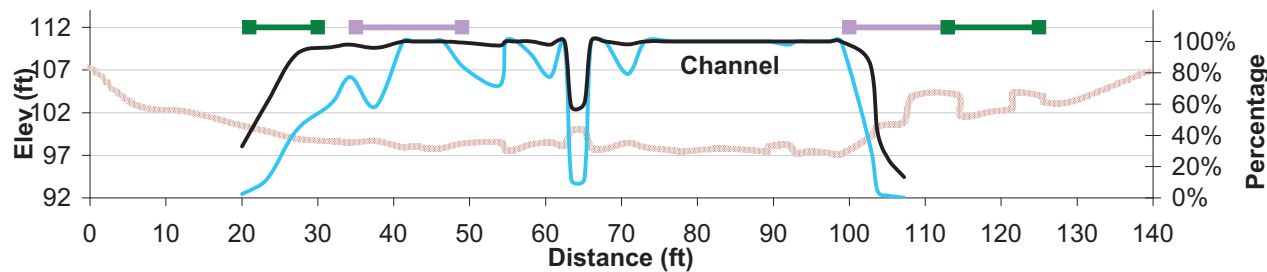
MF26.2, Transect 2 - Inundation Frequency



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
Quercus spp. (shrub)	STOF4, SYMO, Rubus spp., TODI	Boulder, sand	
ALRH2, SALA6	Poaceae sp., moss	Sand, cobble	
ALRH2	Rubus spp., Carex spp., CEOCC2	Boulder, sand	
UMCA, CEOCC2	EQHYA, SYMO, VICA5, ELGLG	Boulder, sand	

Transect 2 - May and June Only



Middle Fork American River MF26.2

B-19

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Middle Fork American River MF26.2

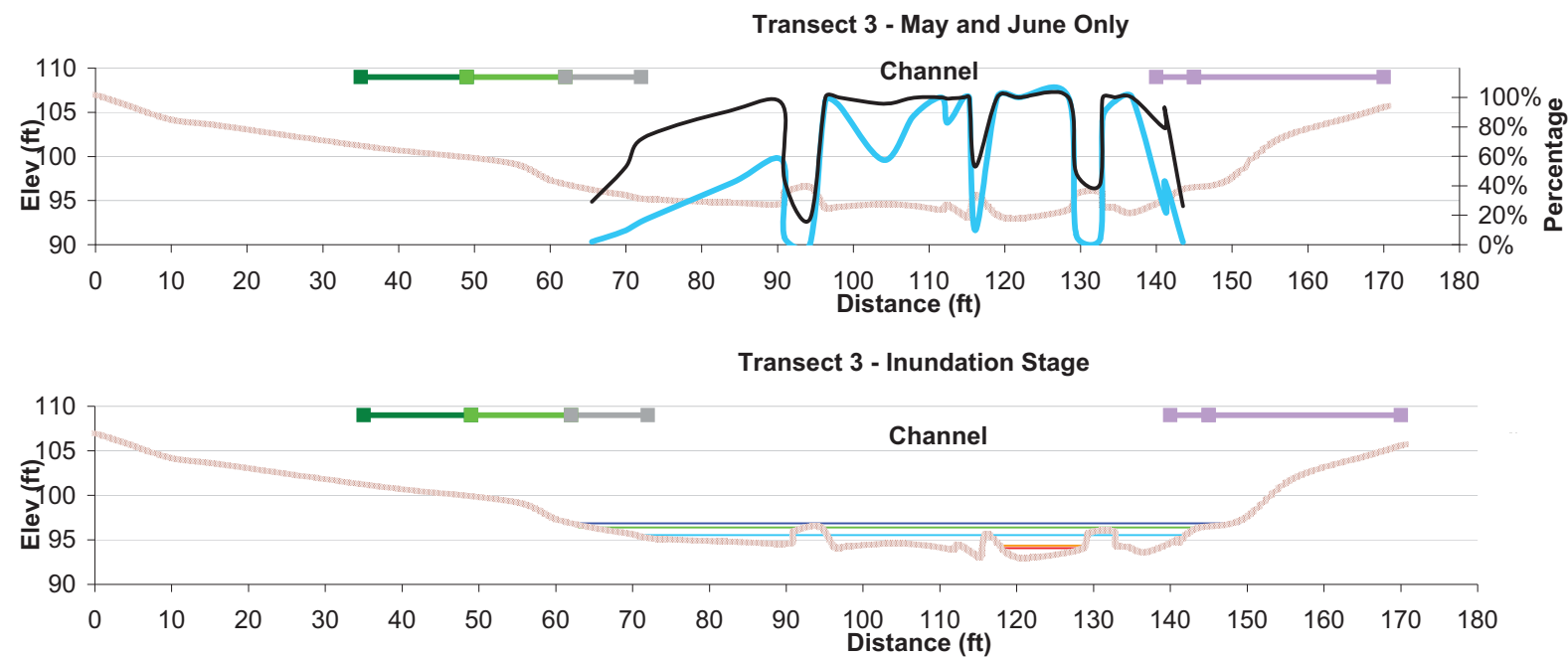


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Middle Fork American River MF26.2

Dominant and Sub-dominant Species Codes, Common Names, and Scientific Names Found Along Surveyed Transects.

Transect 1

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder		EQHYA	<i>Equisetum hyemale</i> ssp. affine	common scouring rush
ARME	<i>Arbutus menziesii</i>	Pacific madrone		Rubus spp.	-	blackberry/ raspberry
Carex spp.	-	sedge		SALU	<i>Salix lucida</i>	shining willow
CEOCC2	<i>Cephalanthus occidentalis</i> var. californicus	California button willow		VICA5	<i>Vitis californica</i>	California wild grape

Transect 2

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder		Rubus spp.	-	blackberry/ raspberry
Carex spp.	-	sedge		SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
CEOCC2	<i>Cephalanthus occidentalis</i> var. californicus	California button willow		STRE4 (STOF4)	<i>Styrax rediviva</i> (= <i>Styrax officinalis</i> var. <i>redivivus</i>)	California snowdrop bush
ELGLG	<i>Elymus glaucus</i> ssp. <i>glaucus</i>	blue wildrye		SYMO	<i>Symphoricarpos mollis</i>	creeping snowberry
EQHYA	<i>Equisetum hyemale</i> ssp. affine	common scouring rush		TODI	<i>Toxicodendron diversilobum</i>	poison oak
Poaceae	-	grass		UMCA	<i>Umbellularia californica</i>	California bay
Quercus spp.	-	oak		VICA5	<i>Vitis californica</i>	California wild grape

Transect 3

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder		Quercus spp.	-	oak
DAPE	<i>Darmera peltata</i>	Indian rhubarb		Rubus spp.	-	blackberry/ raspberry
DIAC2	<i>Dichanthelium acuminatum</i> var. <i>acuminatum</i>	western panicum		SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
FRCA12 (RHTOT4)	<i>Frangula tomentella</i> (= <i>Rhamnus tomentella</i> ssp. <i>tomentella</i>)	mountain coffeeberry		UMCA	<i>Umbellularia californica</i>	California bay
MIFL2	<i>Mimulus floribundus</i>	manyflowered monkeyflower		VICA5	<i>Vitis californica</i>	California wild grape

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Middle Fork American River MF26.2

Relationship of Stage and Inundation Frequency (a) and Wetted Width and Inundation Frequency (b) with Flow.

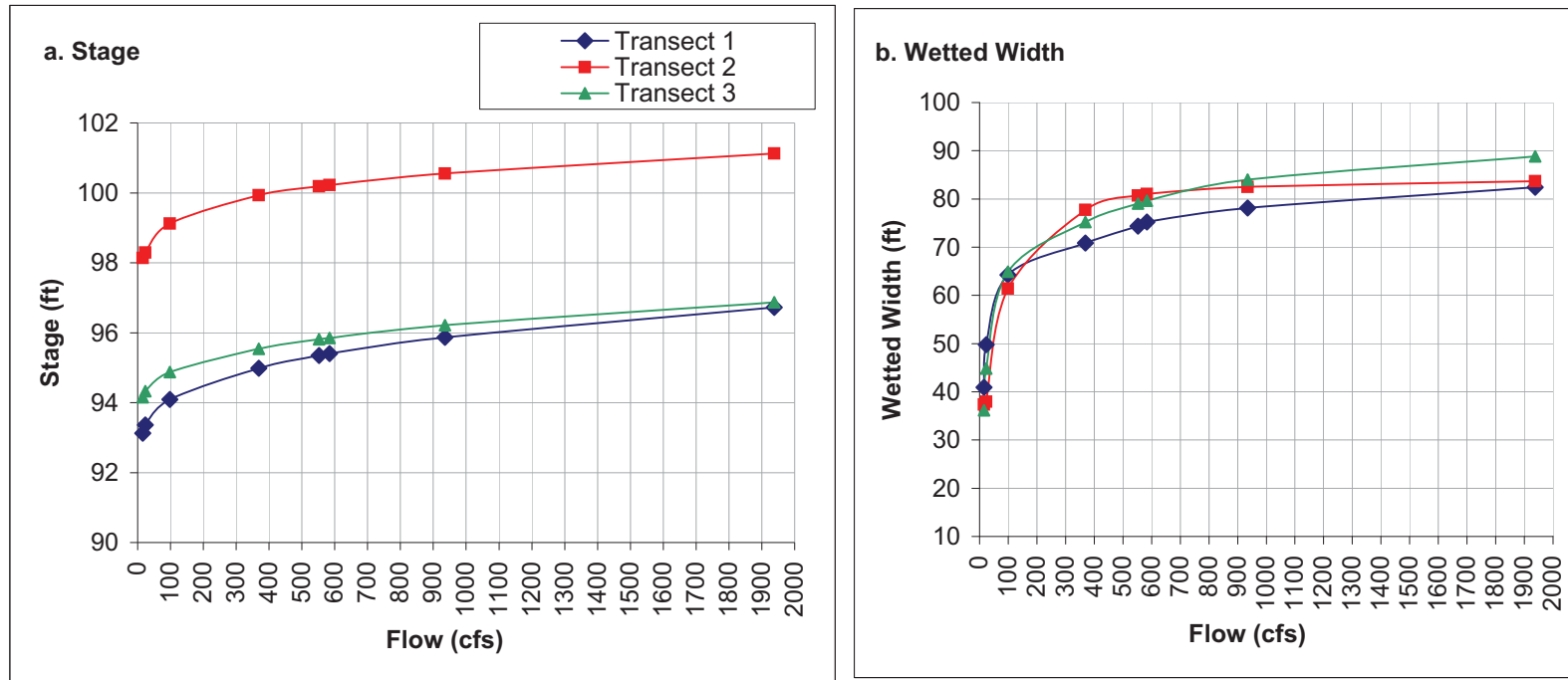
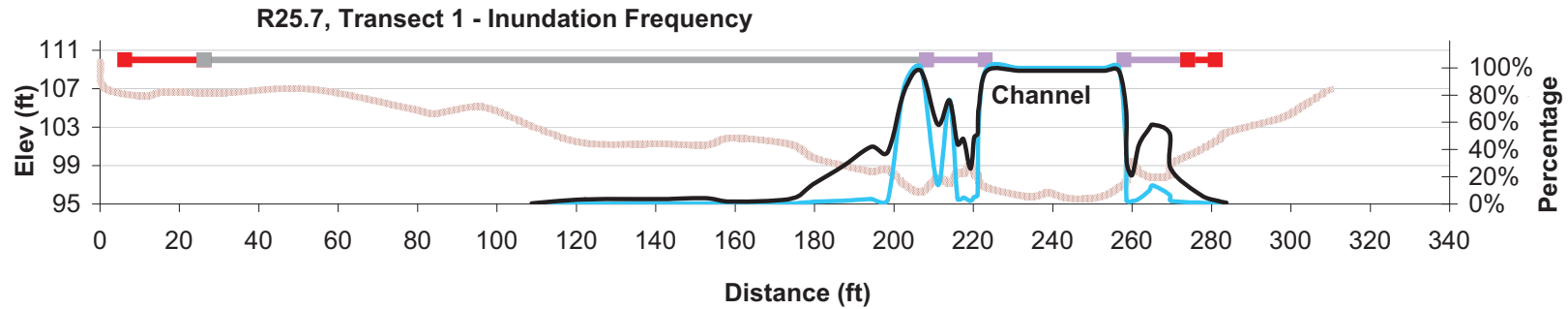


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R25.7

Note vertical exaggeration



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
CADE27, PSME	Ribes spp.	Boulder, sand	
-	BRCA3, PSME	Boulder, sand	
ALRH2, SALU	ARDO3, CHBO2	Boulder, silt	
ALRH2, SALU	CALE9, RHOC, ATFI	Boulder, cobble	
CADE27, ALRH2	BRCA5	Boulder, cobble	

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R25.7

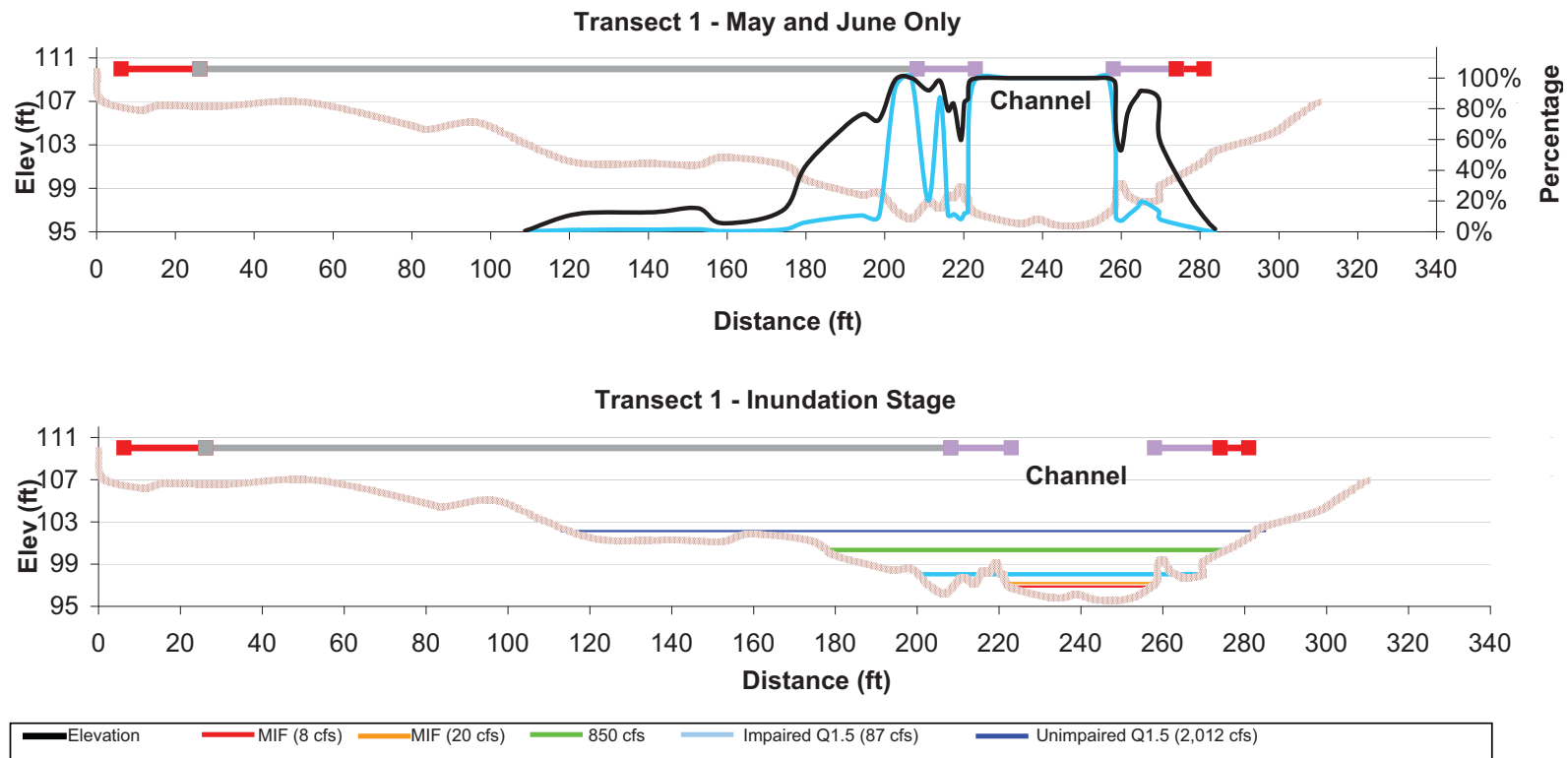
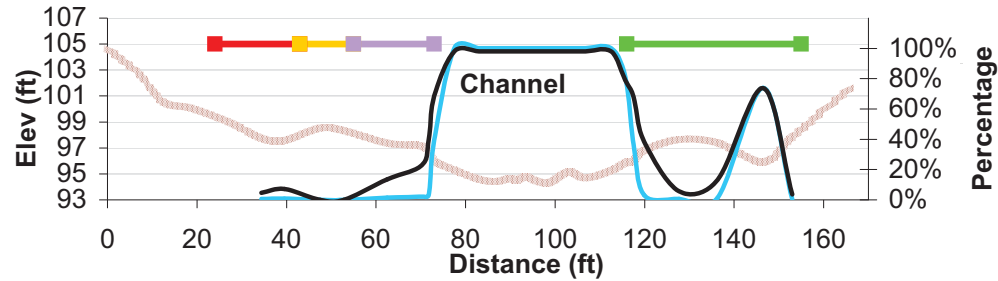


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R25.7

R25.7, Transect 2 - Inundation Frequency



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, CADE27	BRCA5, SALA6	Silt, boulder	
SALA6	CHJU, CHBO2	Silt	
ALRH2, SALA6, BRCA3	SALU, ARDO3	Boulder, gravel	
ALRH2, ARDO3	SALA6, SALU	Boulder, cobble	

Transect 2 - May and June Only

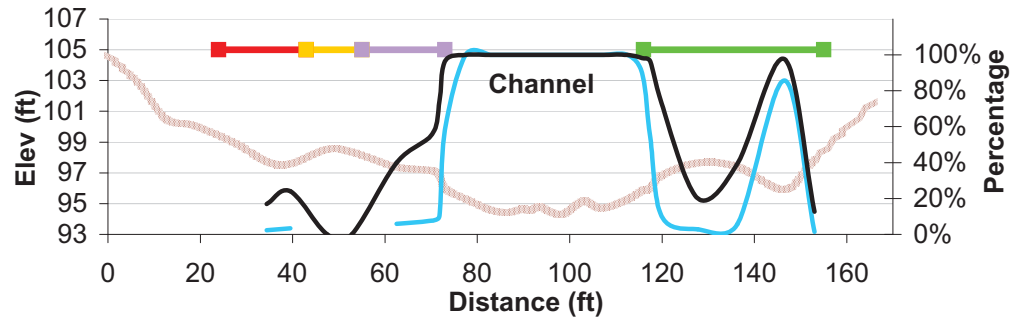
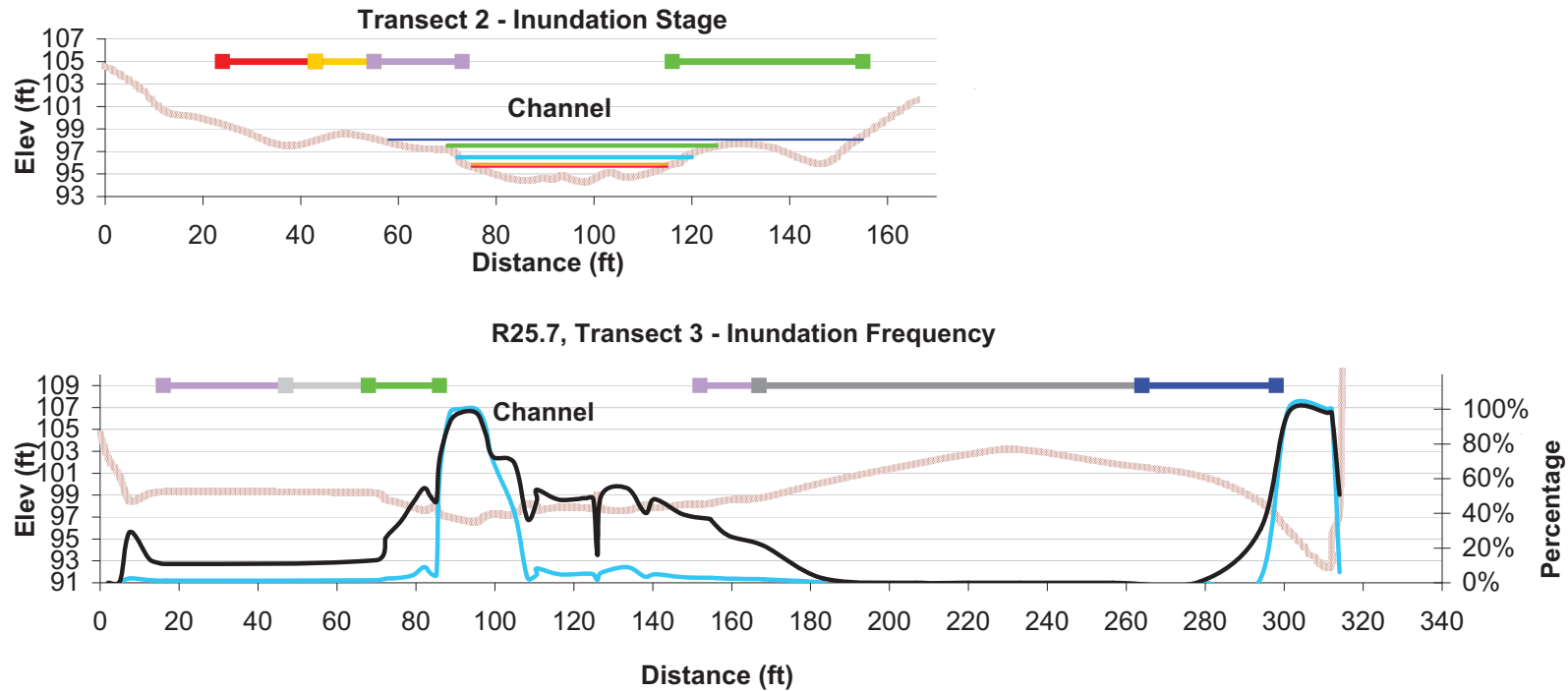


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R25.7



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, SALA6	EQAR, EQHYA, ARDO3	Sand	
-	PIPO	Gravel, cobble	
ALRH2	ARDO3, Carex spp.	Gravel, cobble	
ALRH2, SALA6	SALU, MICA3	Cobble, sand	
-	-	Cobble, boulder	
CADE27, ALRH2, SALU	MICA3, CHFO	Cobble, boulder	

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R25.7

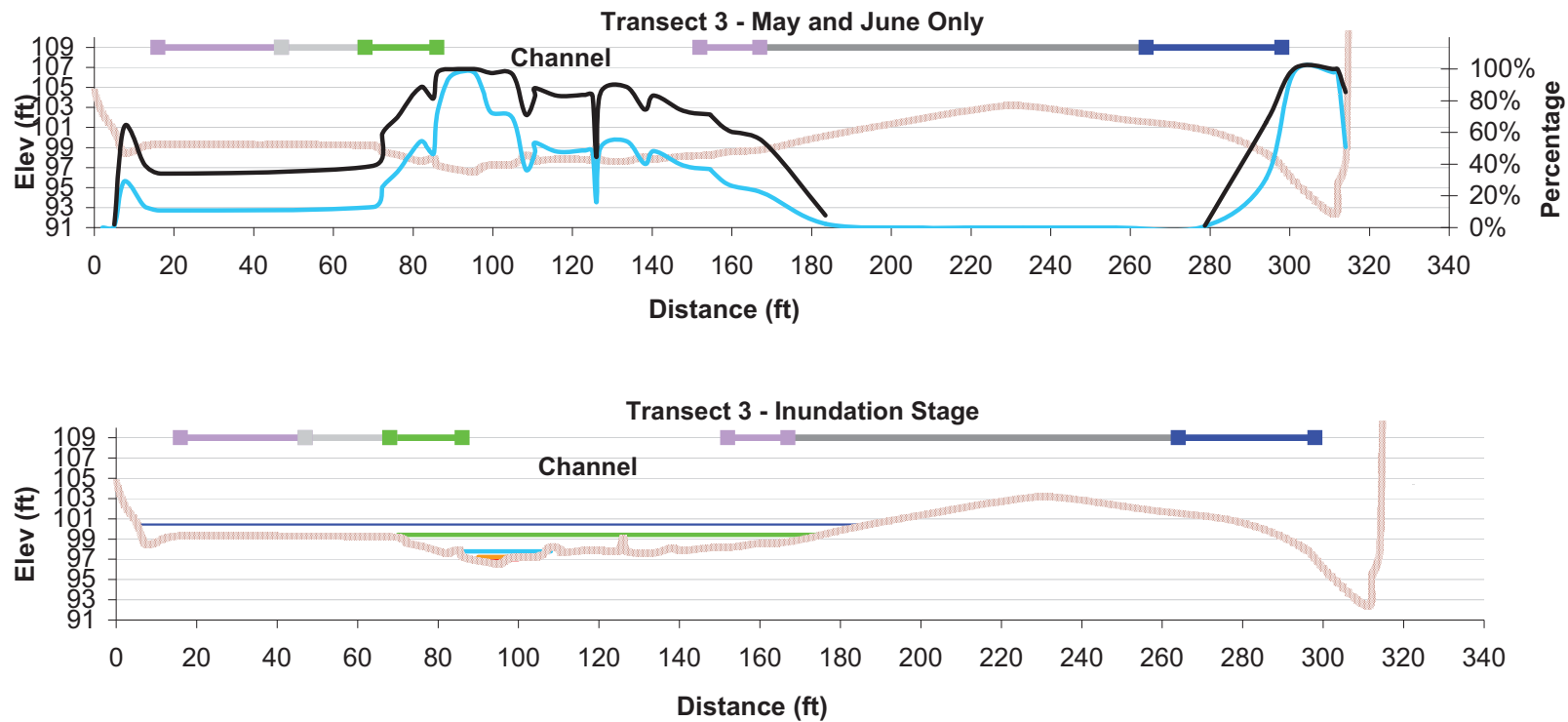


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R25.7

Dominant and Sub-dominant Species Codes, Common Names, and Scientific Names Found Along Surveyed Transect.

Transect 1

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder	CHBO2	<i>Chenopodium botrys</i>	Jerusalem oak
ARDO3	<i>Artemisia douglasiana</i>	Douglas' sagewort (mugwort)	PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir
ATFIC (ATFI)	<i>Athyrium filix-femina</i> var. <i>cyclosorum</i>	lady fern	RHOC	<i>Rhododendron occidentale</i>	western azalea
BRCA3	<i>Brickellia californica</i>	brickellbush	Ribes spp.	-	currant
CADE27	<i>Calocedrus decurrens</i>	incense cedar	SALU	<i>Salix lucida</i>	shining willow
CALE9	<i>Carex leporinella</i>	Sierra hare sedge			

Transect 2

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder	CHBO2	<i>Chenopodium botrys</i>	Jerusalem oak
ARDO3	<i>Artemisia douglasiana</i>	Douglas' sagewort (mugwort)	CHJU	<i>Chondrilla juncea</i>	skeletonweed
BRCA3	<i>Brickellia californica</i>	brickellbush	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
CADE27	<i>Calocedrus decurrens</i>	incense cedar	SALU	<i>Salix lucida</i>	shining willow

Transect 3

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder	EQHYA	<i>Equisetum hyemale</i> ssp. <i>affine</i>	common scouring rush
ARDO3	<i>Artemisia douglasiana</i>	Douglas' sagewort (mugwort)	MICA3	<i>Mimulus cardinalis</i>	crimson monkeyflower
CADE27	<i>Calocedrus decurrens</i>	incense cedar	PIPO	<i>Pinus ponderosa</i>	ponderosa pine
Carex spp.	-	sedge	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
CHFO	<i>Chamaebatia foliolosa</i>	mountain misery	SALU	<i>Salix lucida</i>	shining willow
EQAR	<i>Equisetum arvense</i>	common horsetail			

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R25.7

Relationship of Stage and Inundation Frequency (a) and Wetted Width and Inundation Frequency (b) with Flow.

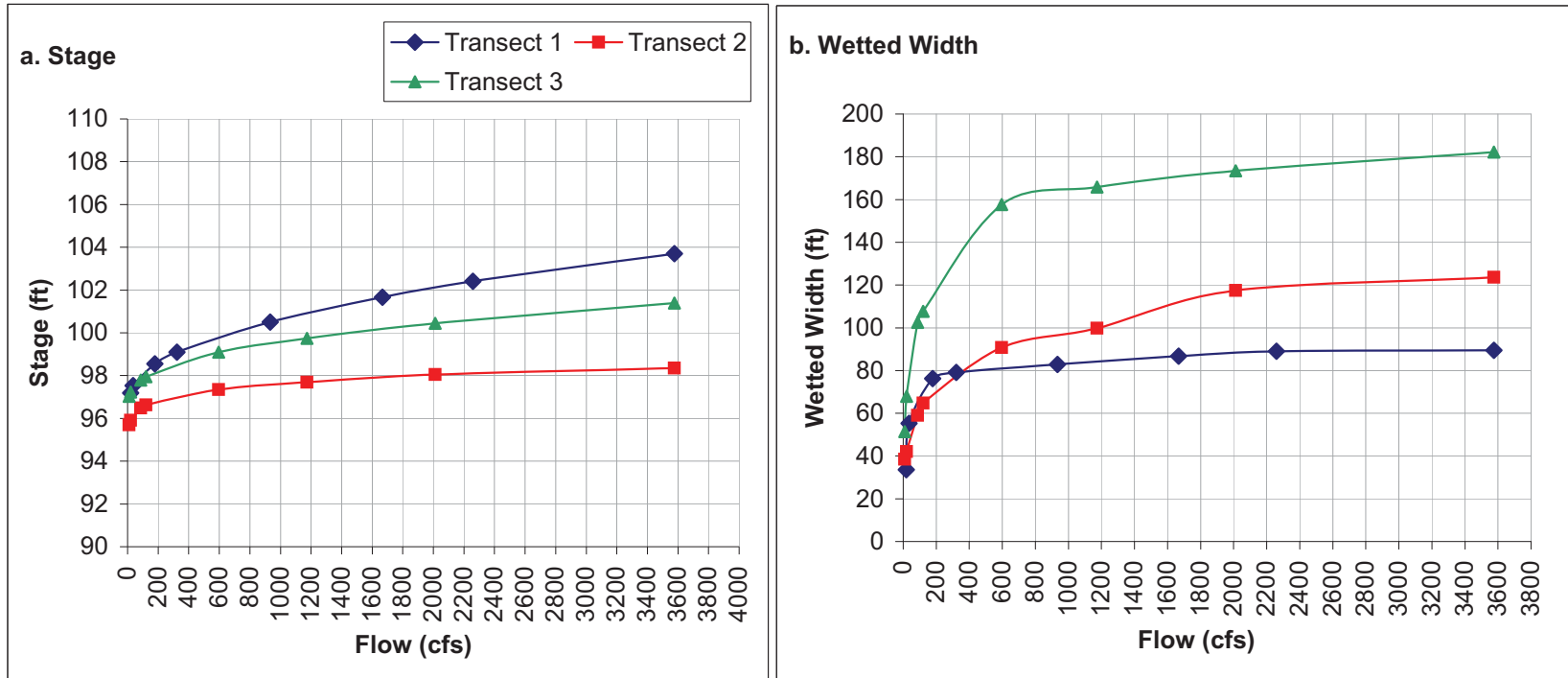
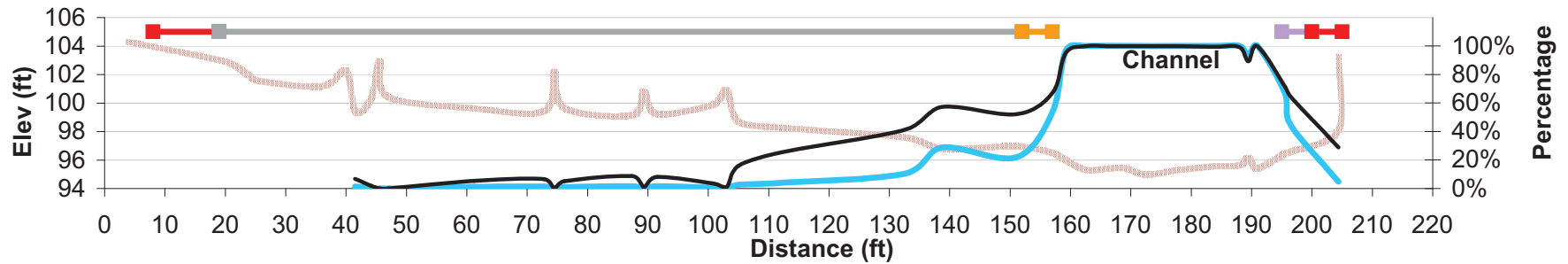


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R20.9

Note vertical exaggeration

R20.9, Transect 1 - Inundation Frequency



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, PSME	QUBE5, CADE27	Sand	
-	BRCA3	Cobble, boulder	
SALA6, SAEX/SAME2, SALU		Gravel, sand	
ALRH2, SALA6	DAPE, Carex spp., ARCA2, WOFI	Gravel, bedrock	
ALRH2, PIPO	SALA6, DIAC2	Bedrock, boulder	Seep

Transect 1 - May and June Only

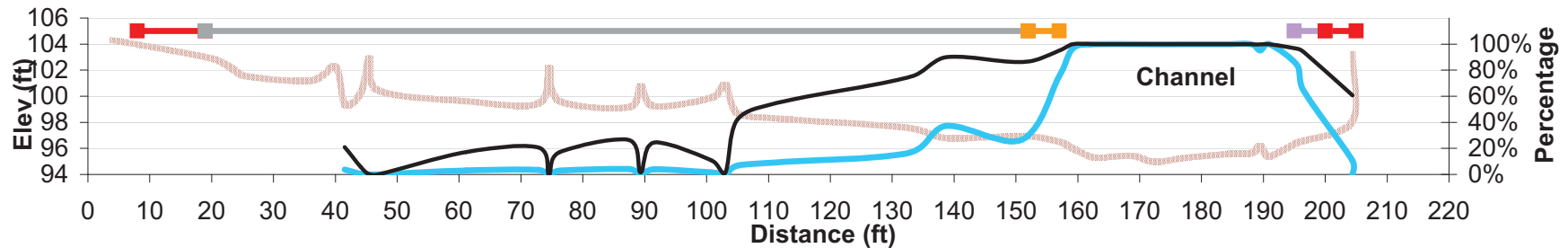
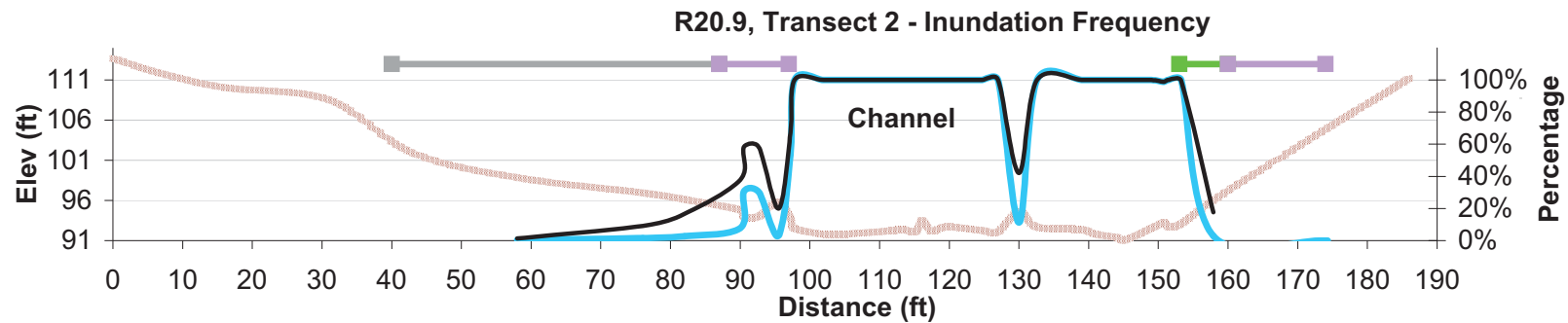
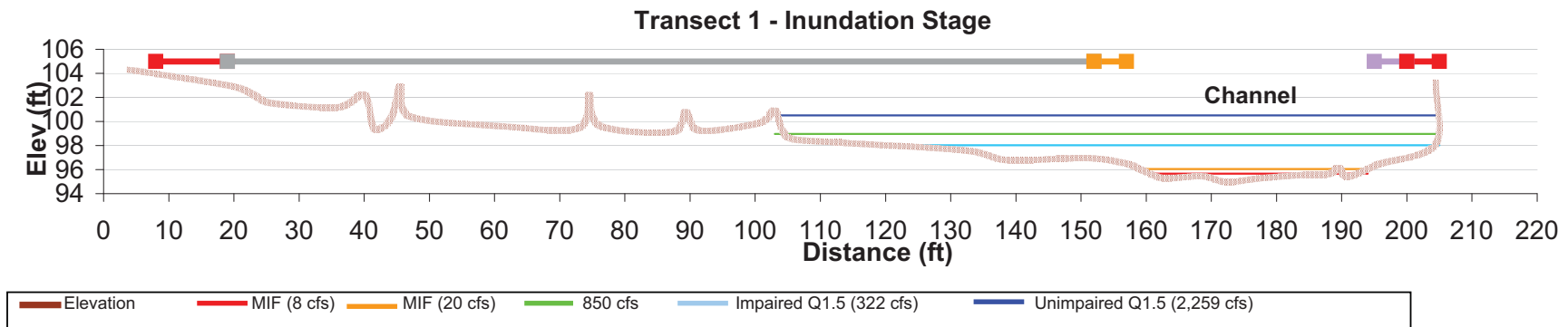


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R20.9



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
-	ARDO3, HIIN3	Sand, boulder	
ALRH2, SALA6, SALA3	ARDO3	Boulder, cobble	
ALRH2, Carex spp.		Boulder, gravel	
ALRH2, SALA3	COGL3, ACMA3, CADE27, POFR2, PSME	Boulder, cobble	Seep

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R20.9

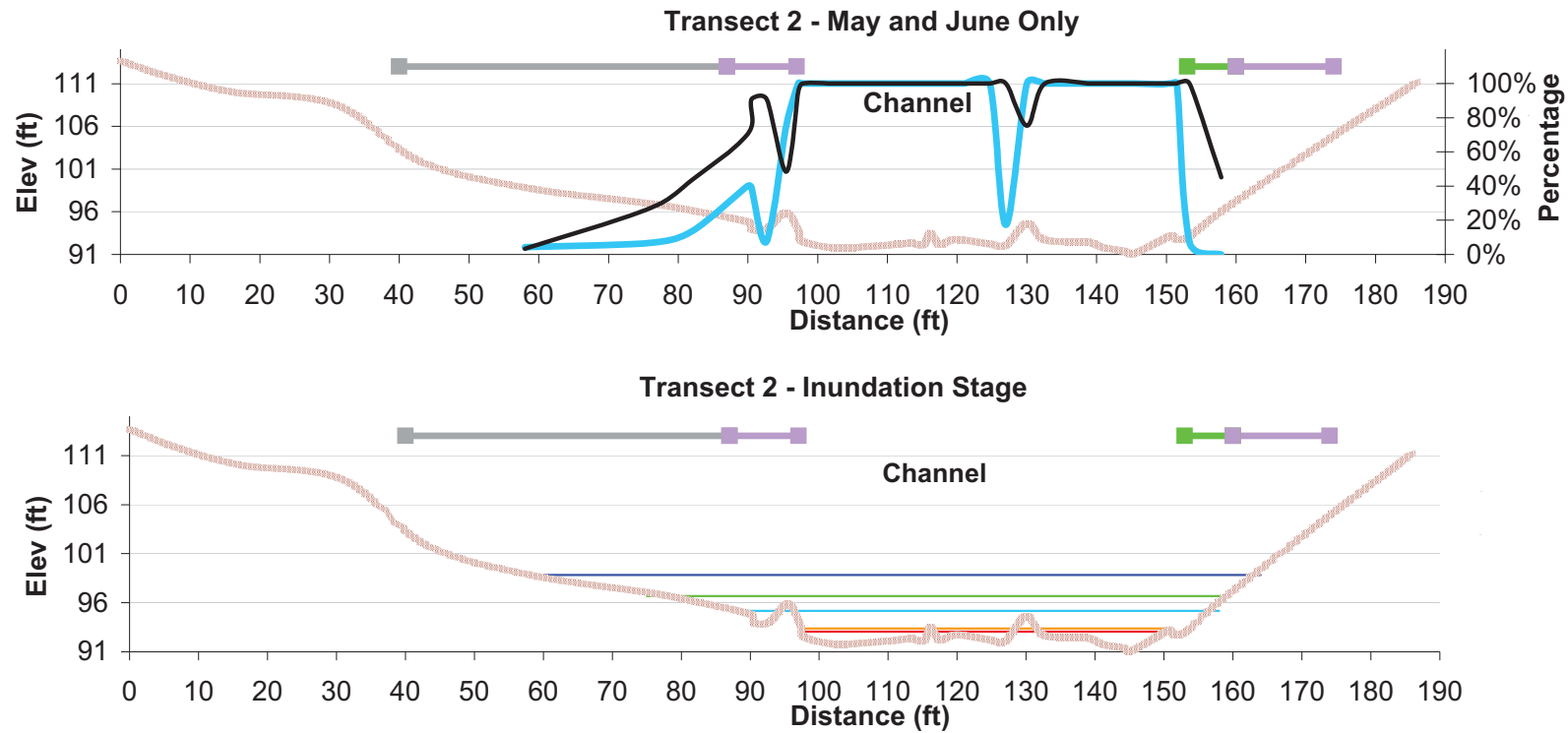
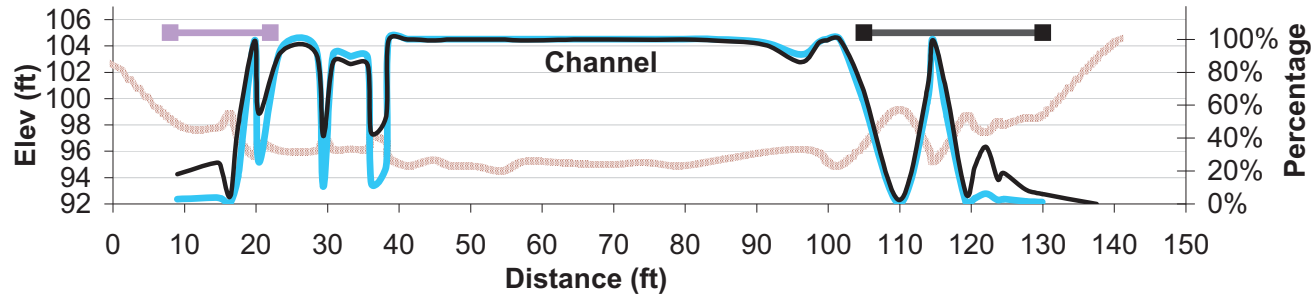


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R20.9

R20.9, Transect 3 - Inundation Frequency



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
SALA6, COSE16, ALRH2	DAPE, Poaceae spp., SALA3	Boulder, cobble	Seep
	ALRH2, DIAC2	Bedrock	

Transect 3 - May and June Only

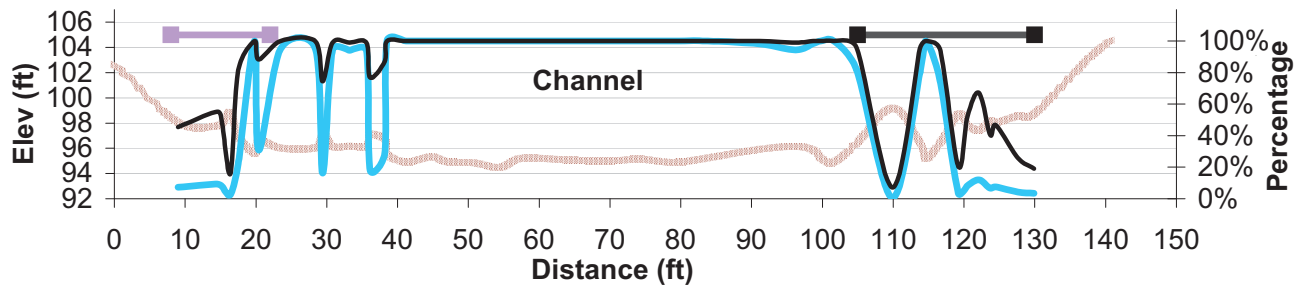


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R20.9

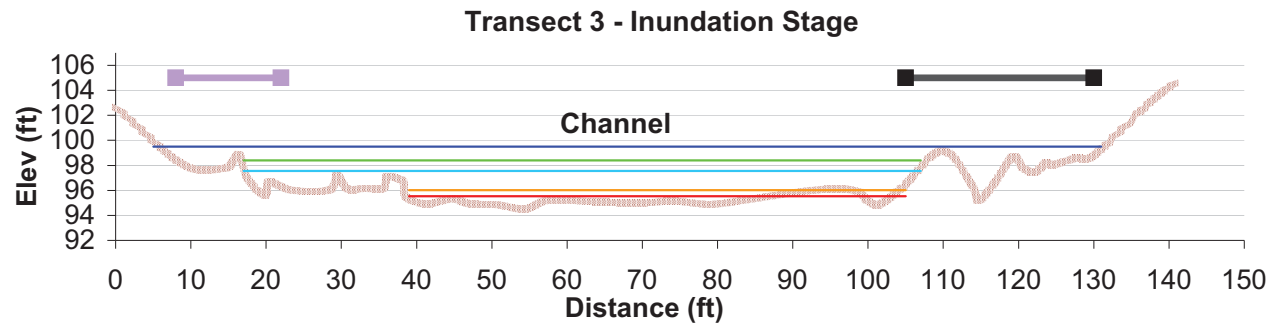


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R20.9

Dominant and Sub-dominant Species Codes, Common Names, and Scientific Names Found Along Surveyed Transect.

Transect 1

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder	PIPO	<i>Pinus ponderosa</i>	ponderosa pine
ARCA2	<i>Aralia californica</i>	California spikenard (elk clover)	PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir
BRCA3	<i>Brickellia californica</i>	brickellbush	QUBE5	<i>Quercus berberidifolia</i>	scrub oak
CADE27	<i>Calocedrus decurrens</i>	incense cedar	SAEX/ SAME2	-	willow
Carex spp.	-	sedge	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
DAPE	<i>Darmera peltata</i>	Indian rhubarb	SALU	<i>Salix lucida</i>	shining willow
DIAC2	<i>Dichanthelium acuminatum</i> var. <i>acuminatum</i>	western panicum	WOFI	<i>Woodwardia fimbriata</i>	giant chain fern

Transect 2

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ACMA3	<i>Acer macrophyllum</i>	big leaf maple	HIIN3	<i>Hirschfeldia incana</i>	shortpod mustard
ALRH2	<i>Alnus rhombifolia</i>	white alder	POFR2	<i>Populus fremontii</i> ssp. <i>Fremontii</i>	Fremont cottonwood
ARDO3	<i>Artemisia douglasiana</i>	Douglas' sagewort (mugwort)	PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir
CADE27	<i>Calocedrus decurrens</i>	incense cedar	SALA3	<i>Salix laevigata</i>	red willow
Carex spp.	-	sedge	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
COGL3	<i>Cornus glabrata</i>	brown dogwood			

Transect 3

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder	Poaceae spp.	-	grass
COSE16	<i>Cornus sericea</i> ssp. <i>sericea</i>	redosier dogwood, American dogwood	SALA3	<i>Salix laevigata</i>	red willow
DAPE	<i>Darmera peltata</i>	Indian rhubarb	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
DIAC2	<i>Dichanthelium acuminatum</i> var. <i>acuminatum</i>	western panicum			

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R20.9

Relationship of Stage and Inundation Frequency (a) and Wetted Width and Inundation Frequency (b) with Flow.

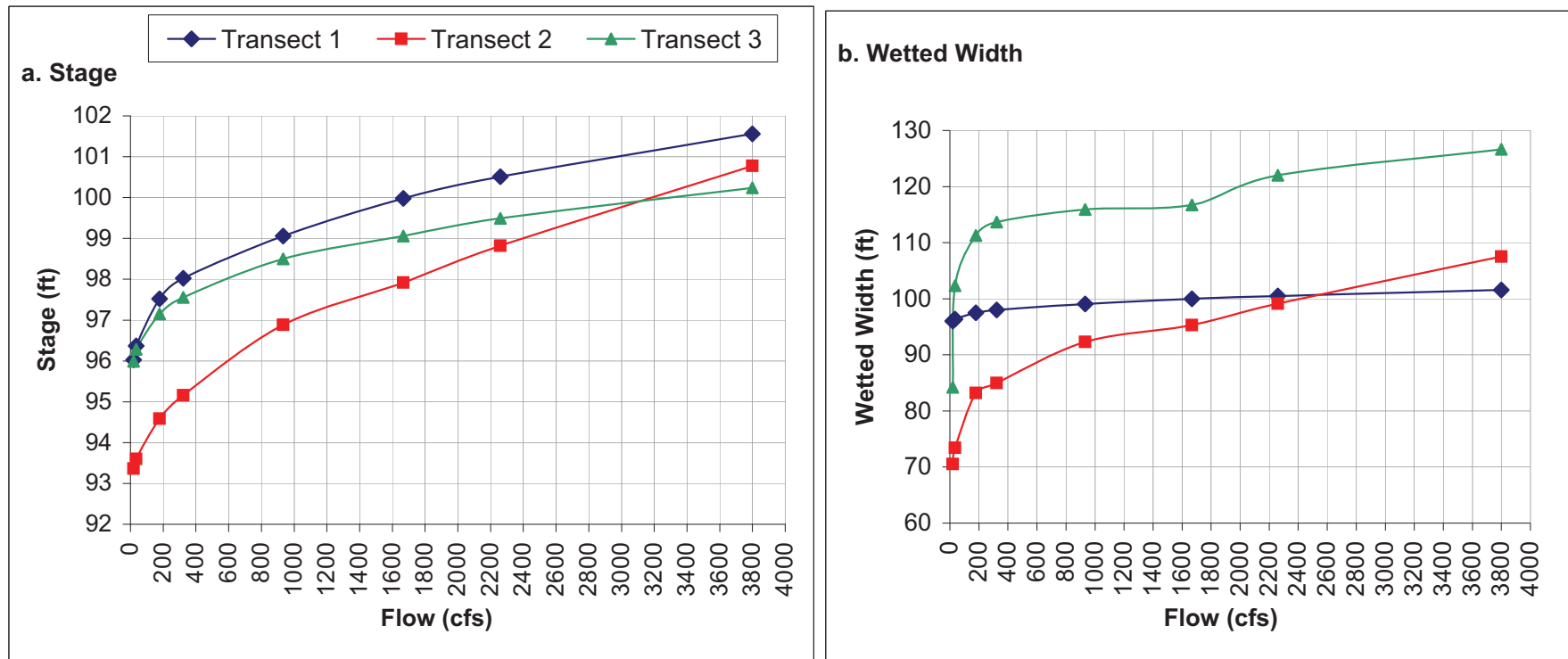
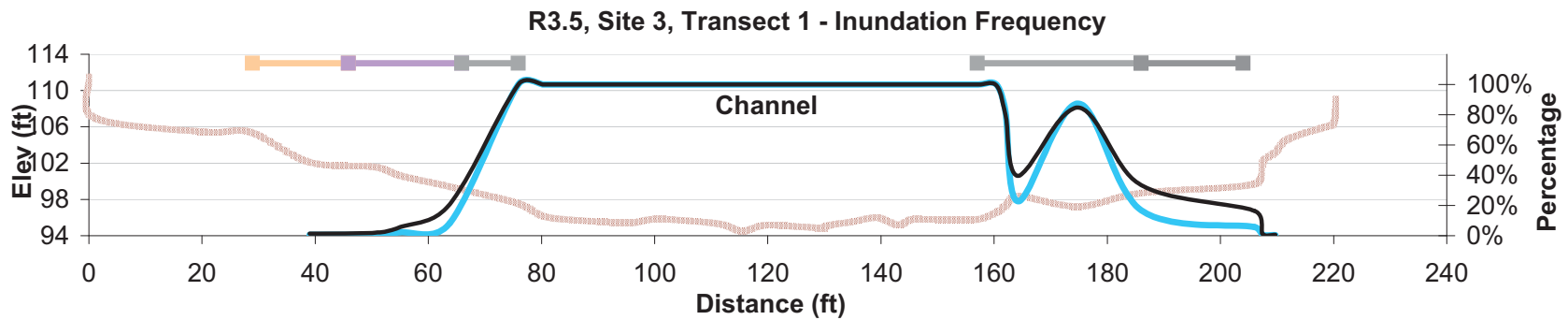


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R3.5

Note vertical exaggeration



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
CHAM	BRCA3, SALA6	Cobble, gravel	
SALA3, ALRH2	SAME2	Boulder, cobble	
-	-	Cobble	
-	DIAC2, CHBO2, DAGL2	Boulder, cobble	Some willow seedlings
-	CHBO2, EPCA3	Sand, boulder	

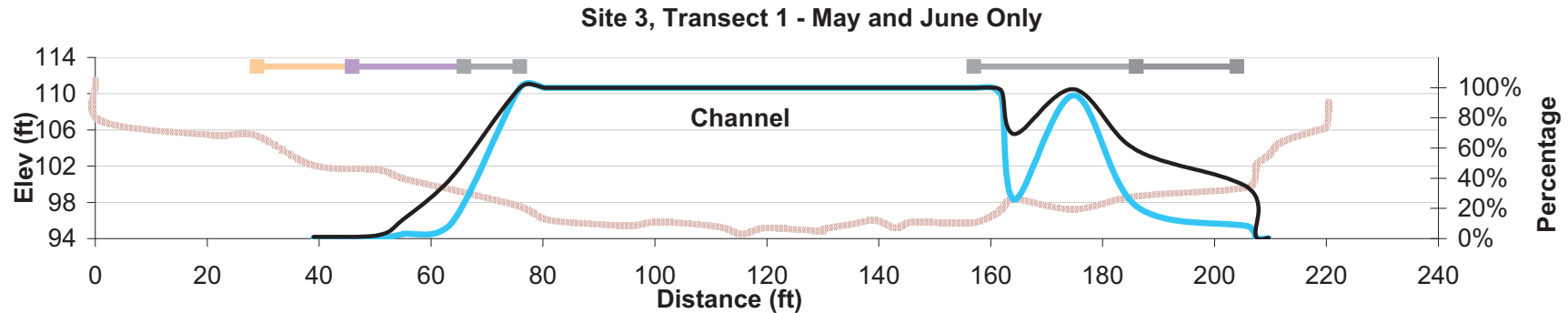
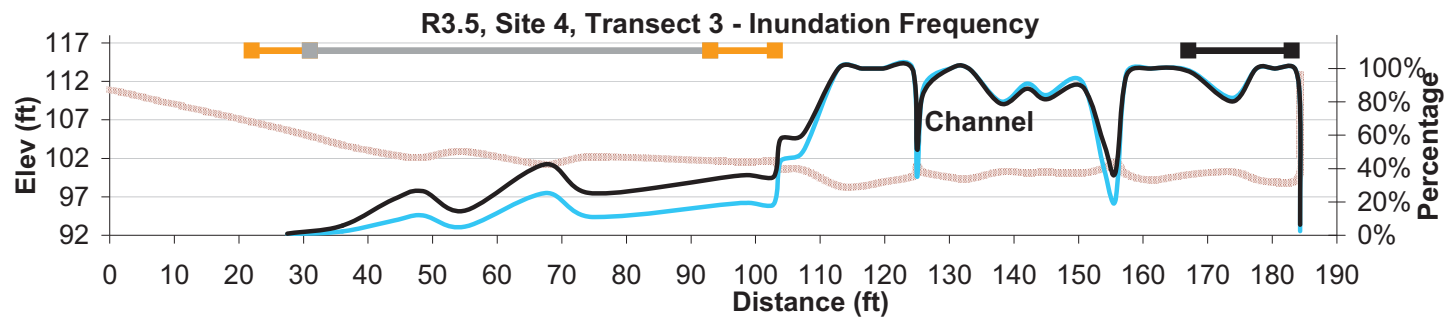
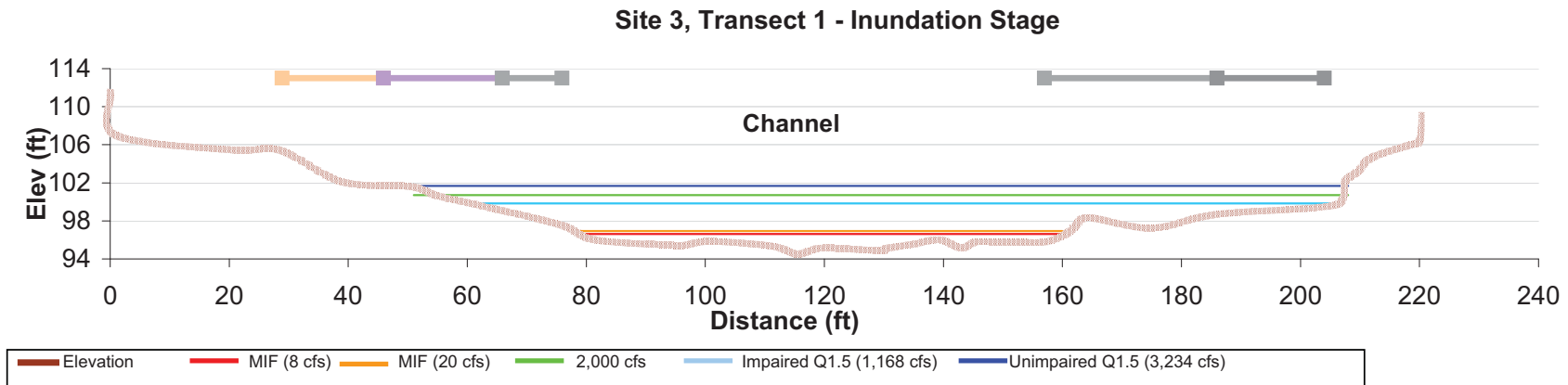


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R3.5



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
Rubus spp., VICA5, SALU	BRCA3, SALA6	Sand, gravel	Transitional
-	-	Cobble, gravel	
SAEX	-	Cobble, boulder	
-	SALU	Bedrock	

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R3.5

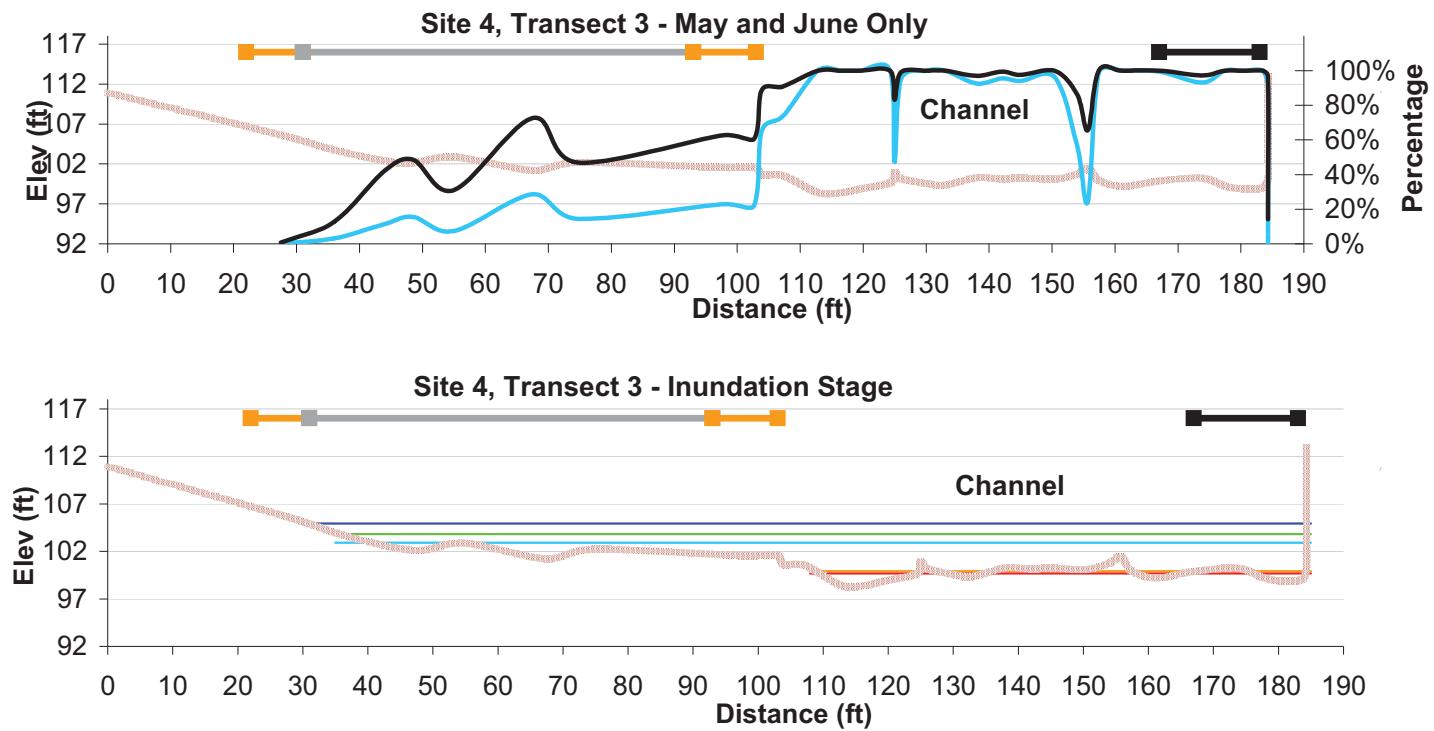
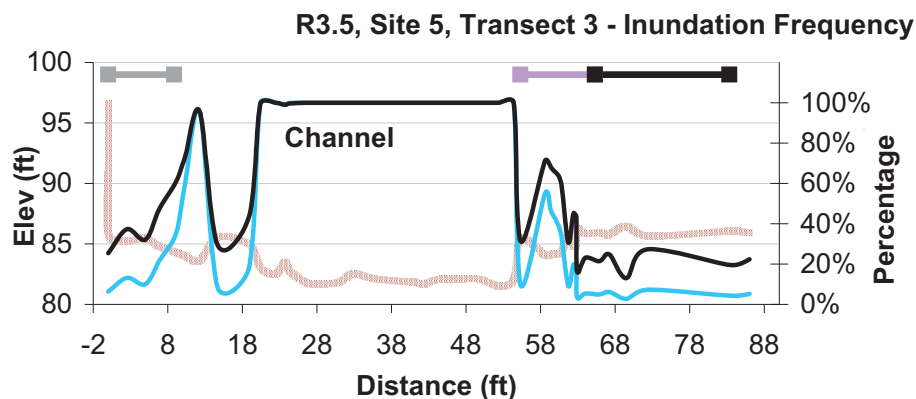


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R3.5



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
-	SALA3, BRCA3, PHLE4, DAGL2	Gravel, cobble	
ALRH2, SALA3	POFR2, SAEX	Boulder, gravel	
-	-	Bedrock, gravel	

Site 5, Transect 3 - May and June Only

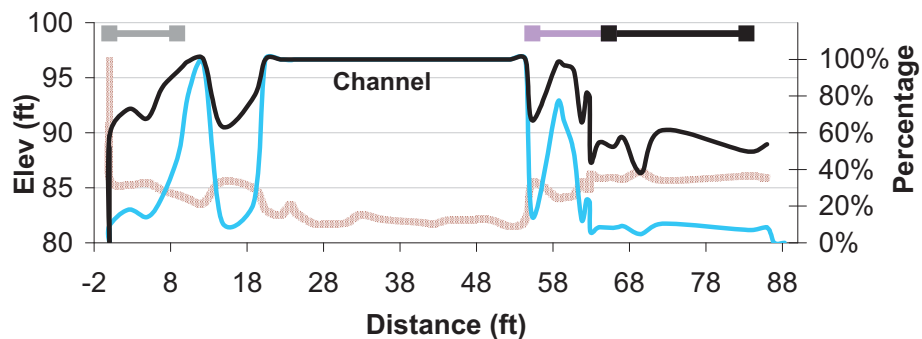
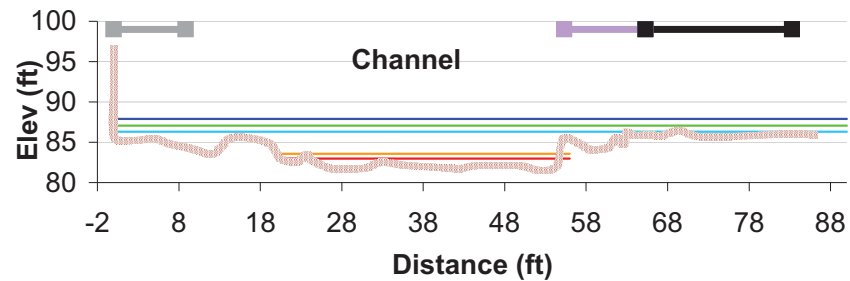


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R3.5

Site 5, Transect 3 - Inundation Stage



Dominant and Sub-dominant Species Codes, Common Names, and Scientific Names Found Along Surveyed Transect.

R3.5 Site 3 T1

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder	DIAC2	<i>Dichanthelium acuminatum</i> var. <i>acuminatum</i>	western panicum
BRCA3	<i>Brickellia californica</i>	brickellbush	EPCA3	<i>Epilobium canum</i> ssp. <i>latifolium</i>	California fuchsia
CHAM	<i>Chenopodium ambrosioides</i>	Mexican tea	SALA3	<i>Salix laevigata</i>	red willow
CHBO2	<i>Chenopodium botrys</i>	Jerusalem oak	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
DAGL2	<i>Datisca glomerata</i>	durango root	SAME2	<i>Salix exigua</i> / <i>Salix melanopsis</i>	dusky willow

R3.5 Site 4 T3

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
BRCA3	<i>Brickellia californica</i>	brickellbush	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
Rubus spp.	-	blackberry/ raspberry	SALU	<i>Salix lucida</i>	shining willow
SAEX	<i>Salix exigua</i>	narrow leaf willow	VICA5	<i>Vitis californica</i>	California wild grape

R3.5 Site 5 T3

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder	POFR2	<i>Populus fremontii</i> ssp. <i>Fremontii</i>	Fremont cottonwood
BRCA3	<i>Brickellia californica</i>	brickellbush	SAEX	<i>Salix exigua</i>	narrow leaf willow
DAGL2	<i>Datisca glomerata</i>	durango root	SALA3	<i>Salix laevigata</i>	red willow
PHLE4	<i>Philadelphus lewisii</i>	wild mock orange			

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Rubicon River R3.5

Relationship of Stage and Inundation Frequency (a) and Wetted Width and Inundation Frequency (b) with Flow.

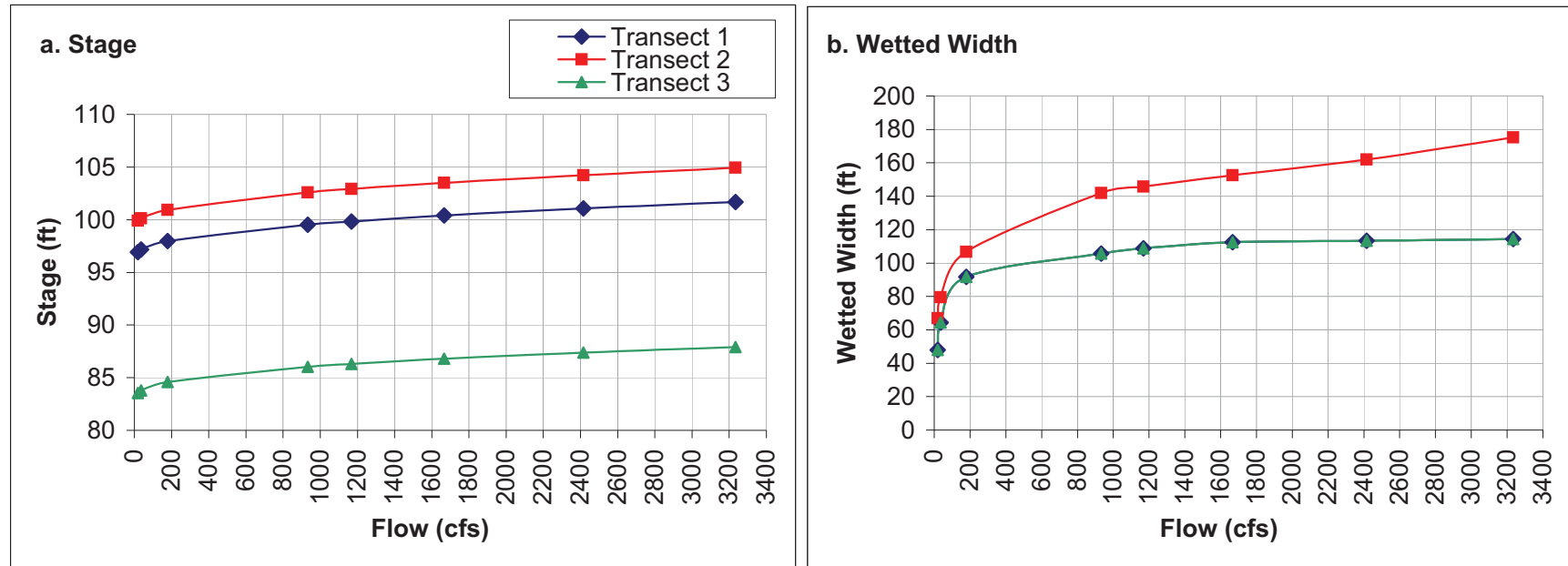
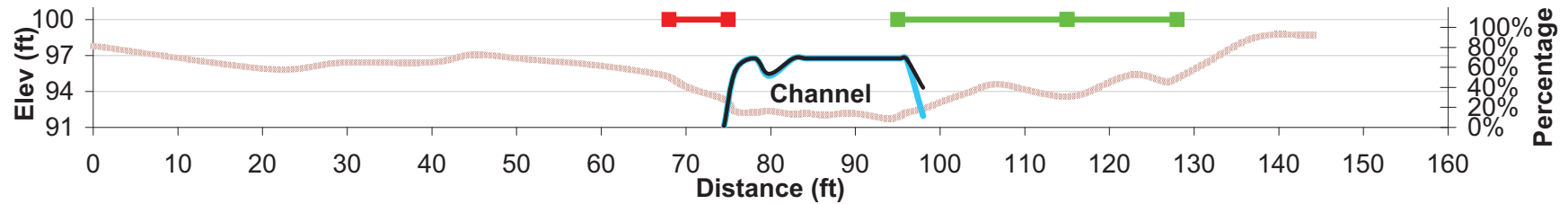


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

South Fork Long Canyon Creek SFLC2.3

Note vertical exaggeration

SFLC2.3, Transect 1 - Inundation Frequency



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, BOMA3, CADE27	PSME, Grass (NF)	Sand, cobble	
ALRH2	ARDO3, PSME, CADE27, MICA3, JUBU	Sand, cobble	
ALRH2	SYMO, PSME, CADE27, RUAC3	Sand, cobble	

Transect 1 - May and June Only

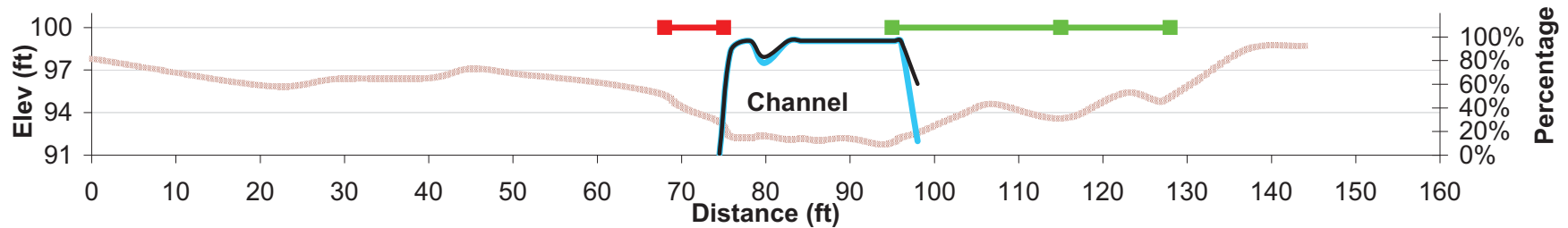
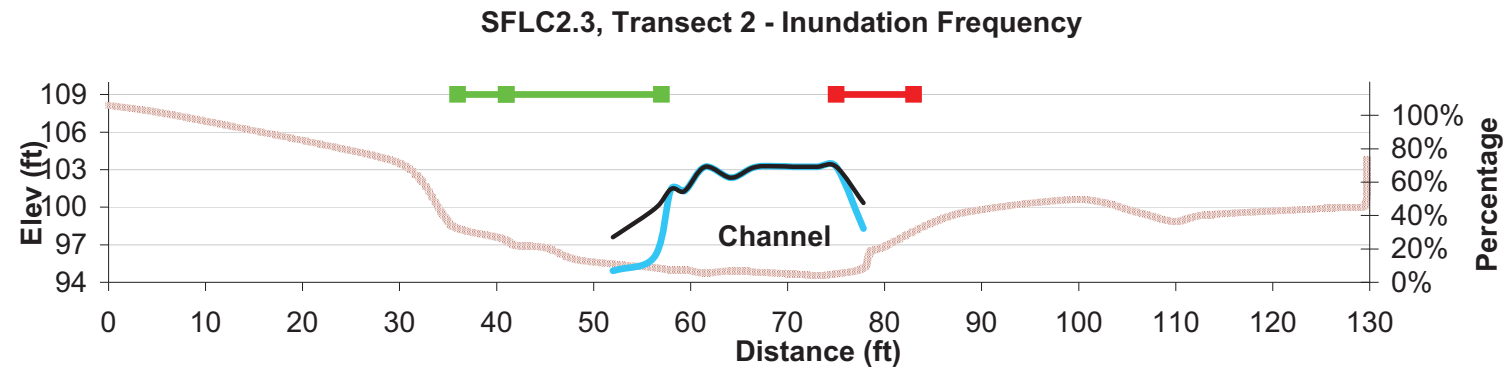
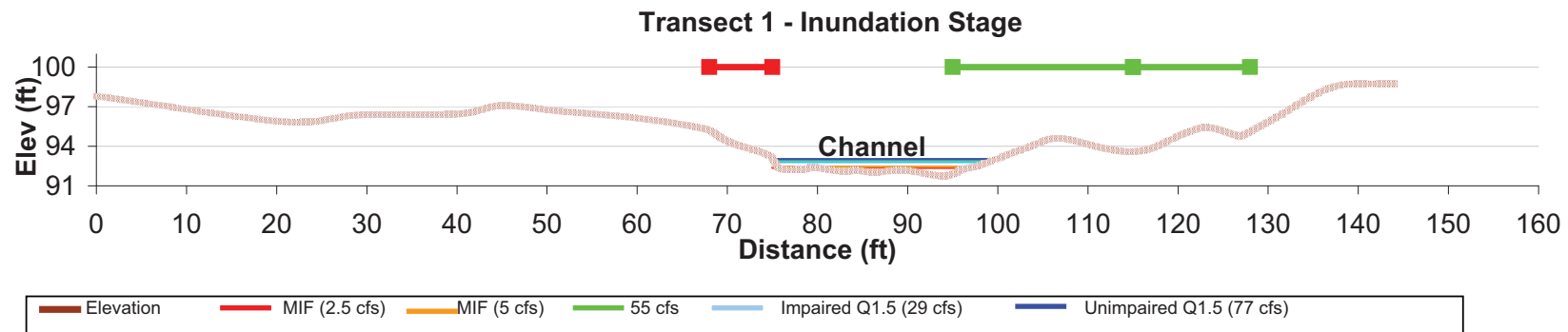


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

South Fork Long Canyon Creek SFLC2.3



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2	CADE27, PSME, ADBI, PIPO	Sand, gravel	
ALRH2	CALE9, SETR	Cobble, gravel	
ALRH2, PSME	Grass (NF), moss, BOMA3	Gravel, duff	

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

South Fork Long Canyon Creek SFLC2.3

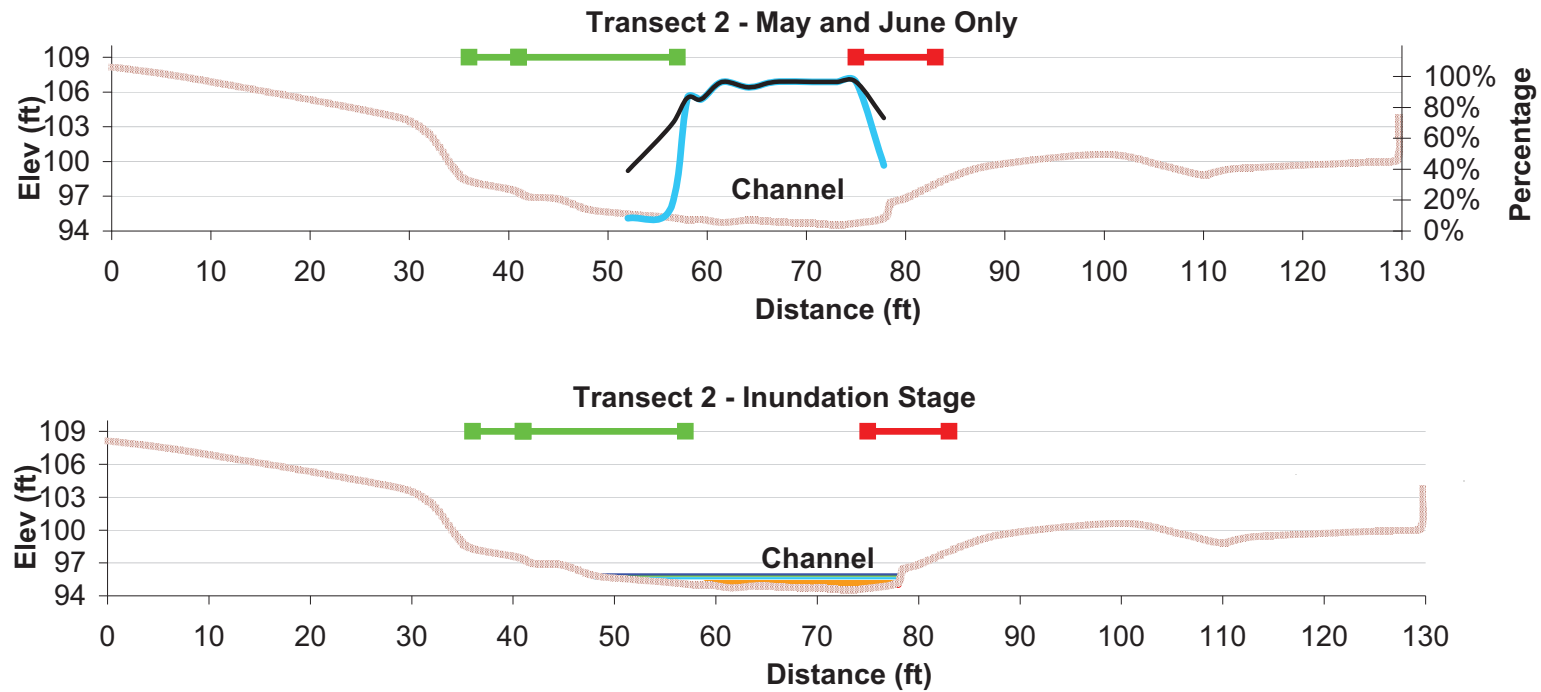
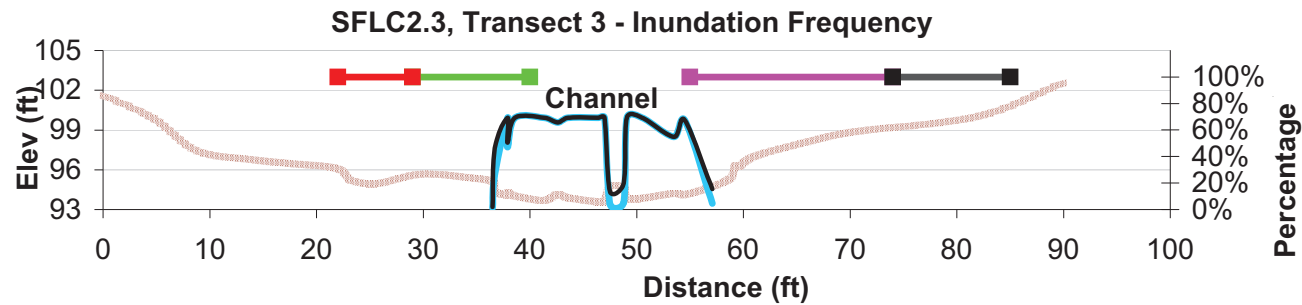


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

South Fork Long Canyon Creek SFLC2.3



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, CADE27	PSME, SYMO, Salix spp.	Sand, gravel	
ALRH2, CALE9	EQAR, PRVU, Juncus spp.	Cobble, gravel	
ALRH2, Juncus spp., COSE16	CADE27, PSME, QUKE, PIPO	Cobble, sand	
-	-	Woody debris	Woody debris pile

Transect 3 - May and June Only

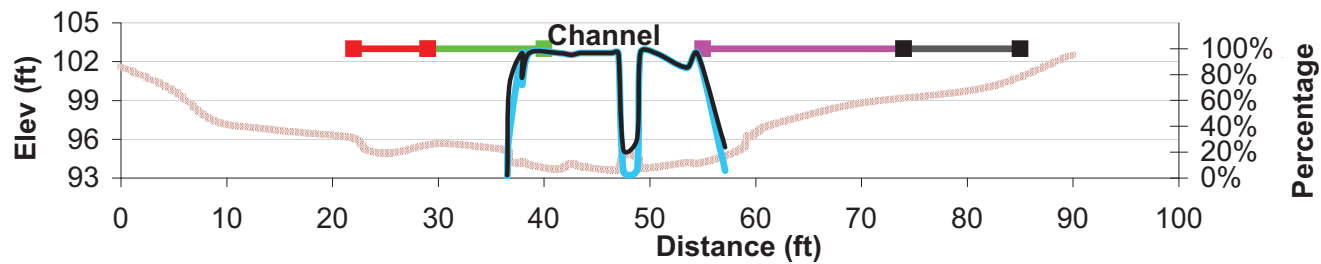
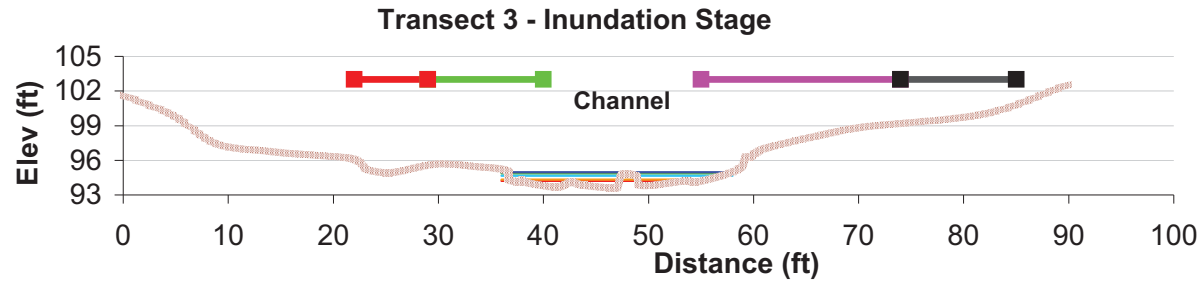


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

South Fork Long Canyon Creek SFLC2.3



Dominant and Sub-dominant Species Codes, Common Names, and Scientific Names Found Along Surveyed Transects.

Transect 1

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder		MICA3	<i>Mimulus cardinalis</i>	crimson monkeyflower
ARDO3	<i>Artemisia douglasiana</i>	Douglas' sagewort (mugwort)		PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir
BOMA3	<i>Boykinia major</i>	large boykinia		RUAC3	<i>Rumex acetosella</i>	sheep sorrel
CADE27	<i>Calocedrus decurrens</i>	incense cedar		SYMO	<i>Symphoricarpos mollis</i>	creeping snowberry
JUBU	<i>Juncus bufonius</i>	toad rush				

Transect 2

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ADBI	<i>Adenocaulon bicolor</i>	trail plant		CALE9	<i>Carex leporinella</i>	Sierra hare sedge
ALRH2	<i>Alnus rhombifolia</i>	white alder		PIPO	<i>Pinus ponderosa</i>	ponderosa pine
BOMA3	<i>Boykinia major</i>	large boykinia		PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir
CADE27	<i>Calocedrus decurrens</i>	incense cedar		SETR	<i>Senecio triangularis</i>	arrowleaf groundsel

Transect 3

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder		PIPO	<i>Pinus ponderosa</i>	ponderosa pine
CADE27	<i>Calocedrus decurrens</i>	incense cedar		PRVU	<i>Prunella vulgaris</i>	self-heal
CALE9	<i>Carex leporinella</i>	Sierra hare sedge		PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir
COSE16	<i>Cornus sericea</i> ssp. <i>sericea</i>	redosier dogwood, American dogwood		QUKE	<i>Quercus kelloggii</i>	California black oak
EQAR	<i>Equisetum arvense</i>	common horsetail		Salix spp.	-	willow
Juncus spp.	-	rush		SYMO	<i>Symphoricarpos mollis</i>	creeping snowberry

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

South Fork Long Canyon Creek SFLC2.3

Relationship of Stage and Inundation Frequency (a) and Wetted Width and Inundation Frequency (b) with Flow.

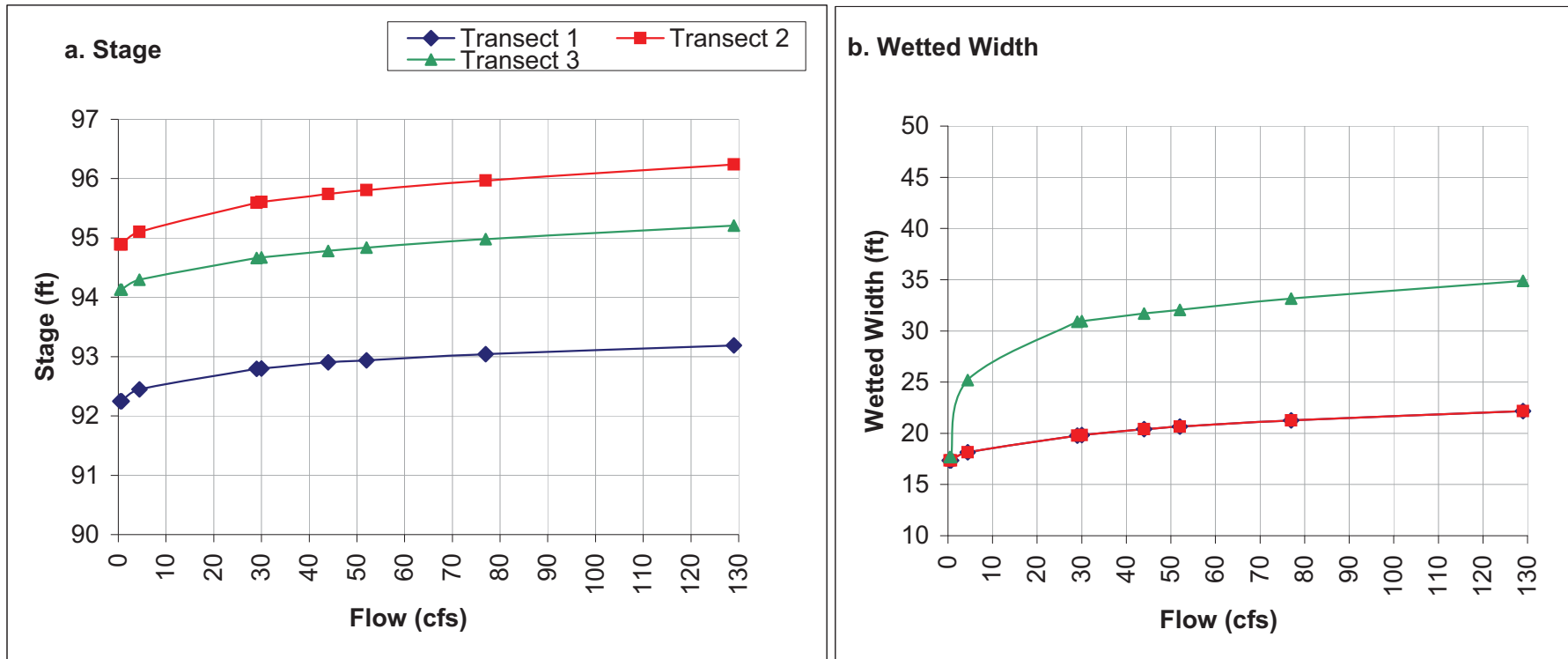
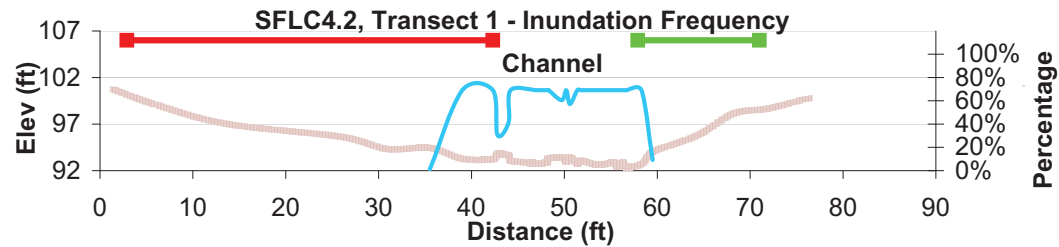


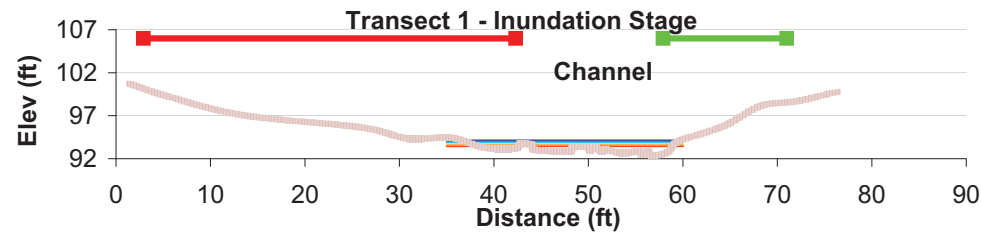
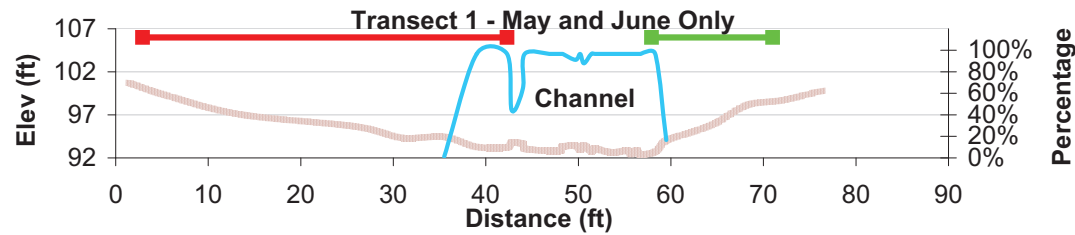
Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

South Fork Long Canyon Creek SFLC4.2



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, CADE27, SYMO, PTAQP2	ADBI, AQFO, MICA3, grass sp, SMRA	Duff	Mixed evergreen woodland
ALRH2, DAPE	AQFO, PTAQP2, BOMA3, VIAMA3	Cobble, gravel, litter	Water's edge

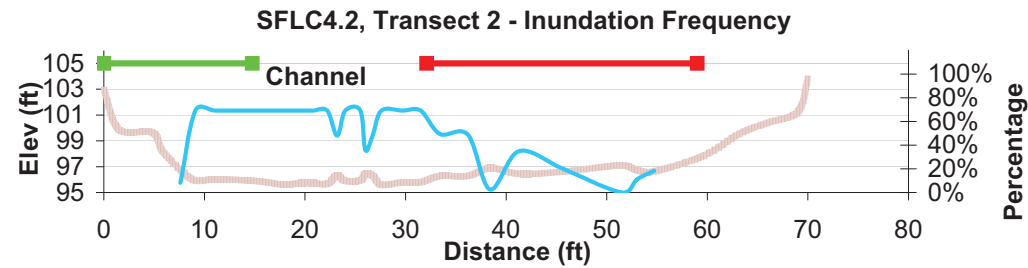


— Elevation
 — MIF (2.5 cfs)
 — MIF (5 cfs)
 — 55 cfs
 — Impaired Q1.5 (29 cfs)
 — Unimpaired Q1.5 (77 cfs)

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

South Fork Long Canyon Creek SFLC4.2

Note vertical exaggeration



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
DAPE, ALRH2	RIAM, MICA3, LAJE, CALE9	Boulder, gravel, duff	
CADE27, ALRH2, RIAM	MICA3, CALE9, AQFO, GATR3	Litter, cobble, gravel	

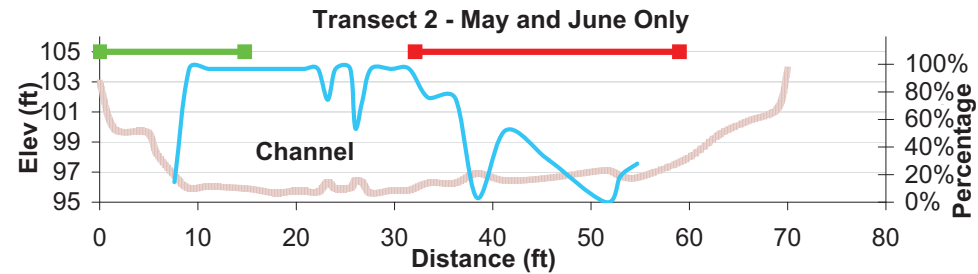


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

South Fork Long Canyon Creek SFLC4.2

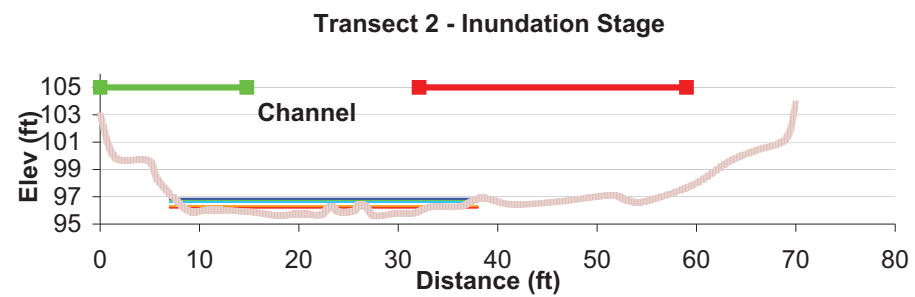
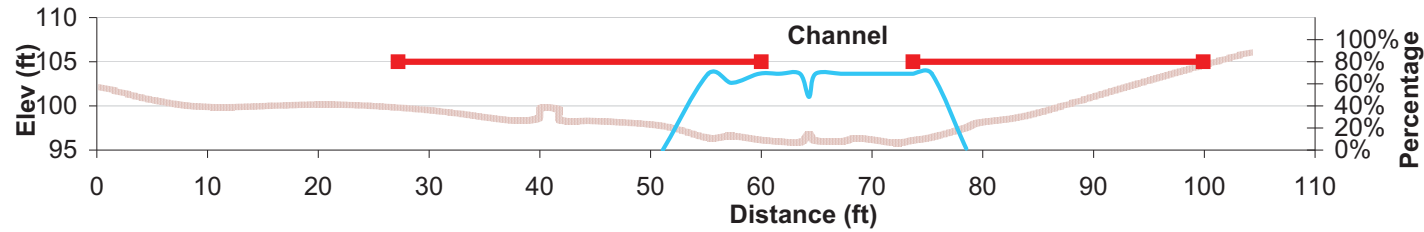


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

South Fork Long Canyon Creek SFLC4.2

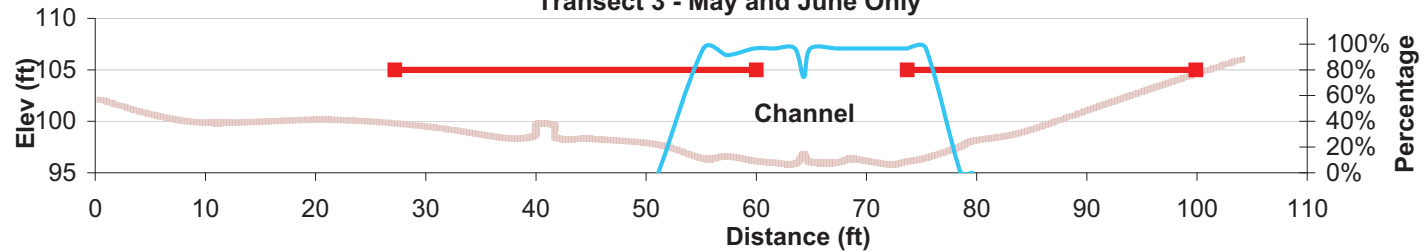
SFLC4.2, Transect 3 - Inundation Frequency



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, ABCO, CADE27, CONU4	SYMO	Litter, duff, cobble, sand	Mixed riparian woodland
PSME, ALRH2, PTAQP2	Grass, AQFO, MICA3	Duff, litter, cobble	Mixed evergreen forest

Transect 3 - May and June Only



Transect 3 - Inundation Stage

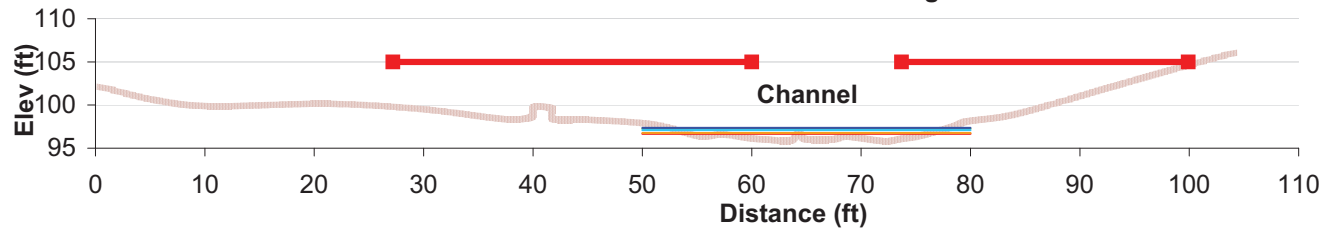


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

South Fork Long Canyon Creek SFLC4.2

Dominant and Sub-dominant Species Codes, Common Names, and Scientific Names Found Along Surveyed Transect.

Transect 1

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ADBI	Adenocaulon bicolor	trail plant		MARAR (SMRA)	Maianthemum racemosum ssp. racemosum (=Smilacina racemosa)	false Solomon's seal
ALRH2	Alnus rhombifolia	white alder		MICA3	Mimulus cardinalis	crimson monkeyflower
AQFO	Aquilegia formosa	western columbine		PTAQP2	Pteridium aquilinum var. pubescens	bracken fern
BOMA3	Boykinia major	large boykinia		SYMO	Symphoricarpos mollis	creeping snowberry
CADE27	Calocedrus decurrens	incense cedar		VIAMA3	Vicia americana var. americana	American vetch
DAPE	Darmera peltata	Indian rhubarb				

Transect 2

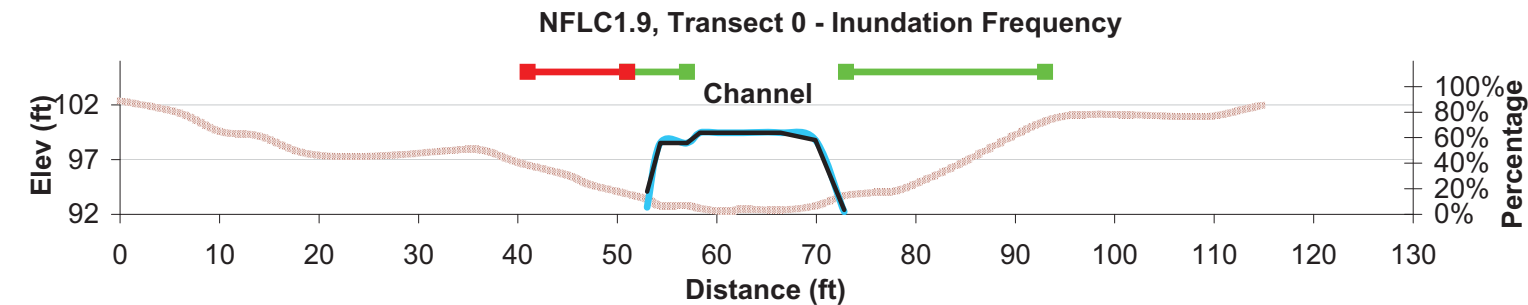
Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ALRH2	Alnus rhombifolia	white alder		GATR3	Galium triflorum	sweet-scented bedstraw
AQFO	Aquilegia formosa	western columbine		LAJE	Lathyrus jepsonii	tule pea
CADE27	Calocedrus decurrens	incense cedar		MICA3	Mimulus cardinalis	crimson monkeyflower
CALE9	Carex leporinella	Sierra hare sedge		RIAM	Ribes amarum	bitter gooseberry
DAPE	Darmera peltata	Indian rhubarb				

Transect 3

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ABCO	Abies concolor	white fir		MICA3	Mimulus cardinalis	crimson monkeyflower
ALRH2	Alnus rhombifolia	white alder		PSME	Pseudotsuga menziesii var. menziesii	Douglas fir
AQFO	Aquilegia formosa	western columbine		PTAQP2	Pteridium aquilinum var. pubescens	bracken fern
CADE27	Calocedrus decurrens	incense cedar		SYMO	Symphoricarpos mollis	creeping snowberry
CONU4	Cornus nuttallii	mountain dogwood				

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork Long Canyon Creek NFLC1.9



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, CADE27	PTAQP2, ADBI, DIHO3	Gravel, sand	
DAPE, ALRH2	AQFO, PTAQP2	Cobble, boulder	
ALRH2	ACMA3, Leymus spp. (NF), Ribes spp. (NF)	Gravel, cobble	

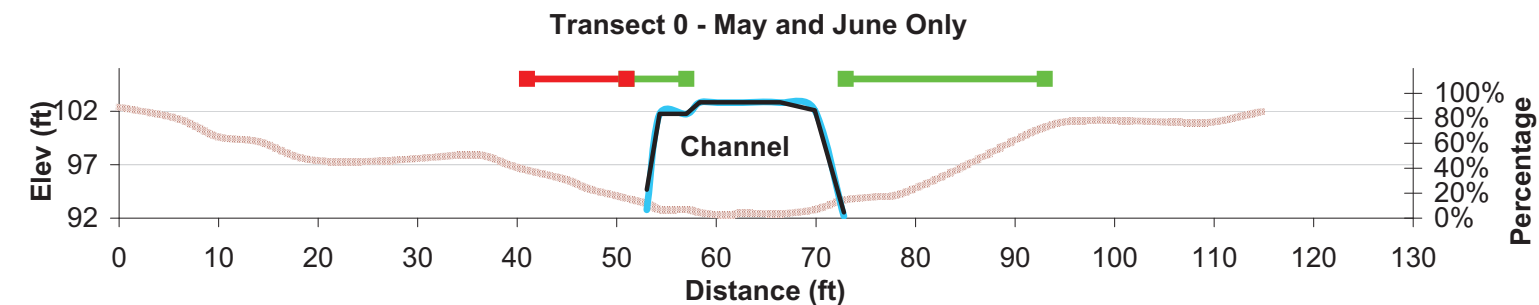
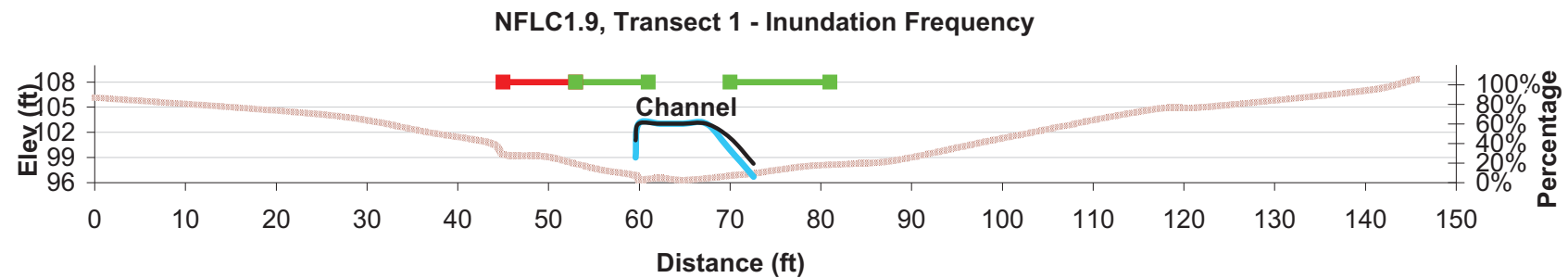
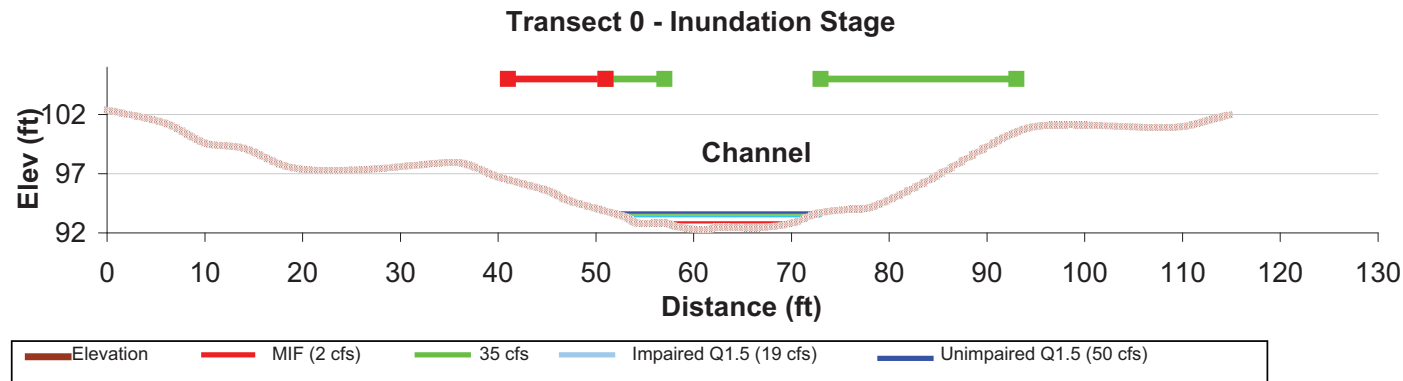


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork Long Canyon Creek NFLC1.9



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, PSME	QUCH2, AQFO, SYMO, CADE27	Gravel, sand	
ALRH2, ARCA2	AQFO, SYMO	Gravel, cobble	
ALRH2, ARCA2, AQFO	CALE9, grass (NF), Leymus spp. (NF)	Sand, cobble	

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork Long Canyon Creek NFLC1.9

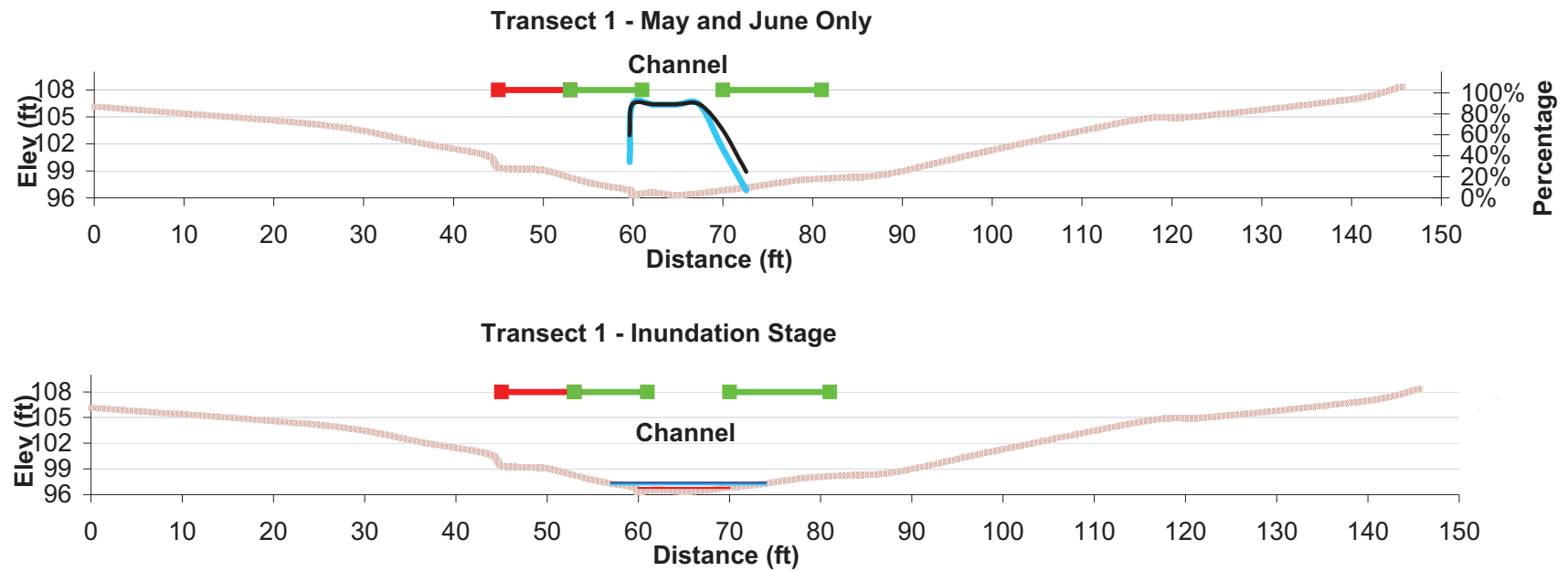
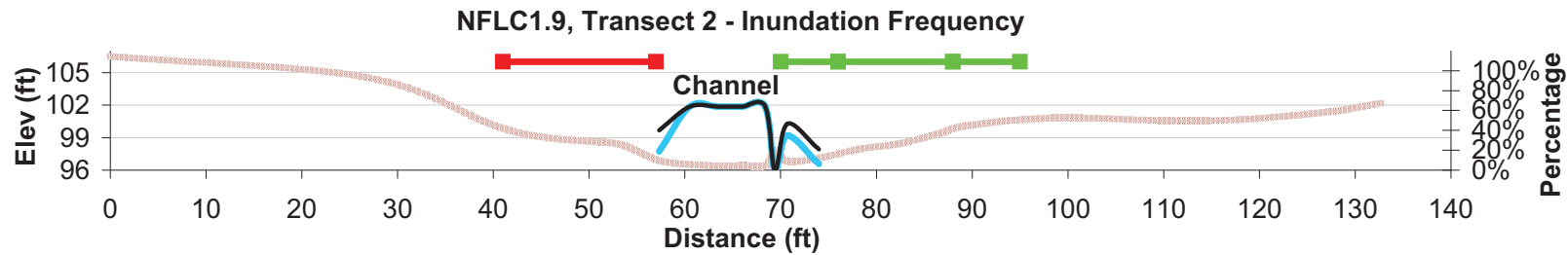


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork Long Canyon Creek NFLC1.9



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, PSME	CALE9, SYMO, CADE27, COSE16	Sand, cobble	
ALRH2, CALE9	MIFL2, ARCA2	Boulder, cobble	
ALRH2	CADE27, PSME, PTAQP2, COSE16	Cobble, silt	
ALRH2	BOMA3, ADBI, PSME, CADE27	Silt	Backwater channel area

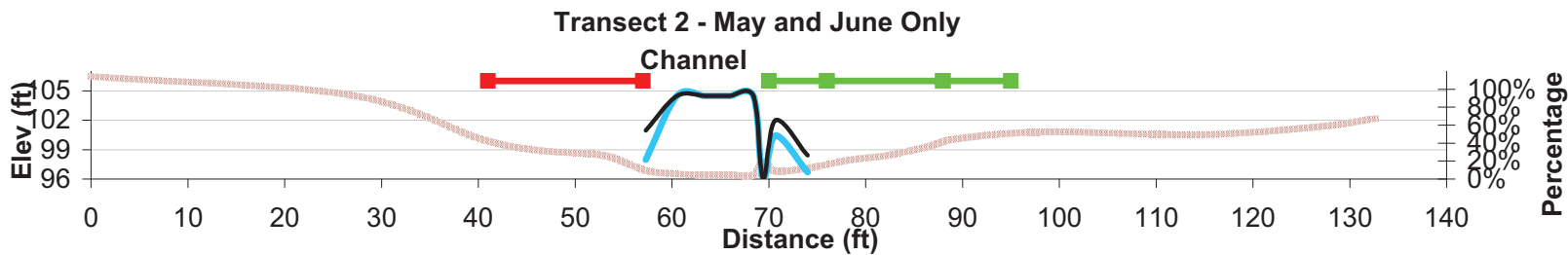
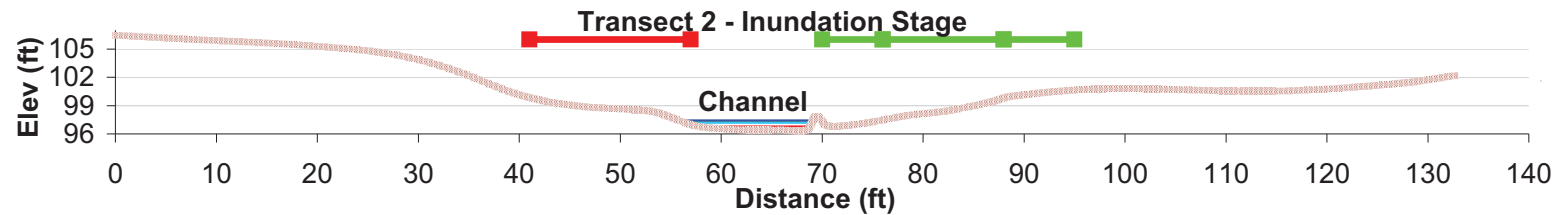


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork Long Canyon Creek NFLC1.9



Dominant and Sub-dominant Species Codes, Common Names, and Scientific Names Found Along Surveyed Transects.

Transect 1

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ACMA3	<i>Acer macrophyllum</i>	big leaf maple		DAPE	<i>Darmera peltata</i>	Indian rhubarb
ADBI	<i>Adenocaulon bicolor</i>	trail plant		Leymus spp.	-	wild rye
ALRH2	<i>Alnus rhombifolia</i>	white alder		PRHOH (DIHO3)	<i>Prosartes hookeri</i> (=Disporum hookeri)	drops of gold
AQFO	<i>Aquilegia formosa</i>	western columbine		PTAQP2	<i>Pteridium aquilinum</i> var. <i>pubescens</i>	bracken fern
CADE27	<i>Calocedrus decurrens</i>	incense cedar		Ribes spp.	-	currant

Transect 2

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder		Leymus spp.	-	wild rye
AQFO	<i>Aquilegia formosa</i>	western columbine		PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir
ARCA2	<i>Aralia californica</i>	California spikenard (elk clover)		QUCH2	<i>Quercus chrysolepis</i>	canyon live oak
CADE27	<i>Calocedrus decurrens</i>	incense cedar		SYMO	<i>Symphoricarpos mollis</i>	creeping snowberry
CALE9	<i>Carex leporinella</i>	Sierra hare sedge				

Transect 3

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ADBI	<i>Adenocaulon bicolor</i>	trail plant		COSE16	<i>Cornus sericea</i> ssp. <i>sericea</i>	redosier dogwood, American dogwood
ALRH2	<i>Alnus rhombifolia</i>	white alder		MIFL2	<i>Mimulus floribundus</i>	manyflowered monkeyflower
CALE9	<i>Carex leporinella</i>	Sierra hare sedge		PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir
ARCA2	<i>Aralia californica</i>	California spikenard (elk clover)		PTAQP2	<i>Pteridium aquilinum</i> var. <i>pubescens</i>	bracken fern
BOMA3	<i>Boykinia major</i>	large boykinia		SYMO	<i>Symphoricarpos mollis</i>	creeping snowberry
CADE27	<i>Calocedrus decurrens</i>	incense cedar				

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork Long Canyon Creek NFLC1.9

Relationship of Stage and Inundation Frequency (a) and Wetted Width and Inundation Frequency (b) with Flow.

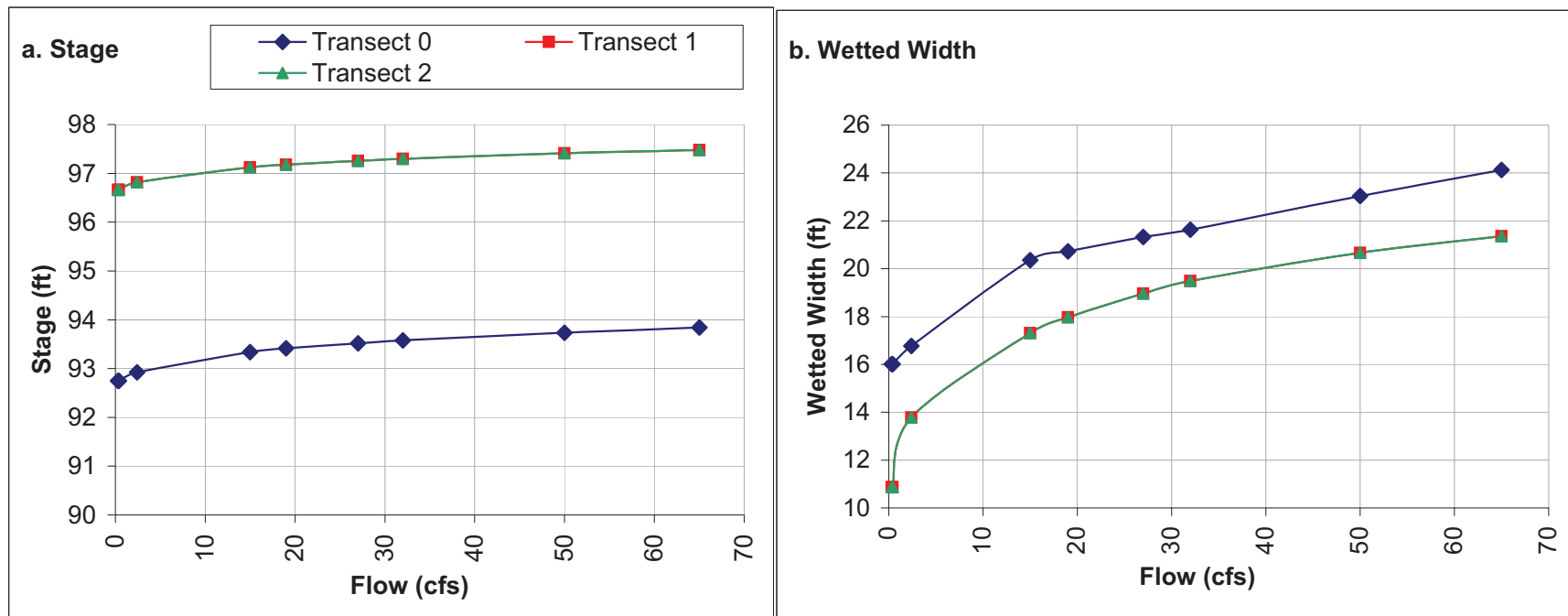
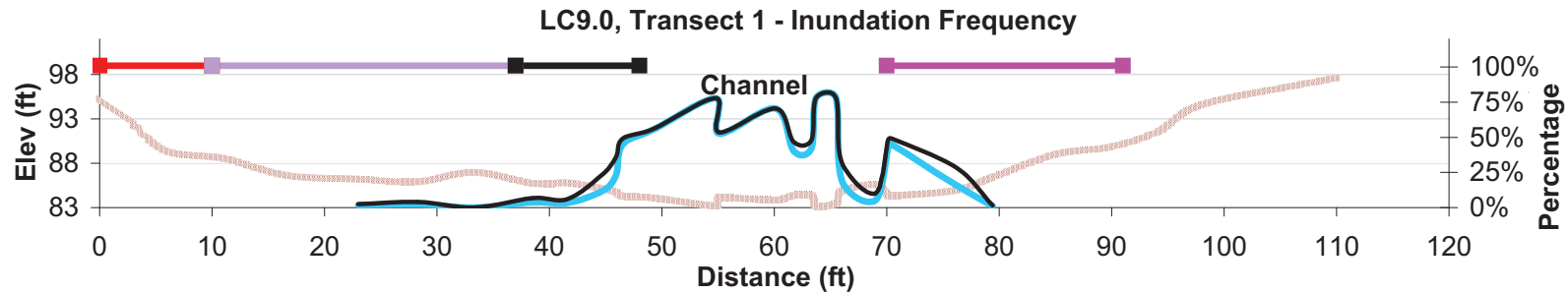


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Long Canyon Creek LC9.0



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
PSME, ACMA3, ALRH2	BOMA3, BOOC2, moss	Bedrock	
ALRH2, SAEX	ACMA3	Boulder, cobble	
None	None	Bedrock, cobble	
ALRH2, COSE3	BOOC2, PTAQP2, Leymus spp., DAPE	Bedrock, cobble	

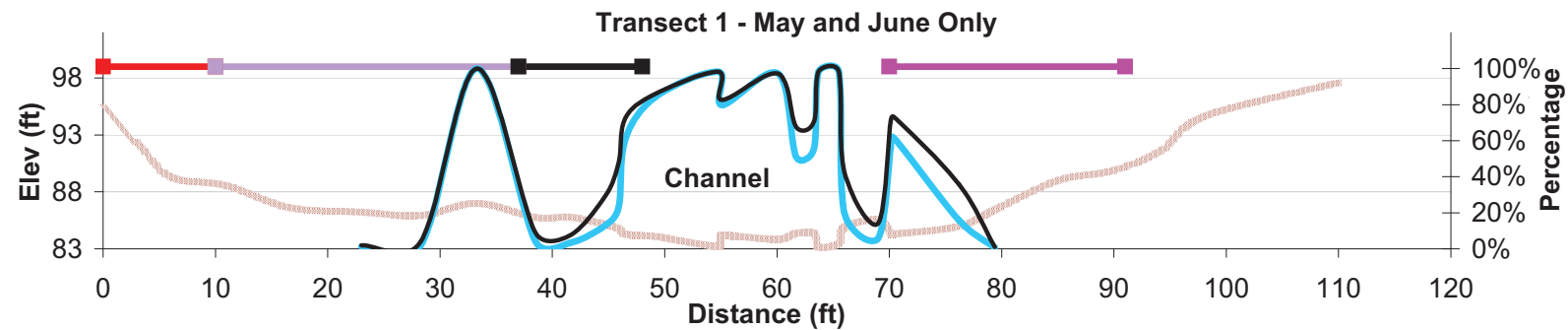
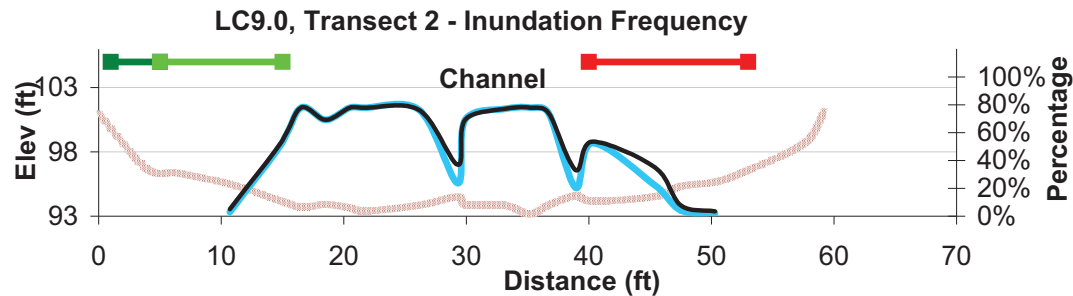
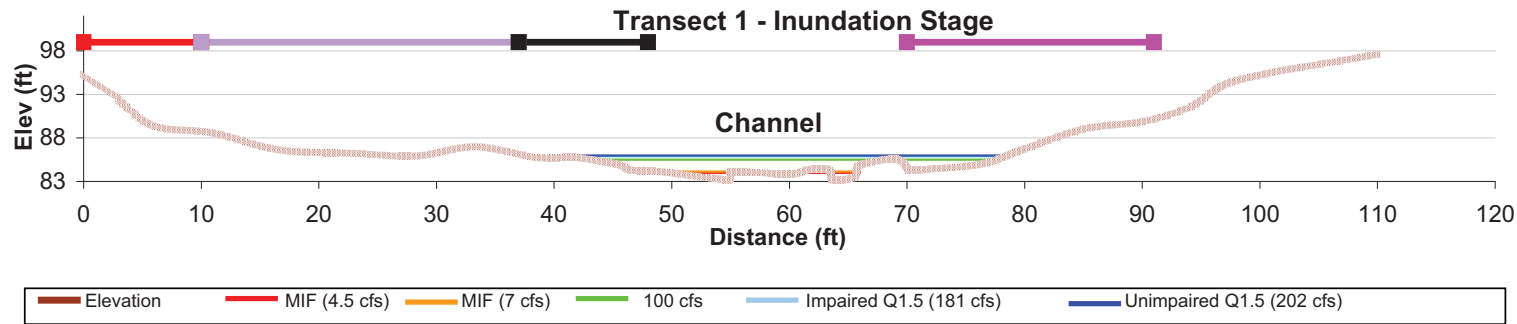


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Long Canyon Creek LC9.0



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
QUCH2, BOOC2	BOMA3	Bedrock, boulder	
ALRH2, ARCA2	Carex spp., BOOC2	Boulder, cobble	
PSME, ALRH2, BOMA3	Carex spp., PTAQP2, DAPE	Boulder, cobble	

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Long Canyon Creek LC9.0

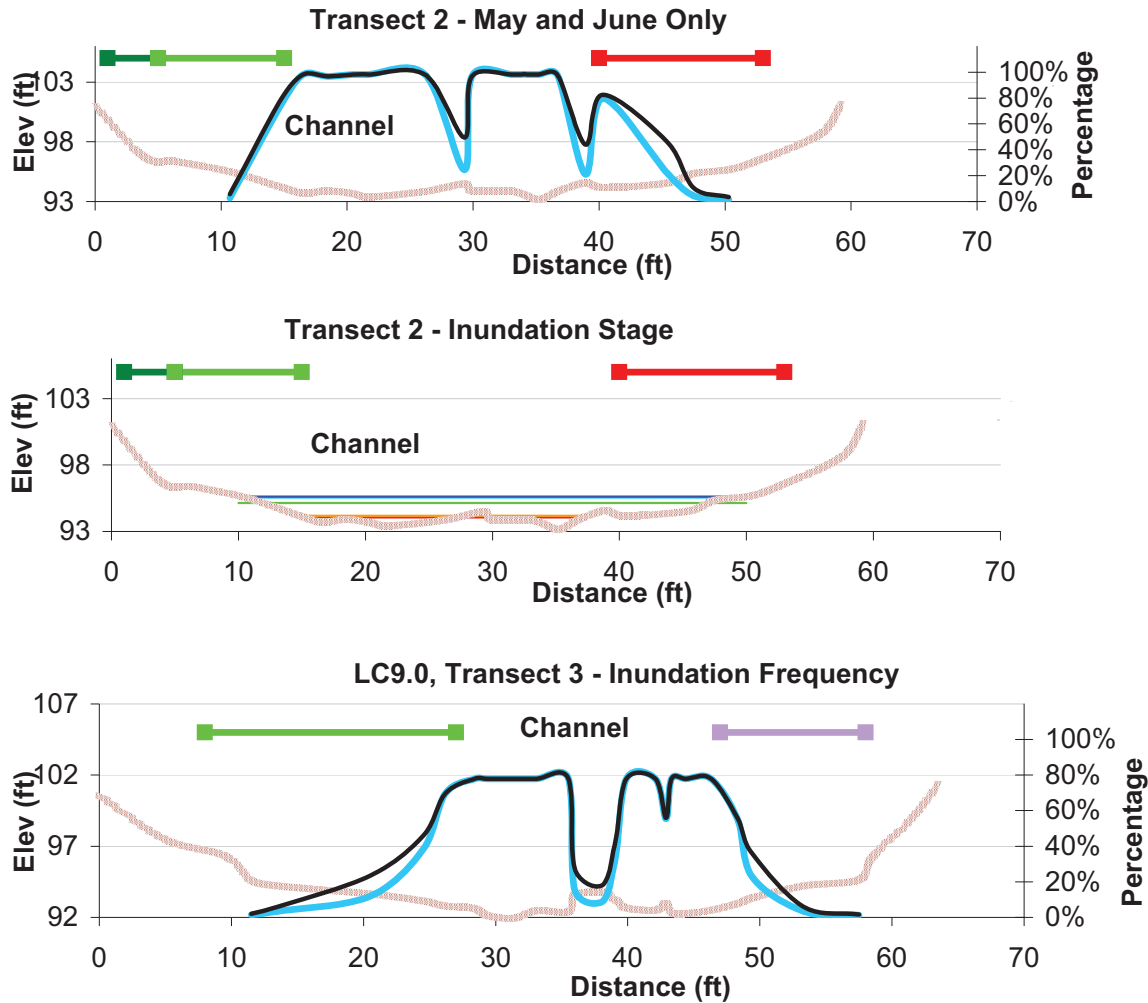


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Long Canyon Creek LC9.0

Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, BOMA3, RUPA	moss, AQFO	Bedrock, gravel	
ALRH2, SALU	BOMA3, LOOB2	Cobble, gravel	

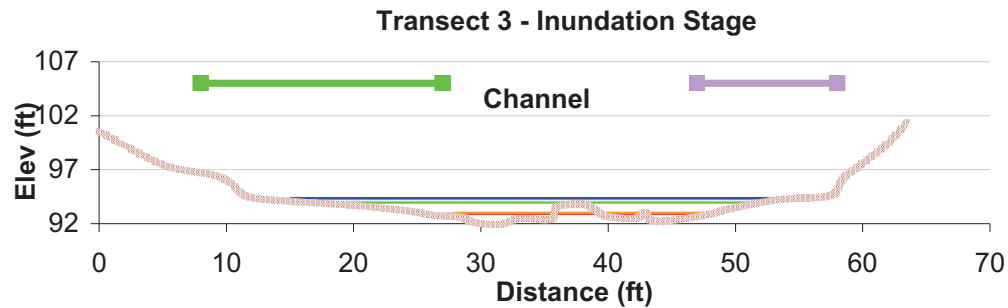
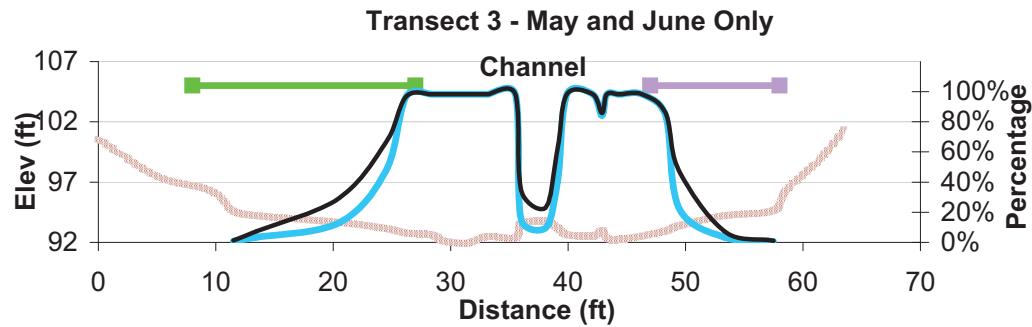


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Long Canyon Creek LC9.0

Dominant and Sub-dominant Species Codes, Common Names, and Scientific Names Found Along Surveyed Transects.

Transect 1

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ACMA3	Acer macrophyllum	big leaf maple		DAPE	Darmera peltata	Indian rhubarb
ALRH2	Alnus rhombifolia	white alder		Leymus spp.	-	wild rye
BOMA3	Boykinia major	large boykinia		PSME	Pseudotsuga menziesii var. menziesii	Douglas fir
BOOC2	Boykinia occidentalis	western brookfoam		PTAQP2	Pteridium aquilinum var. pubescens	bracken fern
COSE3	Cornus sessilis	blackfruit dogwood		SAEX	Salix exigua	narrow leaf willow

Transect 2

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ARCA2	Aralia californica	California spikenard (elk clover)		DAPE	Darmera peltata	Indian rhubarb
ALRH2	Alnus rhombifolia	white alder		PSME	Pseudotsuga menziesii var. menziesii	Douglas fir
BOMA3	Boykinia major	large boykinia		PTAQP2	Pteridium aquilinum var. pubescens	bracken fern
BOOC2	Boykinia occidentalis	western brookfoam		QUCH2	Quercus chrysolepis	canyon live oak
Carex spp.	-	sedge				

Transect 3

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ALRH2	Alnus rhombifolia	white alder		LOOB2	Lotus oblongifolius var. oblongifolius	streambank trefoil
AQFO	Aquilegia formosa	western columbine		RUPA	Rubus parviflorus	thimbleberry
BOMA3	Boykinia major	large boykinia		SALU	Salix lucida	shining willow

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Long Canyon Creek LC9.0

Relationship of Stage and Inundation Frequency (a) and Wetted Width and Inundation Frequency (b) with Flow.

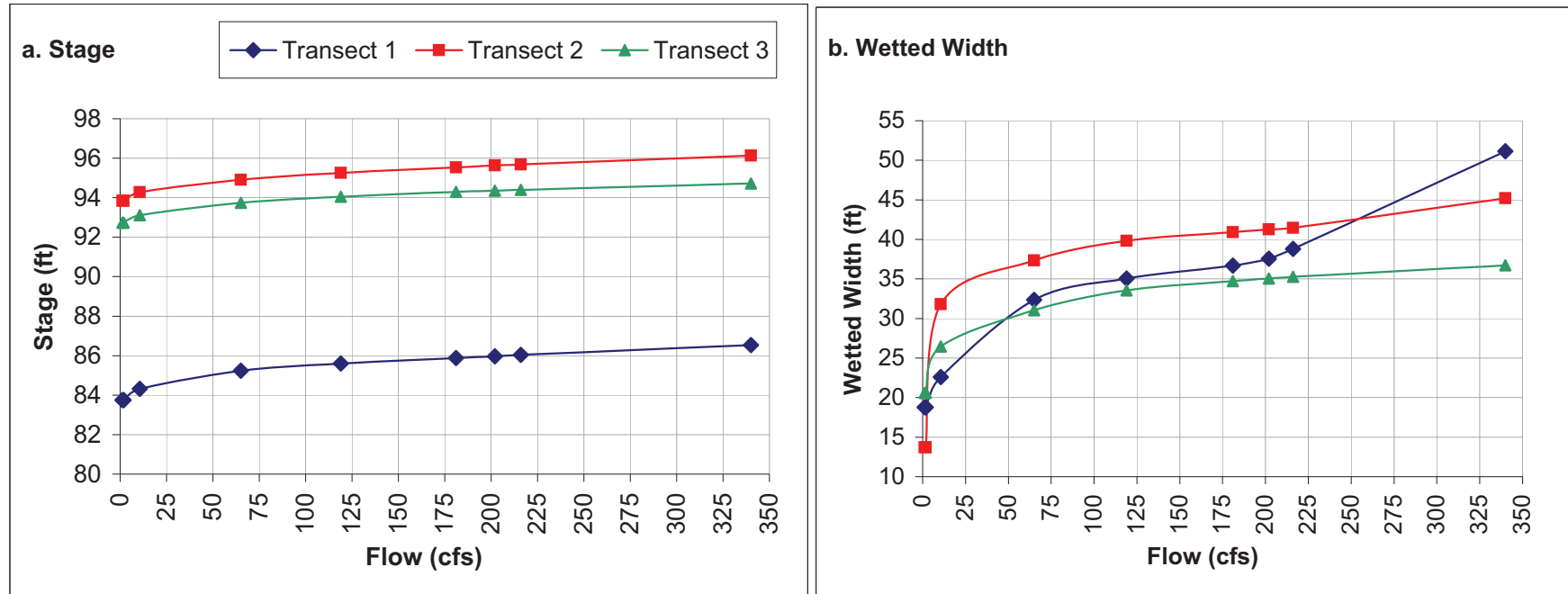
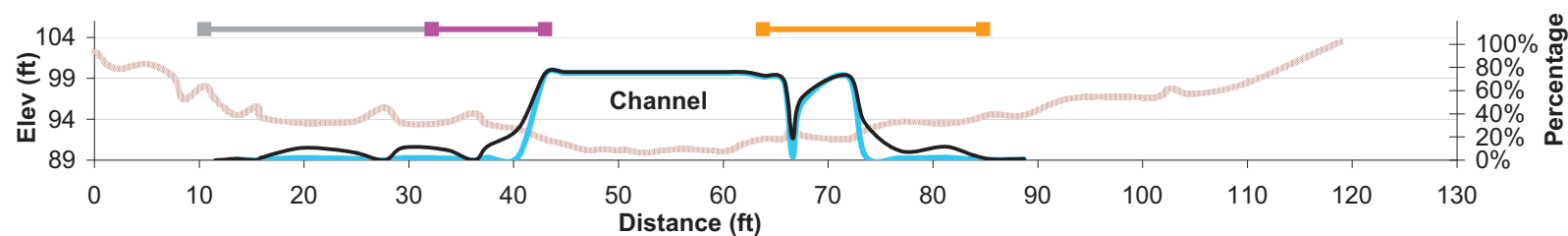


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Duncan Creek D6.3

D6.3, Transect 1 - Inundation Frequency



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
-	BOMA3, SYMO, SPDE	Boulder, cobble	
SAJE, COSE16, ANMA	DAPE, RUPA	Boulder, cobble	
SAJE	PSME	Boulder, cobble	

Transect 1 - May and June Only

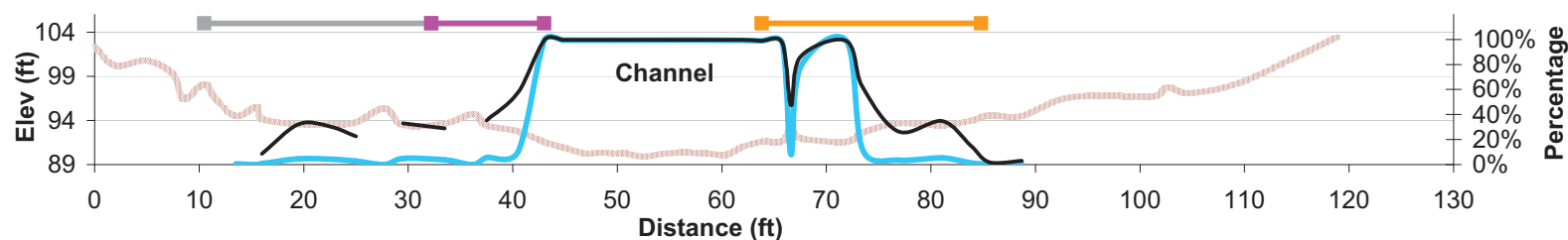
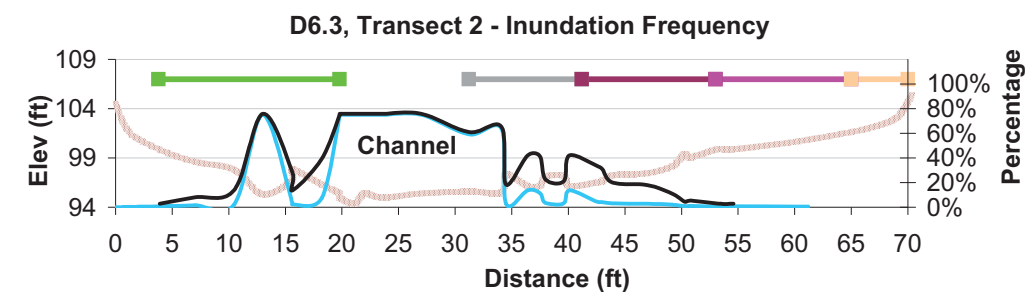
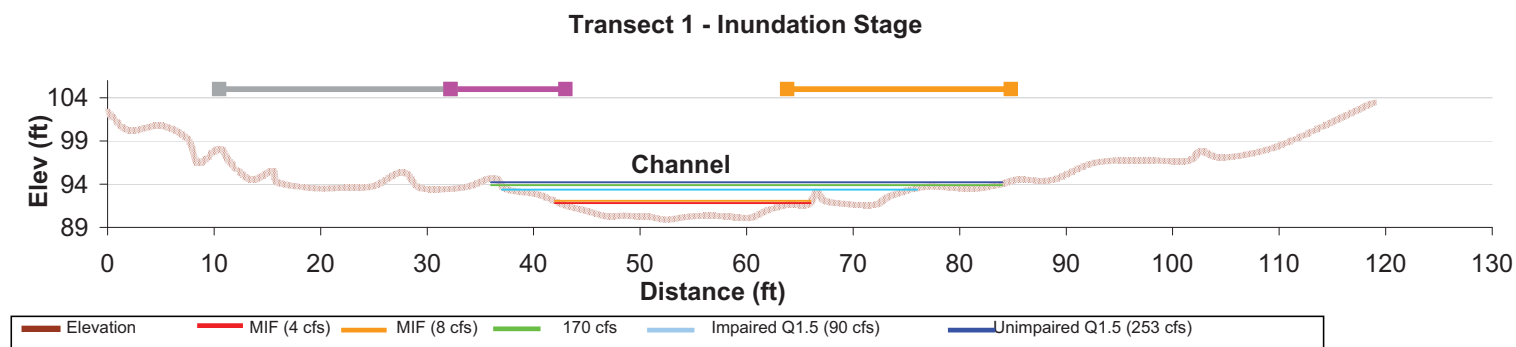


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Duncan Creek D6.3



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
DAPE, ALINT	LOOB2, BOMA3, PSME, ANMA	Bedrock, boulder	
-		Cobble, gravel	Cobble deposit
DAPE, COSE16	SAJE	Boulder, cobble	
ALINT, COSE16, RHOC, PSME		Sand, gravel	
SOSC2, PTAQP2, ADBI		Sand, cobble	

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Duncan Creek D6.3

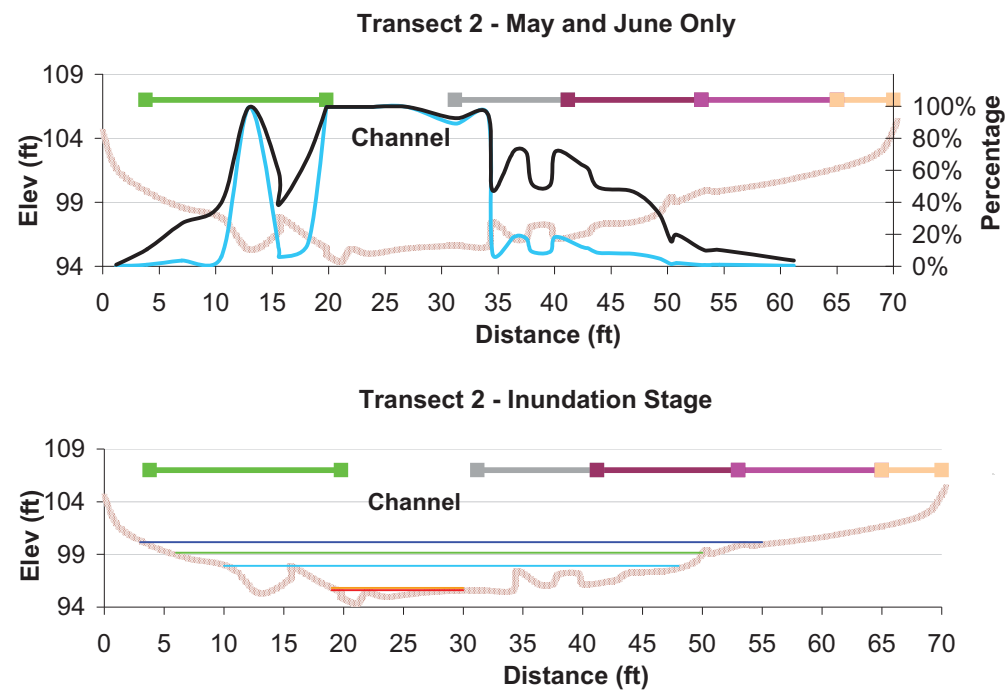
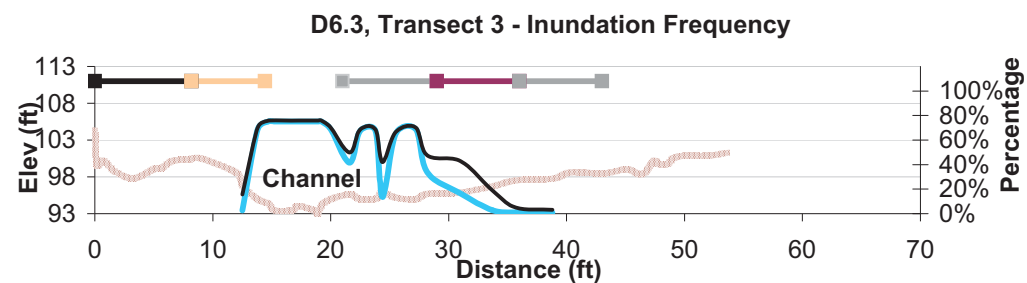


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Duncan Creek D6.3



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
-	BOMA3	Bedrock	
DAPE	BOMA3, PTAQP2, ALINT	Boulder, cobble	
-		Boulder, cobble	
DAPE, COSE16		Boulder, cobble	
-		Boulder, cobble	

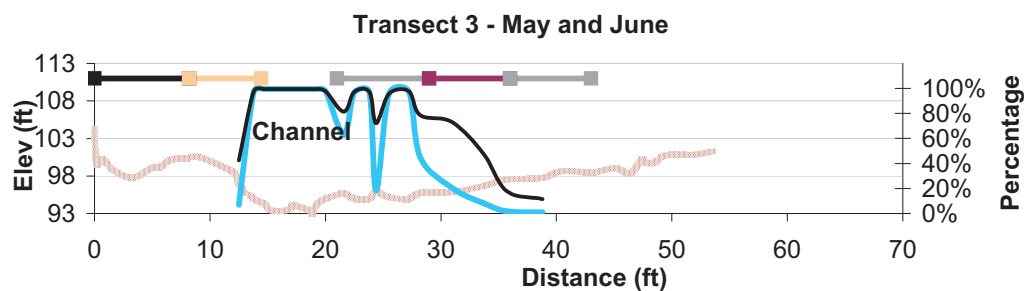
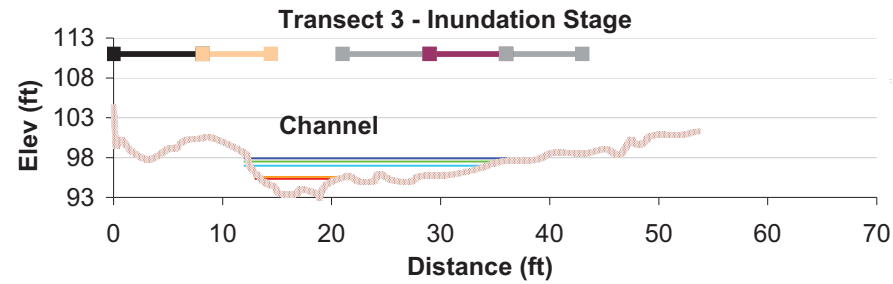


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Duncan Creek D6.3



Dominant and Sub-dominant Species Codes, Common Names, and Scientific Names Found Along Surveyed Transects.

Transect 1

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ANMA	<i>Anaphalis margaritacea</i>	pearly everlasting		RUPA	<i>Rubus parviflorus</i>	thimbleberry
BOMA3	<i>Boykinia major</i>	large boykinia		SAJE	<i>Salix jepsonii</i>	Jepson's willow
COSE16	<i>Cornus sericea</i> ssp. <i>sericea</i>	redosier dogwood, American dogwood		SPSPS (SPDE)	<i>Spiraea splendens</i> var. <i>splendens</i> (= <i>Spiraea densiflora</i>)	spirea
DAPE	<i>Darmera peltata</i>	Indian rhubarb		SYMO	<i>Symphoricarpos mollis</i>	creeping snowberry
PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir				

Transect 2

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ADBI	<i>Adenocaulon bicolor</i>	trail plant		PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir
ALINT	<i>Alnus incana</i> ssp. <i>tenuifolia</i>	mountain alder		PTAQP2	<i>Pteridium aquilinum</i> var. <i>pubescens</i>	bracken fern
ANMA	<i>Anaphalis margaritacea</i>	pearly everlasting		RHOC	<i>Rhododendron occidentale</i>	western azalea
BOMA3	<i>Boykinia major</i>	large boykinia		SAJE	<i>Salix jepsonii</i>	Jepson's willow
COSE16	<i>Cornus sericea</i> ssp. <i>sericea</i>	redosier dogwood, American dogwood		SOSC2	<i>Sorbus scopulina</i>	mountain ash
DAPE	<i>Darmera peltata</i>	Indian rhubarb				
LOOB2	<i>Lotus oblongifolius</i> var. <i>oblongifolius</i>	streambank trefoil				

Transect 3

Species Code	Scientific Name	Common Name
ALINT	<i>Alnus incana</i> ssp. <i>tenuifolia</i>	mountain alder
BOMA3	<i>Boykinia major</i>	large boykinia
COSE16	<i>Cornus sericea</i> ssp. <i>sericea</i>	redosier dogwood, American dogwood
DAPE	<i>Darmera peltata</i>	Indian rhubarb
PTAQP2	<i>Pteridium aquilinum</i> var. <i>pubescens</i>	bracken fern

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Duncan Creek D6.3

Relationship of Stage and Inundation Frequency (a) and Wetted Width and Inundation Frequency (b) with Flow.

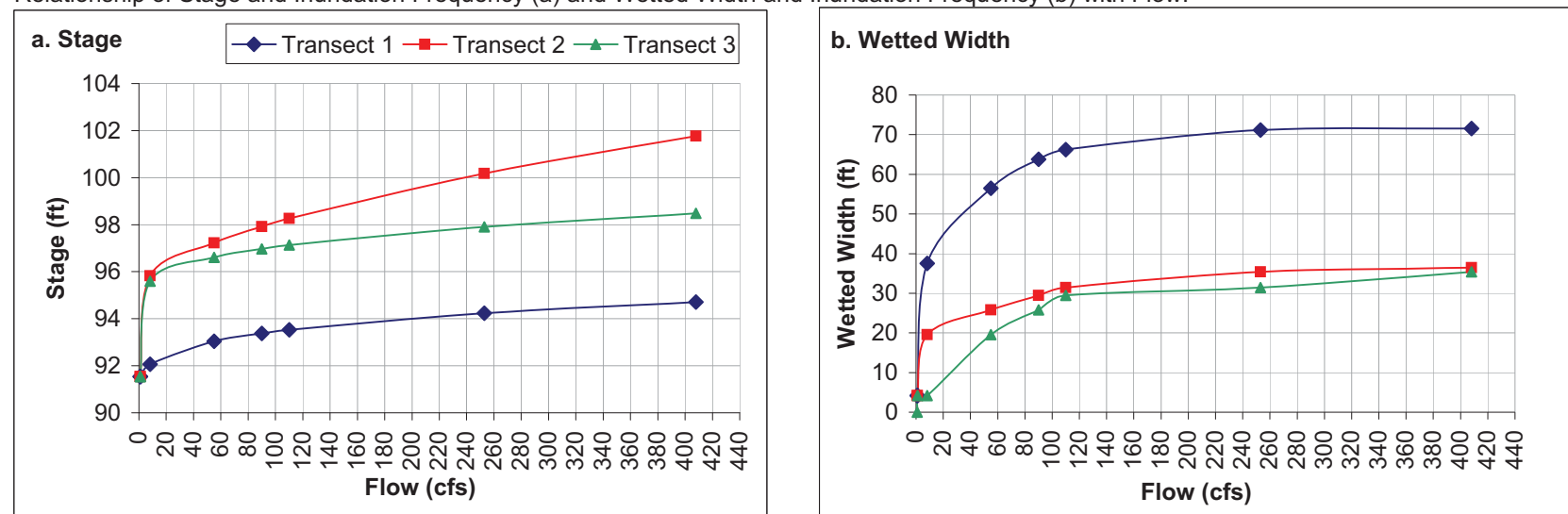
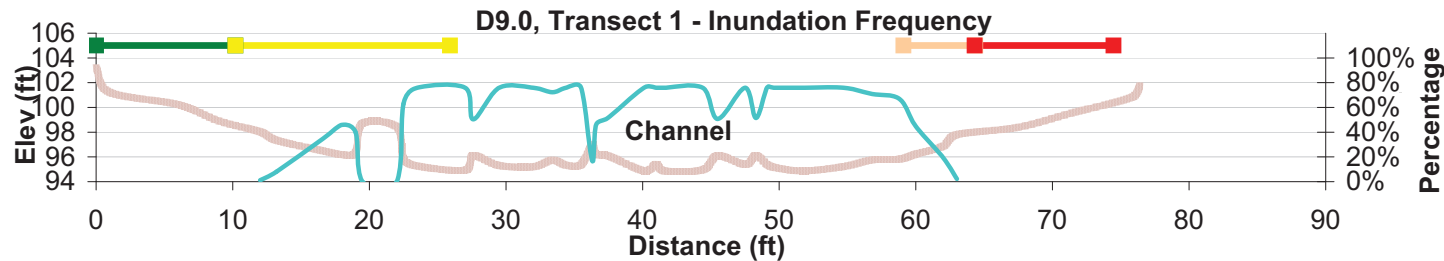


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Duncan Creek D9.0



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ABCO, ARPA6, LOIN5, PHHU, GAFR	-	Cobble, duff	Montane chaparral/mixed evergreen woodland
ALINT, POBAT, COSE16	DAPE, BOMA3	Boulder, cobble, gravel	Cobble/boulder deposit
DAPE, BOMA3	-	Gravel, boulder, cobble	Gravel deposit
ALINT, ABCO	-	Cobble, gravel	Gravel deposit

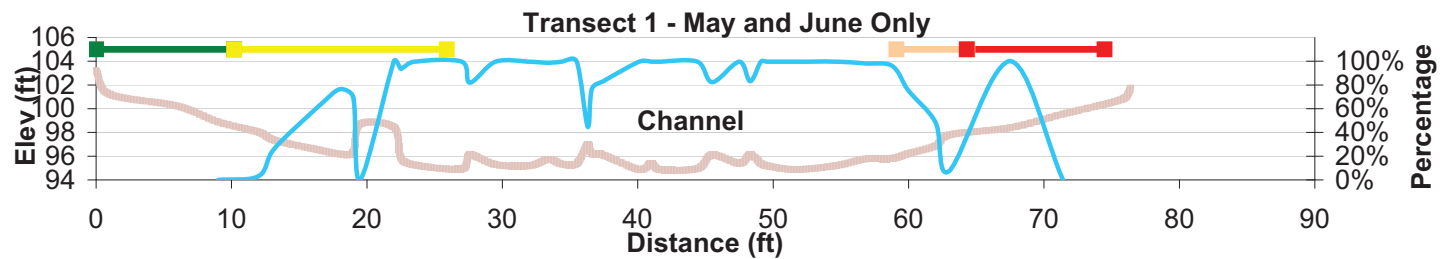
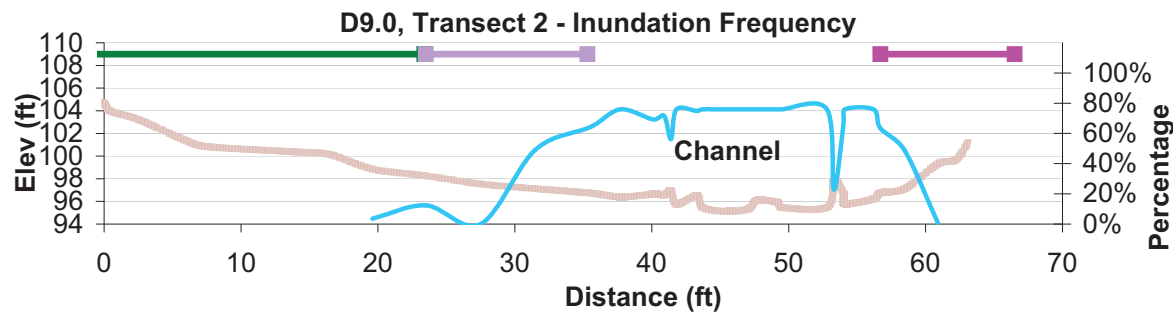
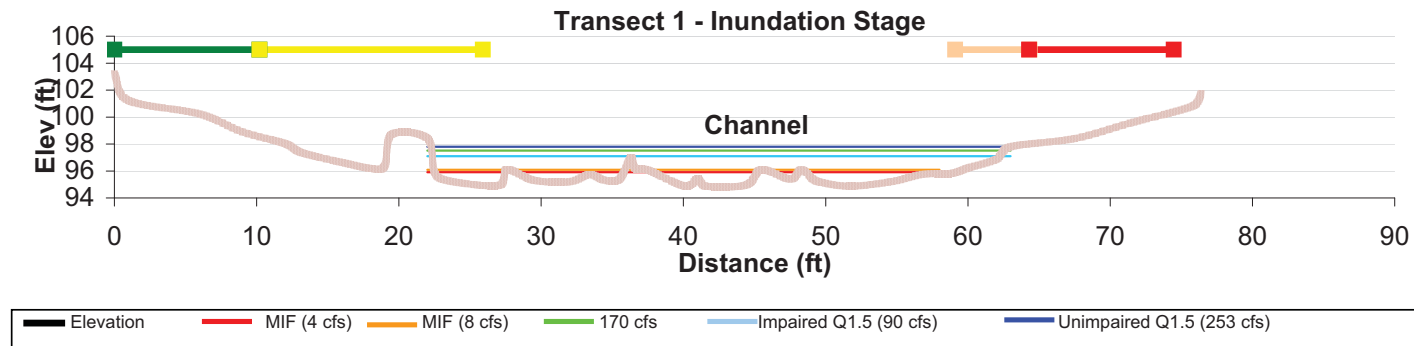


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Duncan Creek D9.0



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ABCO	SYMO	Boulder, cobble, gravel	Mixed evergreen woodland
ALINT, SALU	ABCO	Cobble, gravel	Cobble/gravel deposit
PSME, COSE16, ALINT, PTAQP2	LEDA, BOMA3, moss	Gravel, boulder, roots	Mixed evergreen woodland

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Duncan Creek D9.0

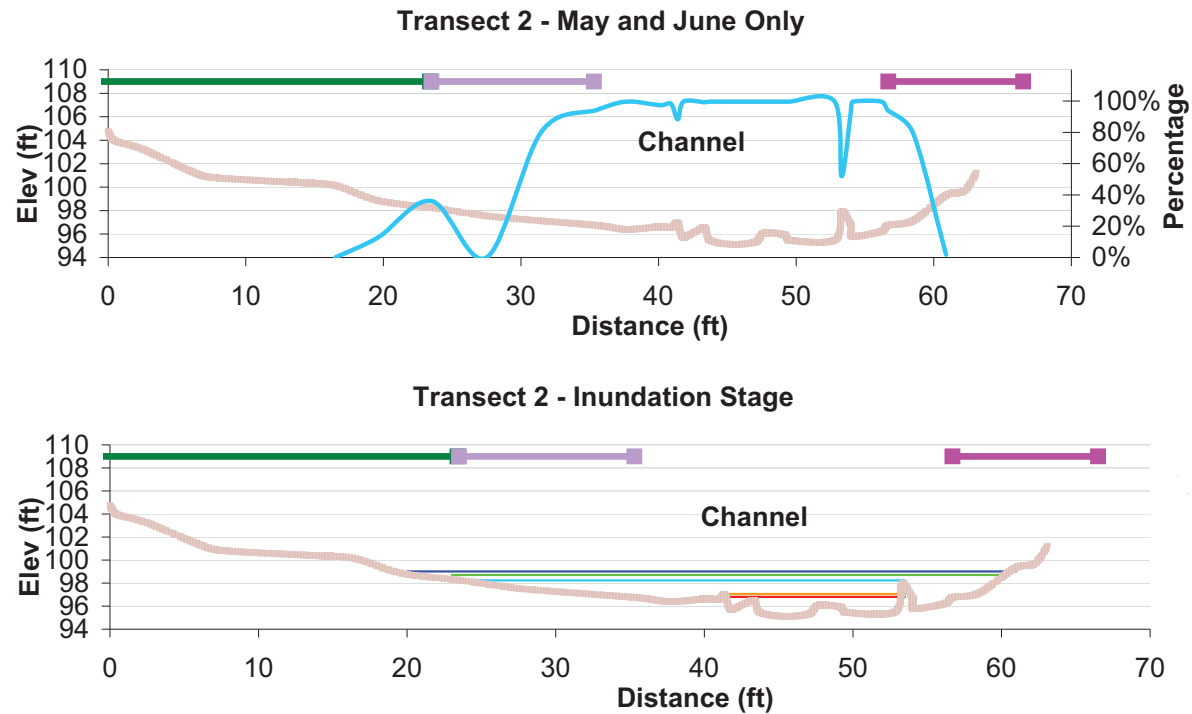
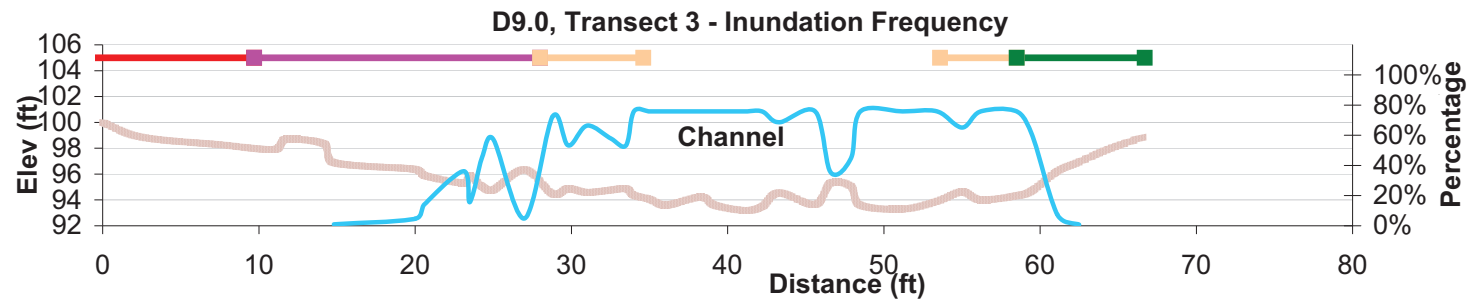


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Duncan Creek D9.0



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ABCO, ALINT, PTAQP2	SETR, PIPO, CADE27	Drift, fine sand	Mixed evergreen woodland
ALINT, COSE16	BOMA3, SETR	Boulder, cobble, sand, drift	Riparian thicket
DAPE, LOOB2	BOMA3	Cobble, sand, boulder	Sandy water's edge
DAPE, PSME, LOOB2	BOMA3	Bedrock, boulder	Inundated zone
PSME, CADE27	PTAQP2	Cobble, boulder, roots	Mixed evergreen woodland

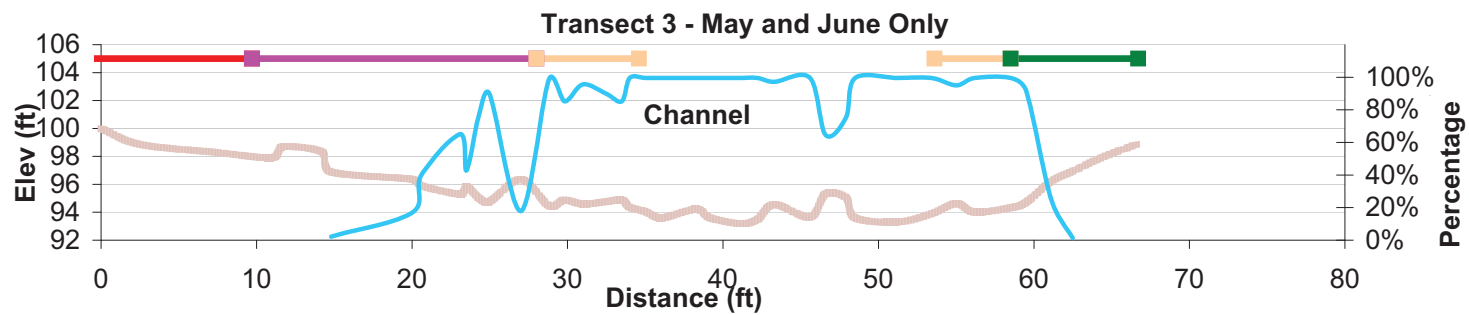
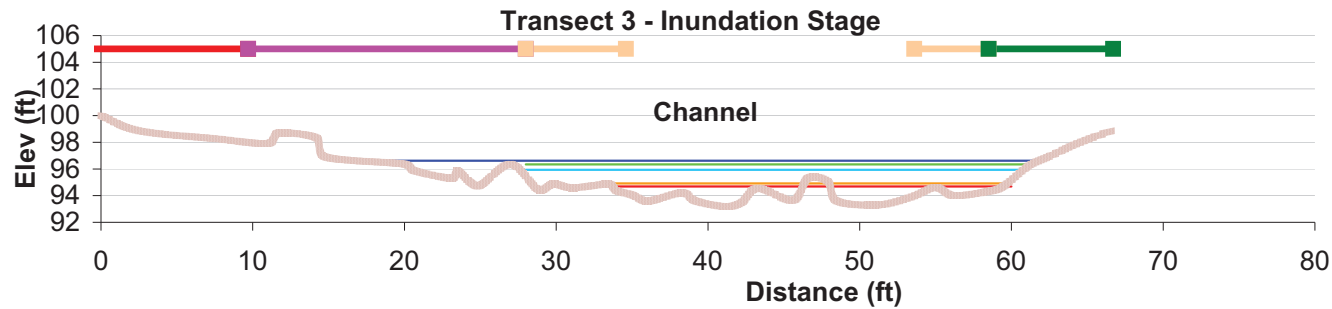


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

Duncan Creek D9.0



Dominant and Sub-dominant Species Codes, Common Names, and Scientific Names Found Along Surveyed Transects.

Transect 1

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ABCO	<i>Abies concolor</i>	white fir		DAPE	<i>Darmera peltata</i>	Indian rhubarb
ALINT	<i>Alnus incana</i> ssp. <i>tenuifolia</i>	mountain alder		GAFR	<i>Garrya fremontii</i>	Fremont's silktassel
ARPA6	<i>Arctostaphylos patula</i>	Greenleaf manzanita		LOIN5	<i>Lonicera involucrata</i>	twinberry
BOMA3	<i>Boykinia major</i>	large boykinia		PHHU	<i>Phacelia hastata</i> var. <i>compacta</i>	compact phacelia
COSE16	<i>Cornus sericea</i> ssp. <i>sericea</i>	redosier dogwood, American dogwood		POBAT	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood

Transect 2

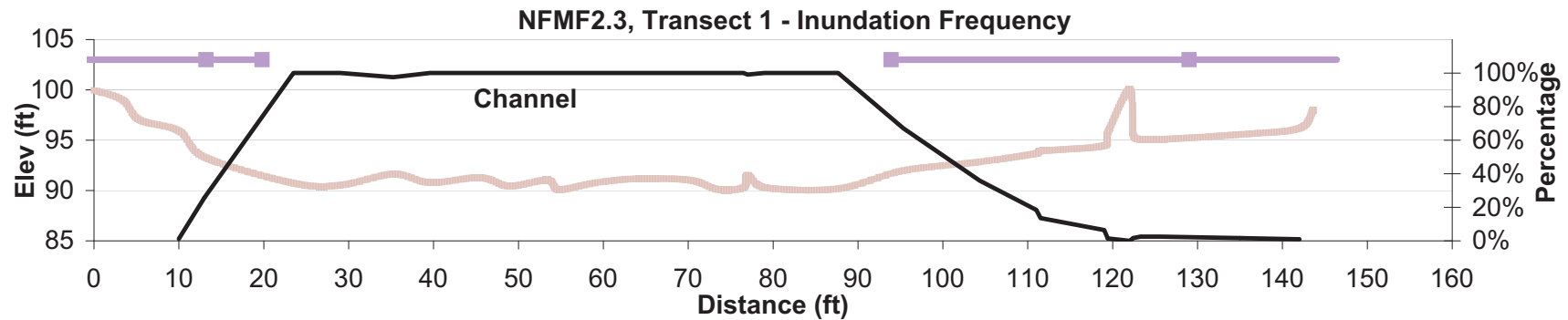
Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ABCO	<i>Abies concolor</i>	white fir		PTAQP2	<i>Pteridium aquilinum</i> var. <i>pubescens</i>	bracken fern
ALINT	<i>Alnus incana</i> ssp. <i>tenuifolia</i>	mountain alder		PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir
BOMA3	<i>Boykinia major</i>	large boykinia		SALU	<i>Salix lucida</i>	shining willow
COSE16	<i>Cornus sericea</i> ssp. <i>sericea</i>	redosier dogwood, American dogwood		SYMO	<i>Symphoricarpos mollis</i>	creeping snowberry
LEDA	<i>Leucothoe davisiae</i>	Sierra laurel				

Transect 3

Species Code	Scientific Name	Common Name		Species Code	Scientific Name	Common Name
ABCO	<i>Abies concolor</i>	white fir		LOOB2	<i>Lotus oblongifolius</i> var. <i>oblongifolius</i>	streambank trefoil
ALINT	<i>Alnus incana</i> ssp. <i>tenuifolia</i>	mountain alder		PIPO	<i>Pinus ponderosa</i>	ponderosa pine
BOMA3	<i>Boykinia major</i>	large boykinia		PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir
CADE27	<i>Calocedrus decurrens</i>	incense cedar		PTAQP2	<i>Pteridium aquilinum</i> var. <i>pubescens</i>	bracken fern
COSE16	<i>Cornus sericea</i> ssp. <i>sericea</i>	redosier dogwood, American dogwood		SETR	<i>Senecio triangularis</i>	arrowleaf groundsel
DAPE	<i>Darmera peltata</i>	Indian rhubarb				

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork of the Middle Fork American River NFMF2.3



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, SALA6	PHLE4, BRCA3	Bedrock, leaf litter	Riparian canopy over an upland shrub understory
ALRH2, SALA6, DAPE	CANU5	Gravel, coarse sand	Streambank vegetation
ALRH2, SAME2	CANU5, VICA5	Boulder, cobble	
ALRH2, VICA2, SALA6,	BRCA5, SAOF4, TODI, EPCA3, ARDO3, QUCH2, UMCA	Boulder, cobble	Boulder bar with upland species; ended just before oak-bay zone

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork of the Middle Fork American River NFMF2.3

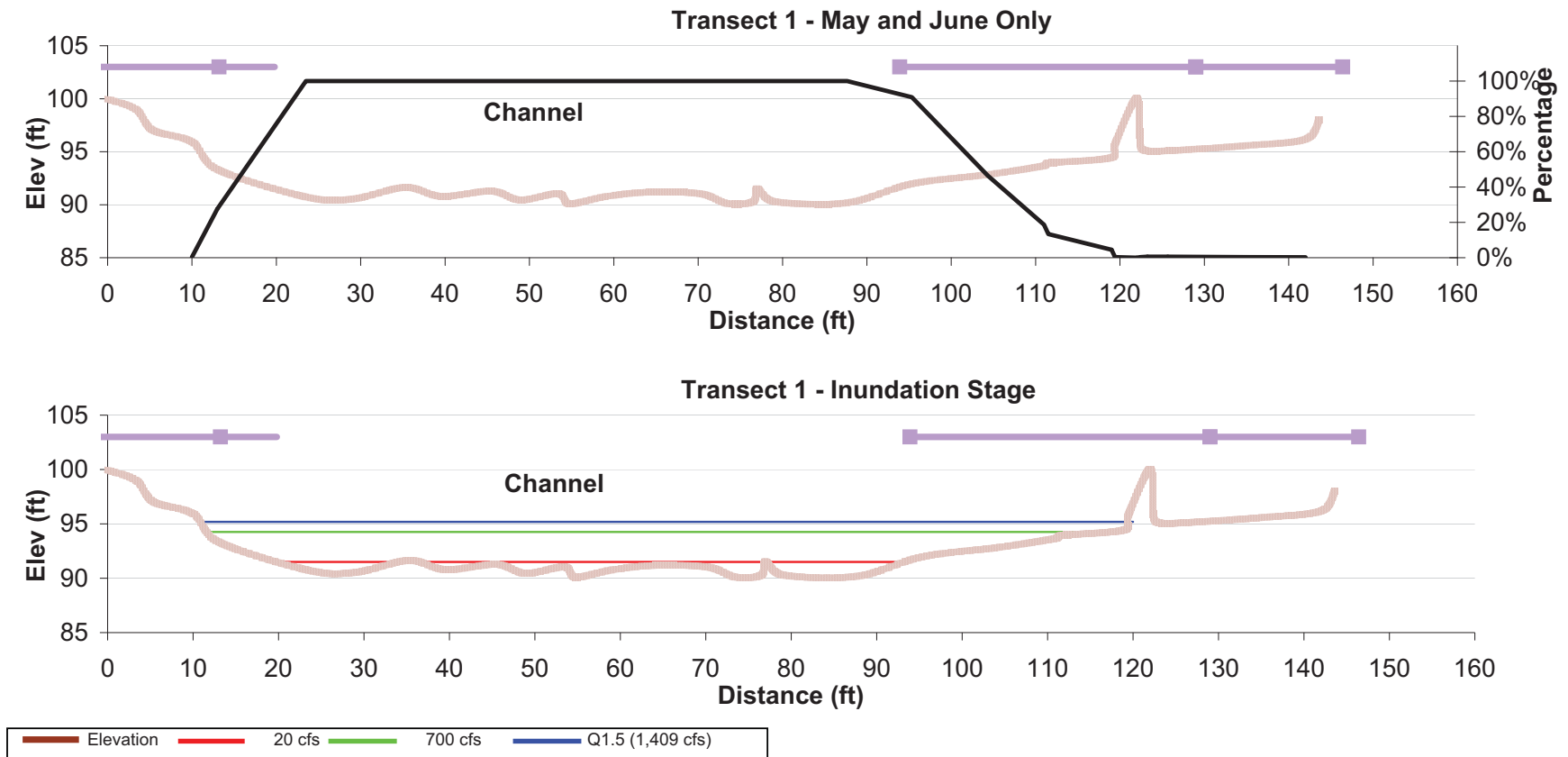
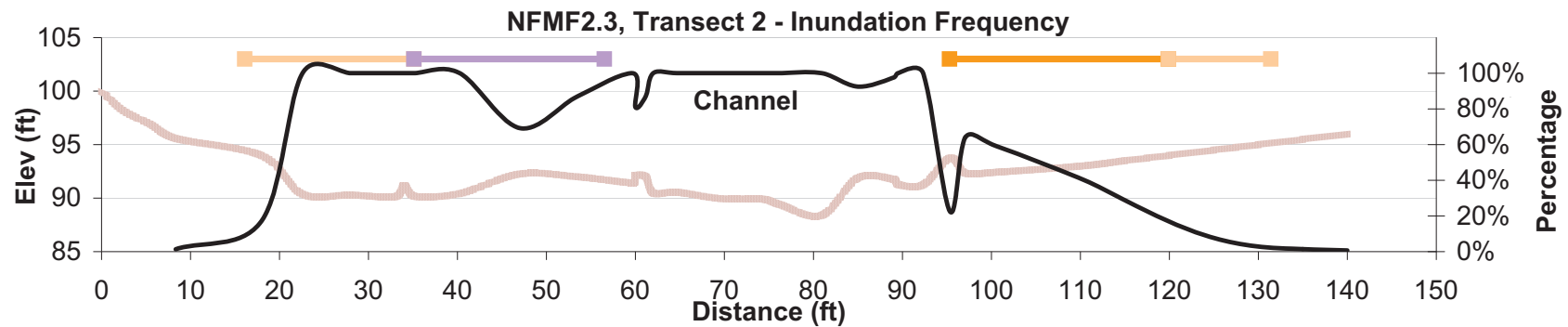


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork of the Middle Fork American River NFMF2.3



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
TODI, VICA5, CLLA3, PHLE4	Moss	Boulder, bedrock, duff	Upland species
ALRH2, SALA6	VICA5	Gravel, boulder, cobble	Floodplain
SAME2, SALA6, CANU5, ARDO3	DAPE, LOOB2, DIAC2, EPCA3	Bedrock, boulder, sand	Largely barren floodplain.
VICA5, RHTOT4, RINE, HEAR5	EPCA3	Boulder, cobble, duff	Back of old floodplain colonized with upland species

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork of the Middle Fork American River NFMF2.3

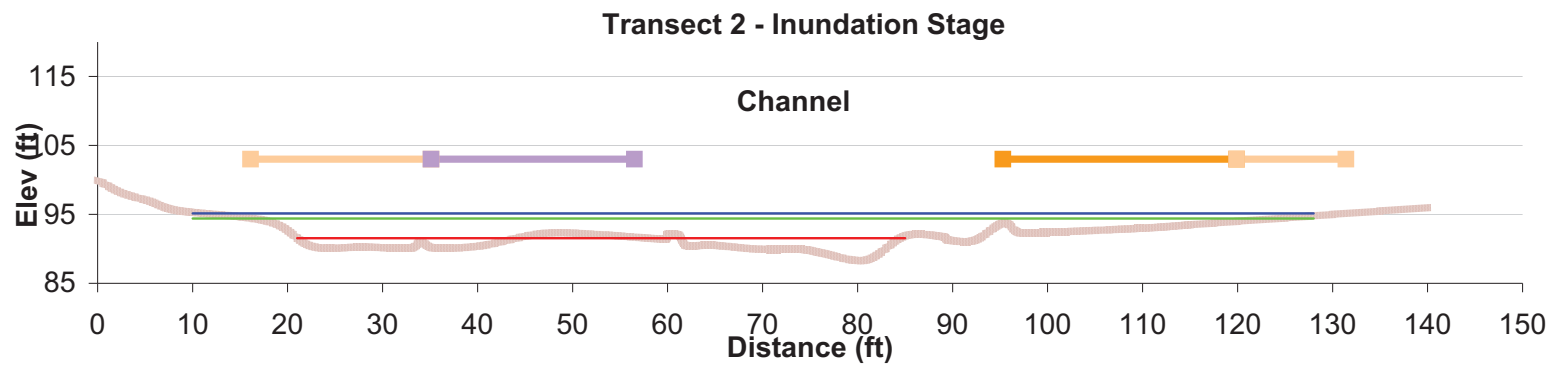
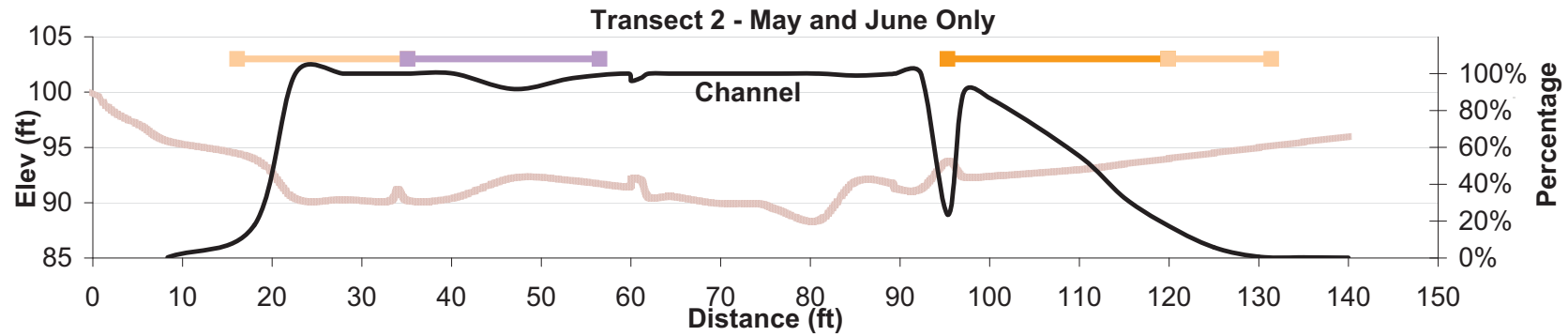
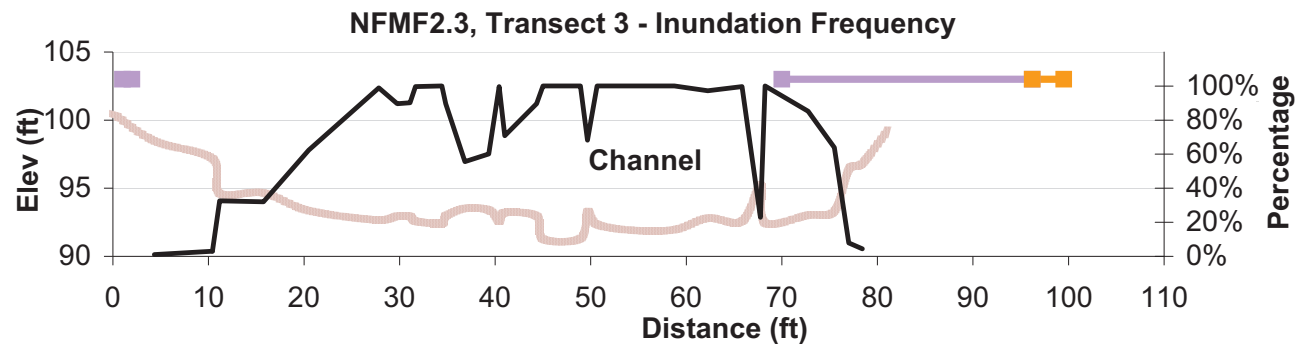


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork of the Middle Fork American River NFMF2.3

Note vertical exaggeration



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, VICA5, SALA6	QUCH2, RULE	Leaf litter, boulder	Drier back of floodplain, dominated by older ALRH2 and upland species
ALRH2, VICA5, SALA6	RHTO4	Boulder, cobble	
ALRH2, VICA5, SALA6	MICA3, DIAC2	Boulder, gravel	ALRH2 and SALA6-dominated woodland
RHTO, VICA5, SALA6		Bedrock, boulder	Upland species on steep canyon slope

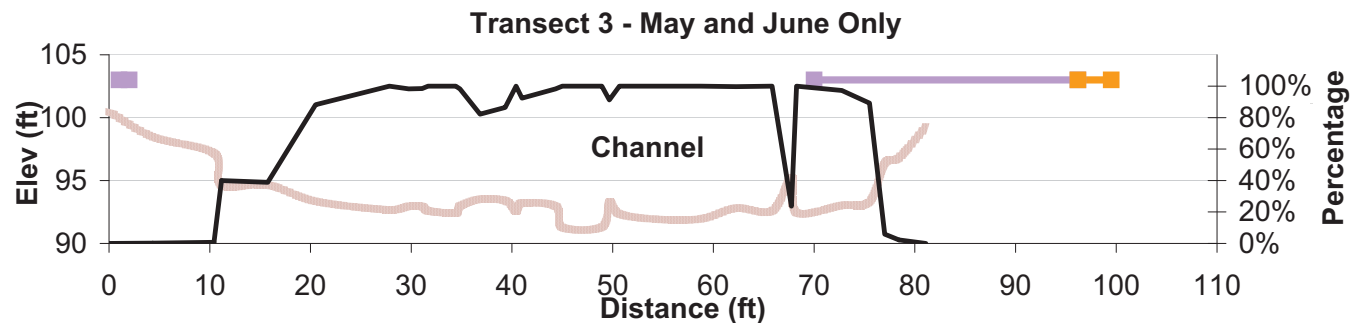


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork of the Middle Fork American River NFMF2.3

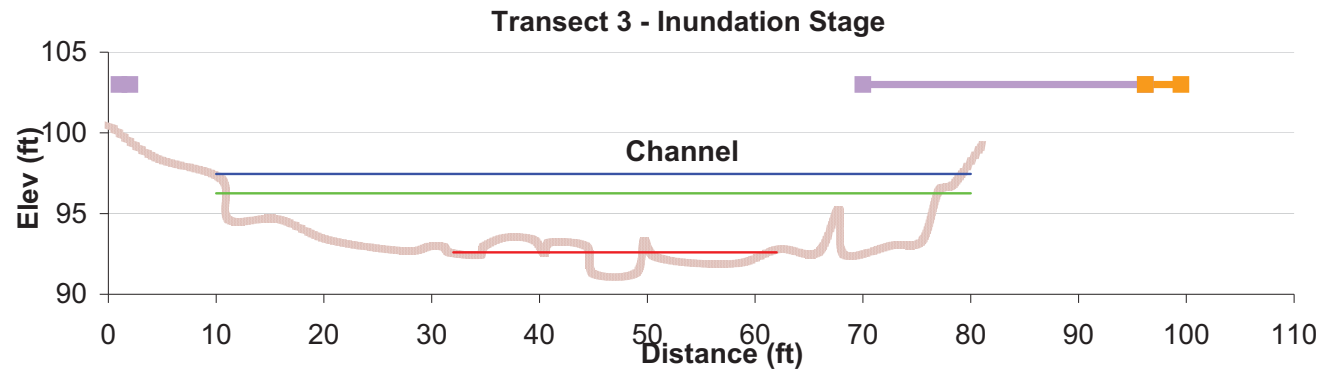


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork of the Middle Fork American River NFMF2.3

Dominant and Sub-dominant Species Codes, Common Names, and Scientific Names Found Along Surveyed Transects.

Transect 1

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder	QUCH2	<i>Quercus chrysolepis</i>	canyon live oak
ARDO3	<i>Artemisia douglasiana</i>	Douglas' sagewort (mugwort)	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
BRCA3	<i>Brickellia californica</i>	brickellbush	SAME2	<i>Salix exigua</i> / <i>Salix melanopsis</i>	dusky willow
CANU5	<i>Carex nudata</i>	torrent sedge	SAOF4	<i>Saponaria officinalis</i>	bouncing bet
DAPE	<i>Darmera peltata</i>	Indian rhubarb	TODI	<i>Toxicodendron diversilobum</i>	poison oak
EPCA3	<i>Epilobium canum</i> ssp. <i>latifolium</i>	California fuchsia	UMCA	<i>Umbellularia californica</i>	California bay
PHLE4	<i>Philadelphus lewisii</i>	wild mock orange	VICA5	<i>Vitis californica</i>	California wild grape

Transect 2

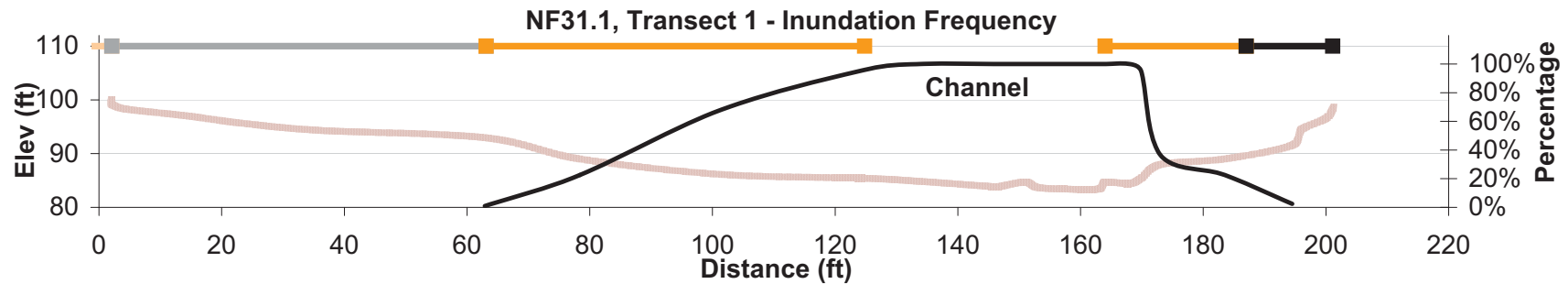
Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder	LOOB2	<i>Lotus oblongifolius</i> var. <i>oblongifolius</i>	streambank trefoil
ARDO3	<i>Artemisia douglasiana</i>	Douglas' sagewort (mugwort)	PHLE4	<i>Philadelphus lewisii</i>	wild mock orange
CANU5	<i>Carex nudata</i>	torrent sedge	FRCAT2 (RHTOT4)	<i>Frangula tomentella</i> (=Rhamnus <i>tomentella</i> ssp. <i>tomentella</i>)	mountain coffeeberry
CLLA3	<i>Clematis lasiantha</i>	chaparral virgin's bower	RINE	<i>Ribes nevadense</i>	Sierra currant
DAPE	<i>Darmera peltata</i>	Indian rhubarb	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
DIAC2	<i>Dichanthelium acuminatum</i> var. <i>acuminatum</i>	western panicum	SAME2	<i>Salix exigua</i> / <i>Salix melanopsis</i>	dusky willow
EPCA3	<i>Epilobium canum</i> ssp. <i>latifolium</i>	California fuchsia	TODI	<i>Toxicodendron diversilobum</i>	poison oak
HEAR5	<i>Heteromeles arbutifolia</i>	toyon	VICA5	<i>Vitis californica</i>	California wild grape

Transect 3

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder	FRCAT2 (RHTOT4)	<i>Frangula tomentella</i> (=Rhamnus <i>tomentella</i> ssp. <i>tomentella</i>)	mountain coffeeberry
DIAC2	<i>Dichanthelium acuminatum</i> var. <i>acuminatum</i>	western panicum	RULE	<i>Rubus leucodermis</i>	whitebark raspberry
MICA3	<i>Mimulus cardinalis</i>	crimson monkeyflower	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
QUCH2	<i>Quercus chrysolepis</i>	canyon live oak	VICA5	<i>Vitis californica</i>	California wild grape

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork American River NF31.3



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
VICA5	TODI, RHTOT4	Boulder, fines	
-	DISA, VICA5, BRCA5, SAME2, JUEFP, TOAR	Cobble, gravel	Cobble bar
SAME2	DISA, VICA5, BRCA5	Cobble, boulder	Cobble bar
SAME2	LOOB2	Boulder, bedrock	Boulder bar with some willow patches
-	BRMA, BRCA5	Boulder, bedrock	Canyon slope with weeds

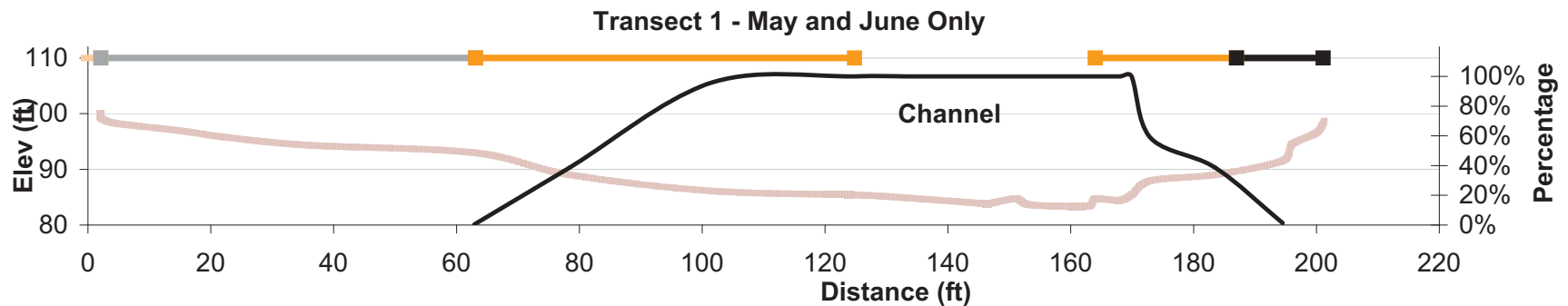
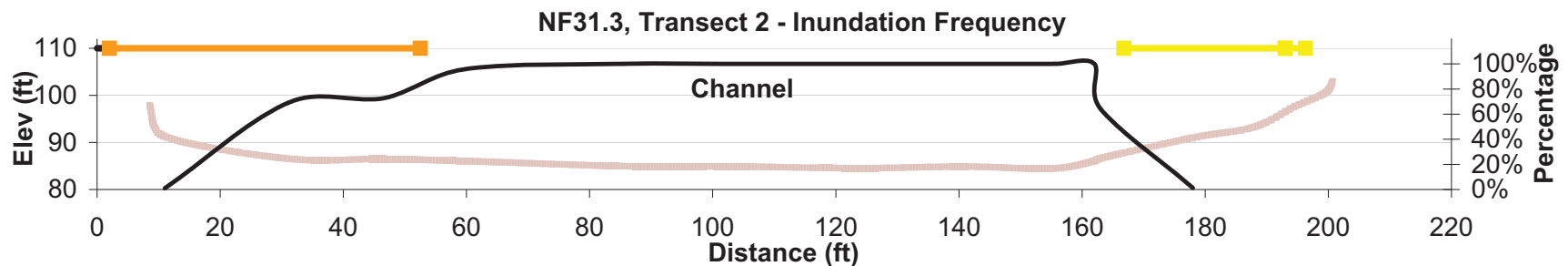
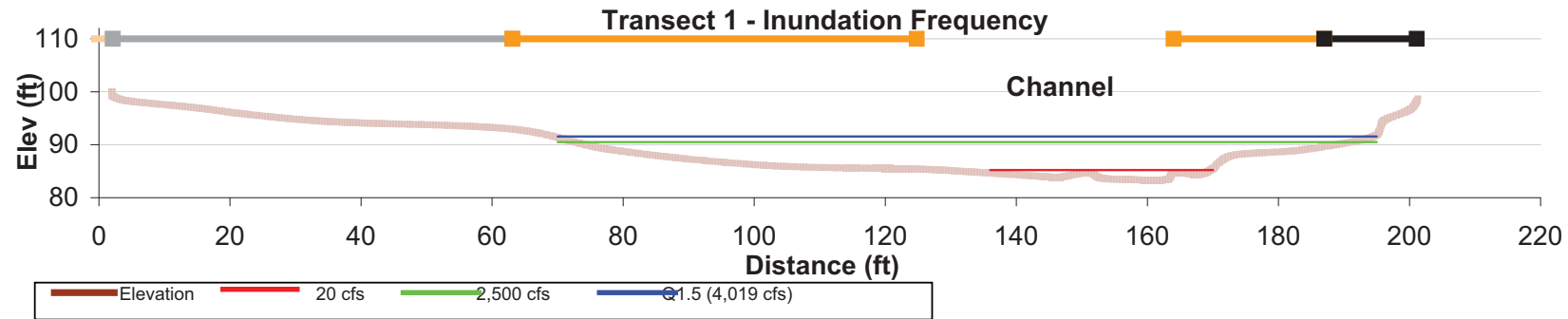


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork American River NF31.3



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
-	BRCA5	Bedrock	Bedrock wall
SAEX	ALRH2, SCSE11, CILA2, FRLA, BRCA5, RUDI2, CHSES	Cobble, gravel, fines	Mixed, disturbed riparian zone
ALRH2, CANU5, SAEX, RUDI2, POFR2	LOOB2, EQHYA, SALI, EPGI	Fines, litter	
RUDI2, BRCA5, POFR2, ALRH2	-	Boulder	

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork American River NF31.3

Note vertical exaggeration

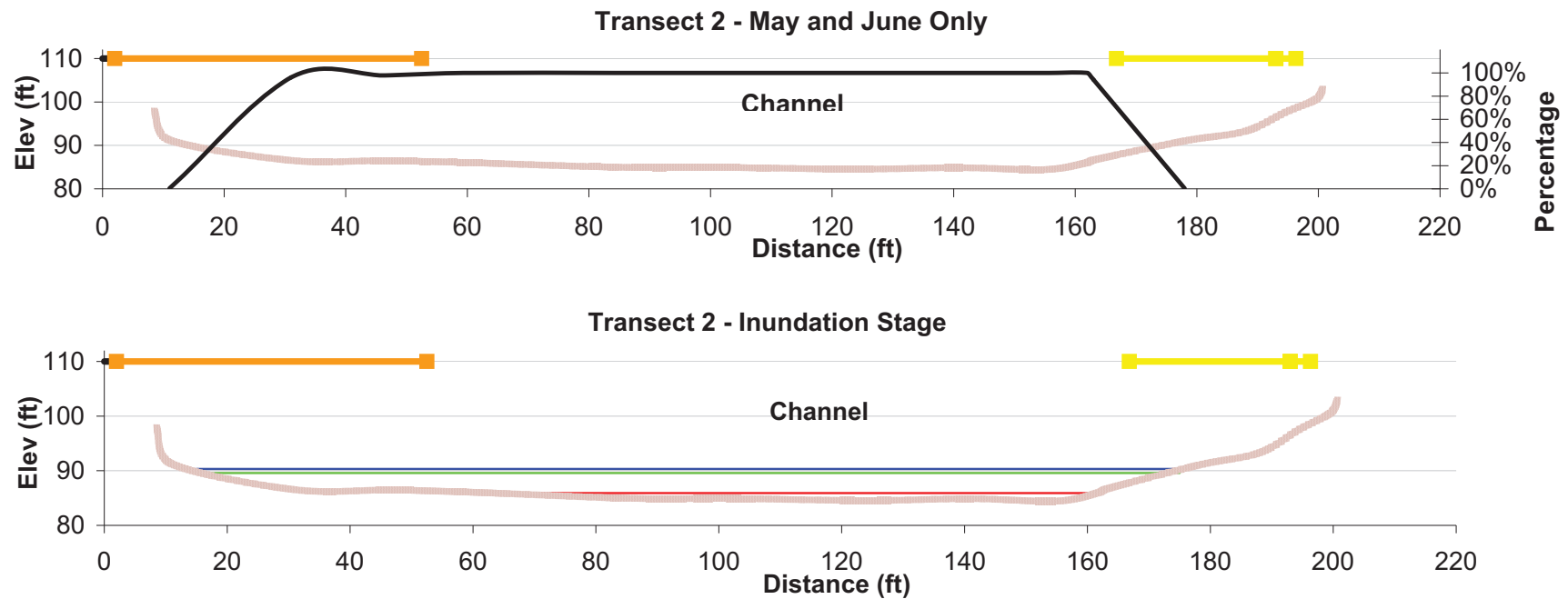
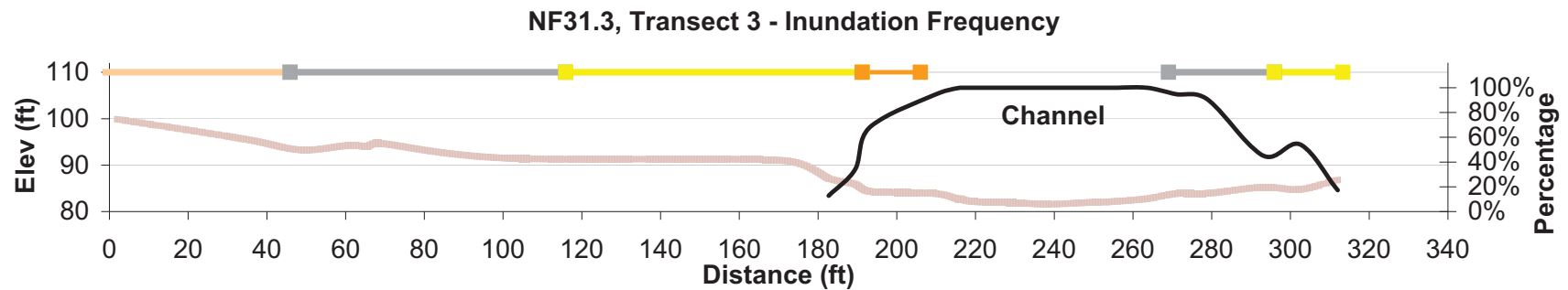


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork American River NF31.3

Note vertical exaggeration



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
VICA5, LOPU3	SOCA5, BRTE, CHJU, HEOR2, BRST2	Cobble, sand, gravel	
-	SAME2 seedlings, BIFR	Cobble, gravel, sand	Sparsely-vegetated bar
ALRH2, POFR2, VICA5	BRCA5, SAME2	Cobble, gravel	Sparsely-vegetated bar
SAME2, SAEX	XAST, CHBO2, LOPU3, CANU4, DISA, SCSE11	Sand, cobble, gravel	
-	SAME2, DIAC2, SCSE11	Cobble, gravel	
SAEX, SAME2, SALA3, SALA6, ALRH2, POFR2	DISA, LOPU3, CHBO2, ELPA, CHSES, CYDA, RUAC3	Sand, cobble, gravel	
-	ECPA3, GRHI	Bedrock	Rock wall

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork American River NF31.3

Note vertical exaggeration

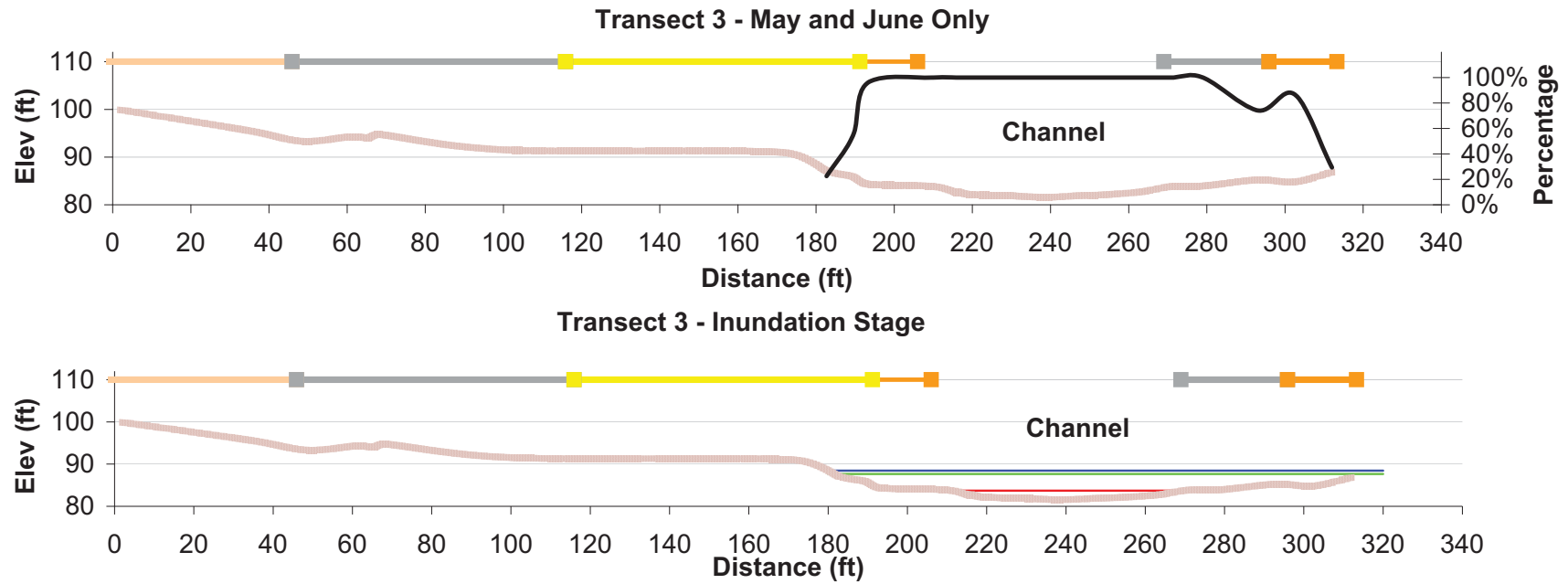
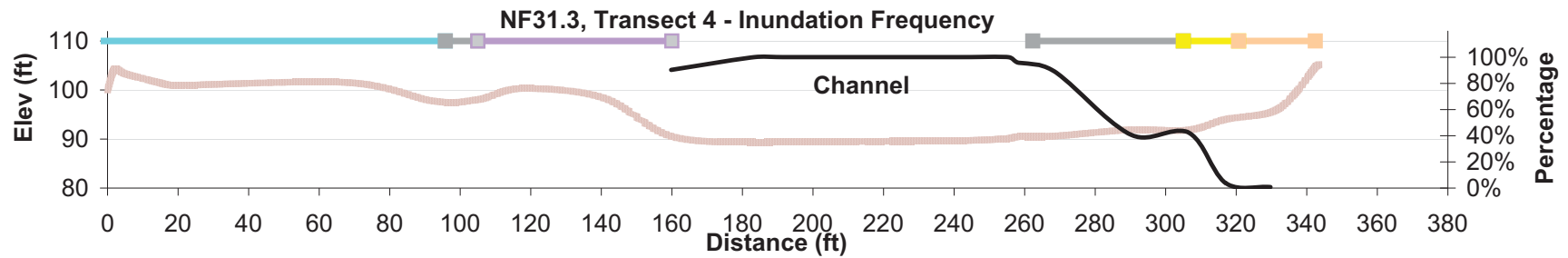


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork American River NF31.3

Note vertical exaggeration



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
RUDI2, ROPS, HEOR2, CHJU	BRCA3, LOPU3, moss		Disturbed flats, dominated by weeds
-	-	Cobble, boulder	Broad, unvegetated historic floodplain to end of transect
SAEX, VICA5, ALRH2	CANU5, EQHYA, CHBO2, DISA, SALU, LOPU3, MEOF, BRCA3	Cobble, boulder	Willow thicket on sloping cobble bar
-	SAEX, SAME2 seedlings, DISA, POMI2	Cobble, boulder	Cobble bar
POFR2, ALRH2, SALA6, SALA3, RUDI2	LOPU3, DISA, SAEX, SAME2, JUEFP, MEIn2	Cobble, sand, boulder	Cobble bar under cottonwood/ willow/ alder canopy
CEOCC2, RUDI	moss, AVFA	Bedrock, sand	Abutting bedrock wall

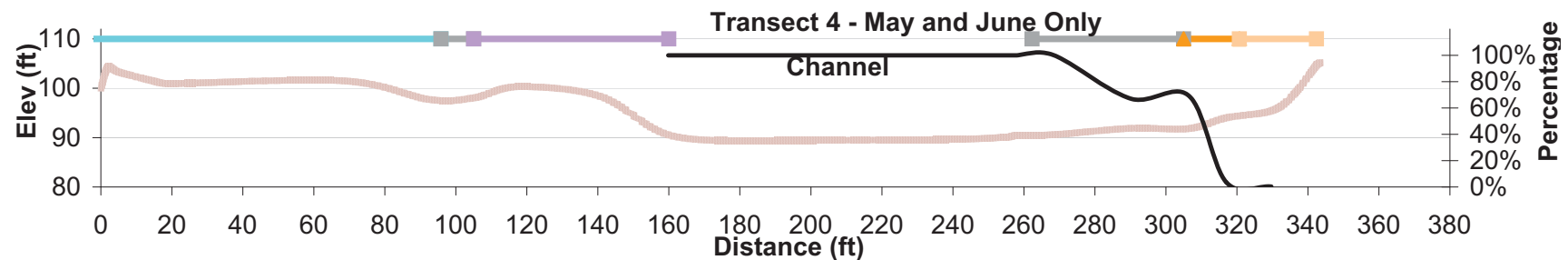


**Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).
North Fork American River NF31.3**

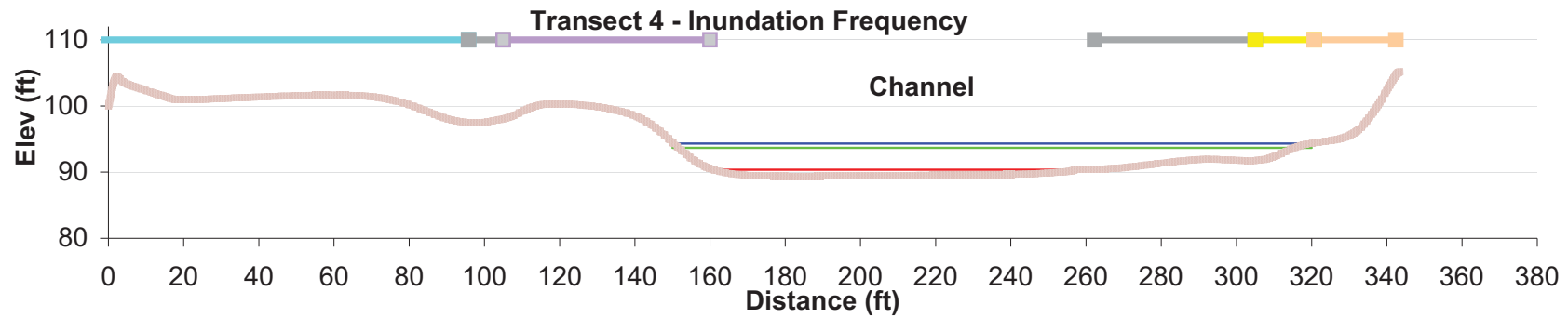


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork American River NF31.3

Dominant and Sub-dominant Species Codes, Common Names, and Scientific Names Found Along Surveyed Transects.

Transect 1

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
BRCA5	Bromus carinatus	California brome	LOOB2	Lotus oblongifolius var. oblongifolius	streambank trefoil
BRMA	Briza maxima	greater rattlesnake grass	SAME2	Salix exigua/Salix melanopsis	dusky willow
DISA	Digitaria sanguinalis	hairy crabgrass	TOAR	Torilis arvensis	field hedge parsley
FRCAT2 (RHTOT4)	Frangula tomentella (=Rhamnus tomentella ssp. tomentella)	mountain coffeeberry	TODI	Toxicodendron diversilobum	poison oak
JUEFP	Juncus effusus var. pacificus	common rush	VICA5	Vitis californica	California wild grape

Transect 2

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ALRH2	Alnus rhombifolia	white alder	FRLA	Fraxinus latifolia	Oregon ash
BRCA5	Bromus carinatus	California brome	LOOB2	Lotus oblongifolius var. oblongifolius	streambank trefoil
CANU5	Carex nudata	torrent sedge	POFR2	Populus fremontii ssp. Fremontii	Fremont cottonwood
CHSES	Chamaesyce serpyllifolia ssp. serpyllifolia	thyme-leaved sandmat	RUAR9 (RUDI2)	Rubus armeniacus (=Rubus discolor)	Himalayan blackberry
CILA2	Cinna latifolia	wood reedgrass	SAEX	Salix exigua	narrow leaf willow
EPGI	Epipactis gigantea	stream orchid	SALI	Salix ligulifolia	strapleaf willow
EQHYA	Equisetum hyemale ssp. affine	common scouring rush	ISSE2 (SCSE11)	Isolepis setacea (=Scirpus setaceus)	bristled dwarf bulrush

**Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).
North Fork American River NF31.3**

Dominant and Sub-dominant Species Codes, Common Names, and Scientific Names Found Along Surveyed Transects (continued).

Transect 3

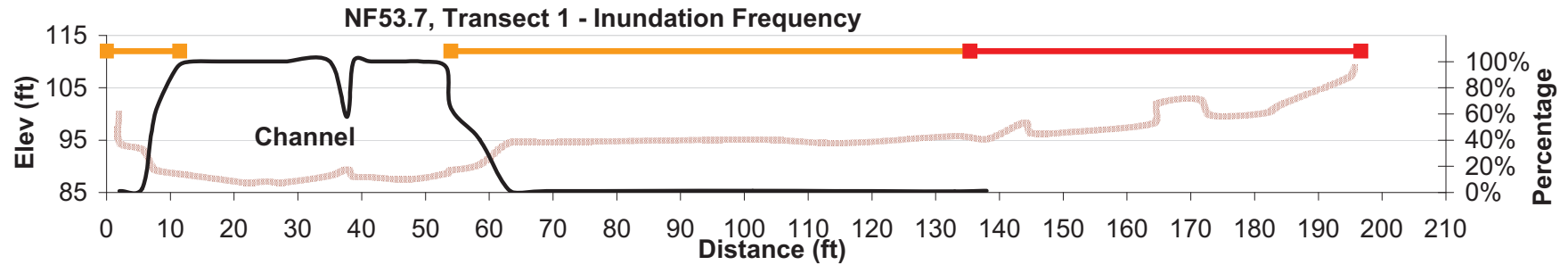
Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder	GRHI	<i>Grindelia hirsutula</i> var <i>davyi</i>	hairy gumweed
BIFR	<i>Bidens frondosa</i>	devil's beggartick	HEOR2	<i>Heterotheca oregona</i>	Oregon false goldenaster
BRCA5	<i>Bromus carinatus</i>	California brome	LOPU3		
BRST2	<i>Bromus sterilis</i>	poverty brome	POFR2	<i>Populus fremontii</i> ssp. <i>Fremontii</i>	Fremont cottonwood
BRTE	<i>Bromus tectorum</i>	cheat grass	RUAC3	<i>Rumex acetosella</i>	sheep sorrel
CANU5	<i>Carex nudata</i>	torrent sedge	SAEX	<i>Salix exigua</i>	narrow leaf willow
CHBO2	<i>Chenopodium botrys</i>	Jerusalem oak	SALA3	<i>Salix laevigata</i>	red willow
CHJU	<i>Chondrilla juncea</i>	skeletonweed	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
CHSES	<i>Chamaesyce serpyllifolia</i> ssp. <i>serpyllifolia</i>	thyme-leaved sandmat	SAME2	<i>Salix exigua</i> / <i>Salix melanopsis</i>	dusky willow
CYDA	<i>Cynodon dactylon</i>	Bermuda grass	ISSE2 (SCSE11)	<i>Isoplepis setacea</i> (= <i>Scirpus setaceus</i>)	bristled dwarf bulrush
DIAC2	<i>Dichanthelium acuminatum</i> var. <i>acuminatum</i>	western panicum	SOCA5	<i>Solidago californica</i>	California goldenrod
DISA	<i>Digitaria sanguinalis</i>	hairy crabgrass	VICA5	<i>Vitis californica</i>	California wild grape
EPCA3	<i>Epilobium canum</i> ssp. <i>latifolium</i>	California fuchsia	XAST	<i>Xanthium strumarium</i>	cocklebur
ELPA	<i>Eleocharis pachycarpa</i>	black sand spike rush			

Transect 4

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder	MEIN2	<i>Melilotus indicus</i>	sourclover
AVFA	<i>Avena fatua</i>	wild oat	MEOF	<i>Melilotus officinalis</i> (= <i>Melilotus alba</i>)	yellow sweetclover
BRCA3	<i>Brickellia californica</i>	brickellbush	POFR2	<i>Populus fremontii</i> ssp. <i>Fremontii</i>	Fremont cottonwood
CANU5	<i>Carex nudata</i>	torrent sedge	POMI2	<i>Polygonum minimum</i>	Leafy dwarf knotweed
CEOCC2	<i>Cephalanthus occidentalis</i> var. <i>californicus</i>	California button willow	ROPS	<i>Robinia pseudoacacia</i>	black locust
CHBO2	<i>Chenopodium botrys</i>	Jerusalem oak	RUAR9 (RUDI2)	<i>Rubus armeniacus</i> (= <i>Rubus discolor</i>)	Himalayan blackberry
CHJU	<i>Chondrilla juncea</i>	skeletonweed	SAEX	<i>Salix exigua</i>	narrow leaf willow
DISA	<i>Digitaria sanguinalis</i>	hairy crabgrass	SALA3	<i>Salix laevigata</i>	red willow
EQHYA	<i>Equisetum hyemale</i> ssp. <i>affine</i>	common scouring rush	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
HEOR2	<i>Heterotheca oregona</i>	Oregon false goldenaster	SALU	<i>Salix lucida</i>	shining willow
JUEFP	<i>Juncus effusus</i> var. <i>pacificus</i>	common rush	SAME2	<i>Salix exigua</i> / <i>Salix melanopsis</i>	dusky willow
LOUNU (LOPU3)	<i>Lotus unifoliolatus</i> var. <i>unifoliolatus</i> (= <i>Lotus purshianus</i> var. <i>purshianus</i>)	Spanish clover	VICA5	<i>Vitis californica</i>	California wild grape

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork American River NF53.7



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
SAME2		Boulder, gravel, bedrock	Boulder bar
SAME2	BRCA3 seedlings	Boulder, gravel, cobble	Boulder bar
ALRH2, RUDI2, UMCA, VICA5	SAOF4, DIAC2, PSME	Boulder	Canyon slope breaching rocky valley wall

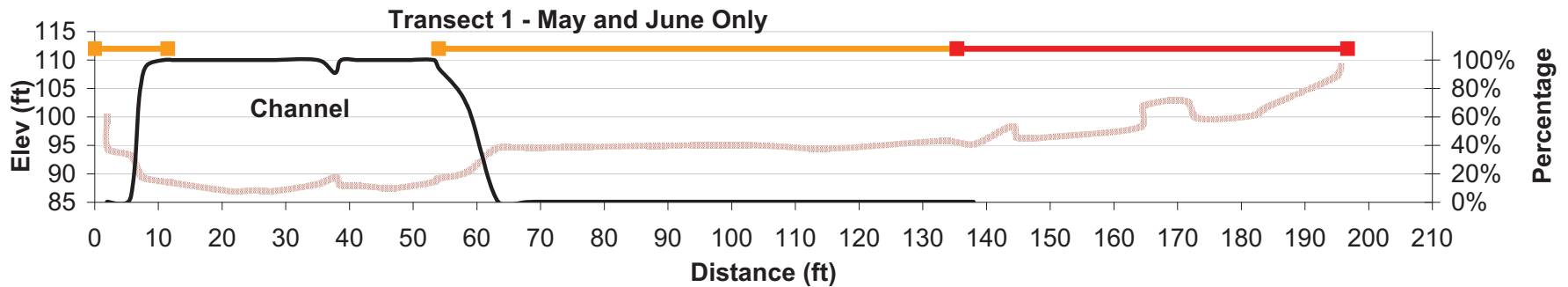
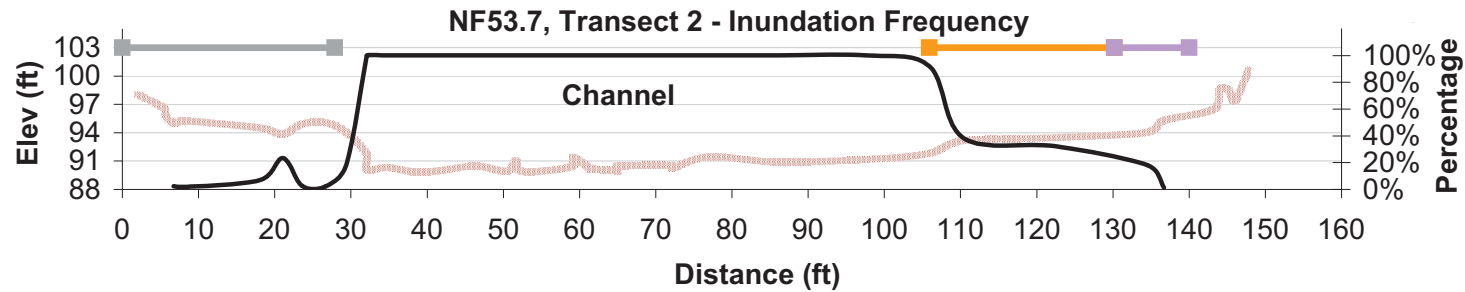
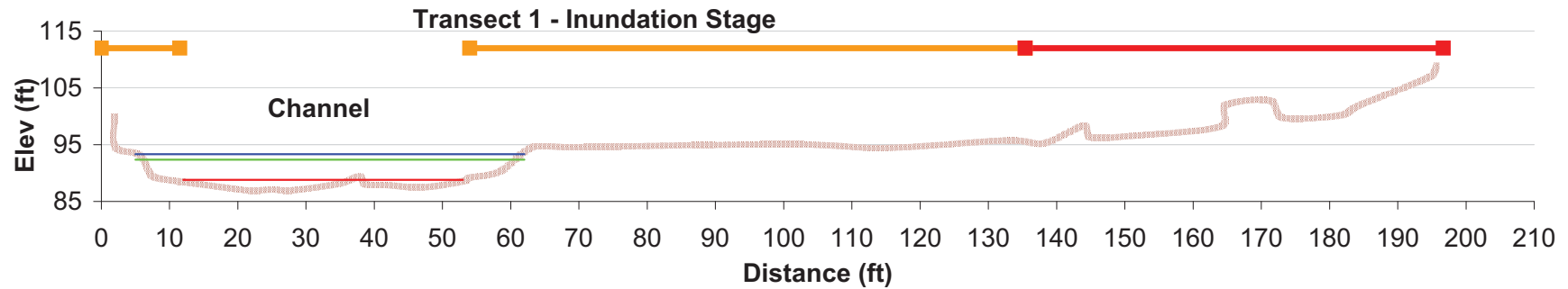


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork American River NF53.7



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
-	SAME2 seedlings, CHBO2	Bedrock, boulder	Boulder bar
SAME2, SALA3	POFR2, LOPU3, MEIN2, ASOCY, ASEA, CHBO2	Boulder, sand	Boulder/ sand bar
ALRH2, SALA6	LOPU3, MEIN2, ASOCY, ASEA	Boulder, sand	Riparian zone lining edge of canyon wall

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork American River NF53.7

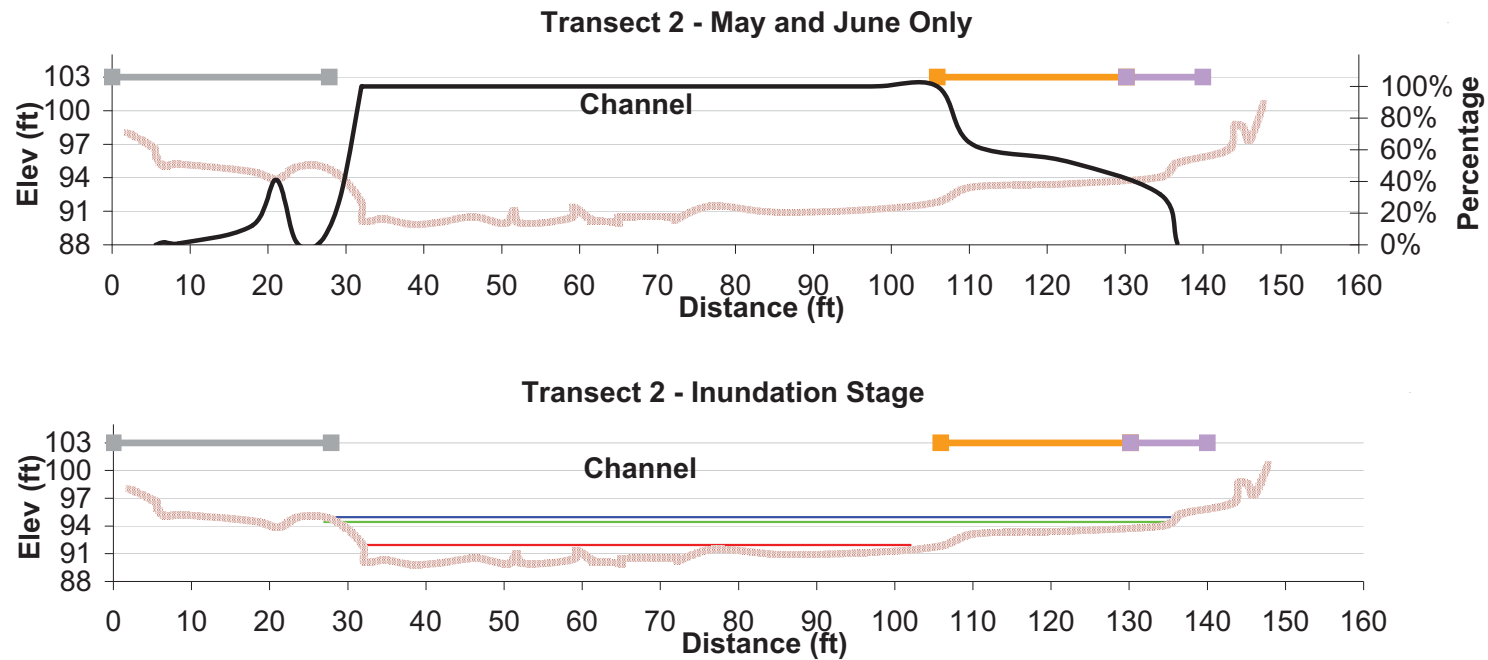
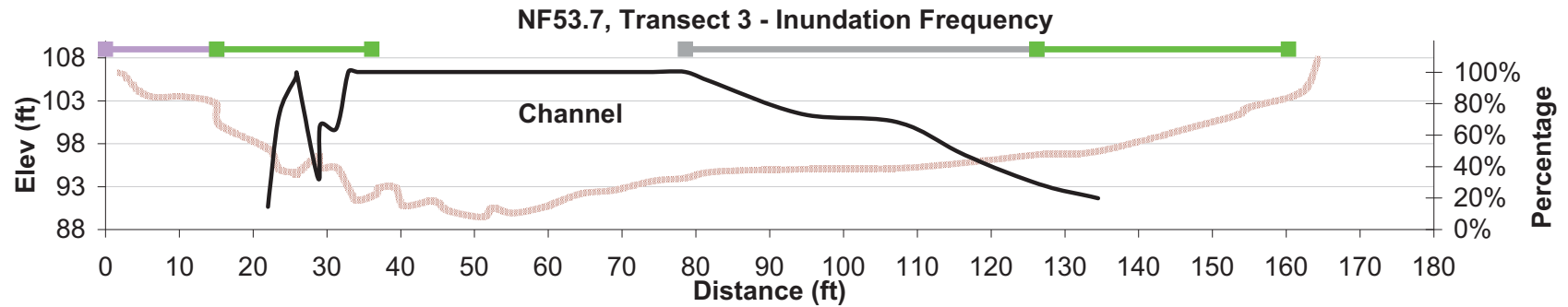


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork American River NF53.7



Vegetation and Substrate Characteristics from Left Bank to Right Bank

Dominant Species (>25% cover)	Subdominant Species	Dominant Substrate	Notes
ALRH2, SAME2, CANU5	MICA3, RUDI2	Bedrock, boulder, duff	
RUDI2, ALRH2, VICA5	SALA6	Bedrock, boulder, duff	Riparian zone lining edge of canyon wall
-	-	Cobble, gravel, boulder, sand	Wide, flat cobble bar
RUDI2, ALRH2, VICA5, TODI	LOPU3, EQLA, CANU5, CALE9, SAME2, RHTO4, ERNU3, MEIN2	Boulder, cobble	Cobble/ gravel stretch ending at bedrock wall

Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork American River NF53.7

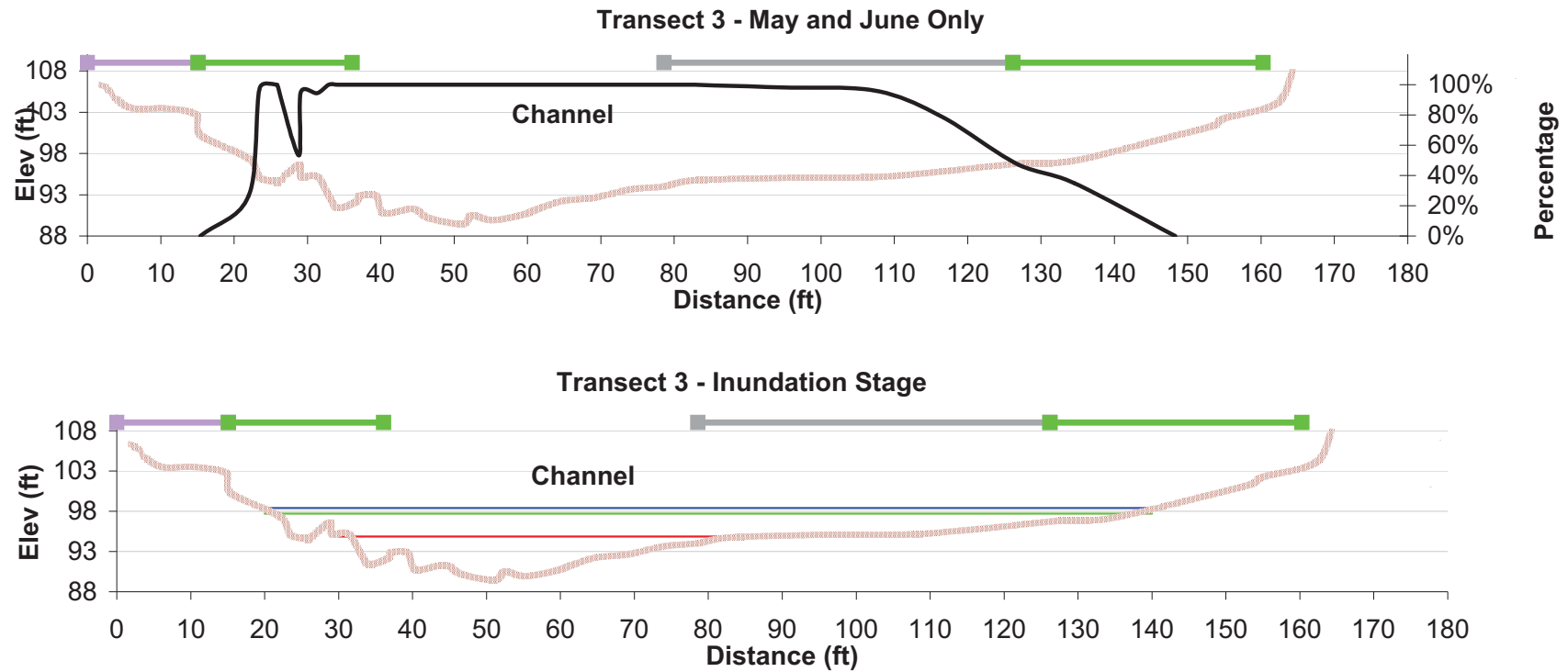


Figure B-1. Riparian Community Patterns and Inundation Frequencies (1975 – 2007) Along Surveyed Transects on the Bypass, Peaking, and Comparison Study Reaches (continued).

North Fork American River NF53.7

Dominant and Sub-dominant Species Codes, Common Names, and Scientific Names Found Along Surveyed Transects.

Transect 1

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder	SAME2	<i>Salix exigua/Salix melanopsis</i>	dusky willow
BRCA3	<i>Brickellia californica</i>	brickellbush	SAOF4	<i>Saponaria officinalis</i>	bouncing bet
DIAC2	<i>Dichanthelium acuminatum</i> var. <i>acuminatum</i>	western panicum	UMCA	<i>Umbellularia californica</i>	California bay
PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir	VICA5	<i>Vitis californica</i>	California wild grape
RUAR9 (RUDI2)	<i>Rubus armeniacus</i> (= <i>Rubus discolor</i>)	Himalayan blackberry			

Transect 2

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder	MEIN2	<i>Melilotus indicus</i>	sourclover
SYEA2 (ASEA)	<i>Symphotrichum eatonii</i> (= <i>Aster eatoni</i>)	Eaton's aster	POFR2	<i>Populus fremontii</i> ssp. <i>Fremontii</i>	Fremont cottonwood
SYSPS (ASOCY)	<i>Symphotrichum spathulatum</i> var. <i>yosemitanum</i> (= <i>Aster occidentalis</i>)	mountain aster	SALA3	<i>Salix laevigata</i>	red willow
CHBO2	<i>Chenopodium botrys</i>	Jerusalem oak	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
LOUNU (LOPU3)	<i>Lotus unifoliolatus</i> var. <i>unifoliolatus</i> (= <i>Lotus purshianus</i> var. <i>purshianus</i>)	Spanish clover	SAME2	<i>Salix exigua/Salix melanopsis</i>	dusky willow

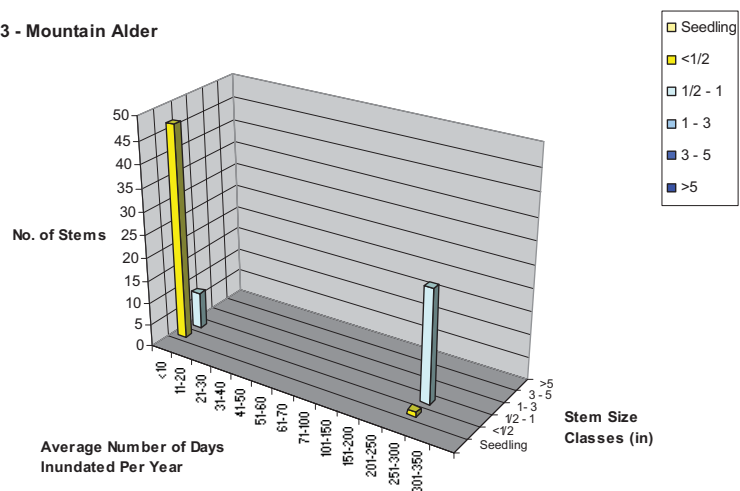
Transect 3

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ALRH2	<i>Alnus rhombifolia</i>	white alder	MICA3	<i>Mimulus cardinalis</i>	crimson monkeyflower
CALE9	<i>Carex leporinella</i>	Sierra hare sedge	FRCAT2 (RHTOT4)	<i>Frangula tomentella</i> (= <i>Rhamnus tomentella</i> ssp. <i>tomentella</i>)	mountain coffeeberry
CANU5	<i>Carex nudata</i>	torrent sedge	RUAR9 (RUDI2)	<i>Rubus armeniacus</i> (= <i>Rubus discolor</i>)	Himalayan blackberry
EQLA	<i>Equisetum laevigatum</i>	smooth scouring rush	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow
ERNU3	<i>Eriogonum nudum</i>	naked buckwheat	SAME2	<i>Salix exigua/Salix melanopsis</i>	dusky willow
LOUNU (LOPU3)	<i>Lotus unifoliolatus</i> var. <i>unifoliolatus</i> (= <i>Lotus purshianus</i> var. <i>purshianus</i>)	Spanish clover	TODI	<i>Toxicodendron diversilobum</i>	poison oak
MEIN2	<i>Melilotus indicus</i>	sourclover	VICA5	<i>Vitis californica</i>	California wild grape

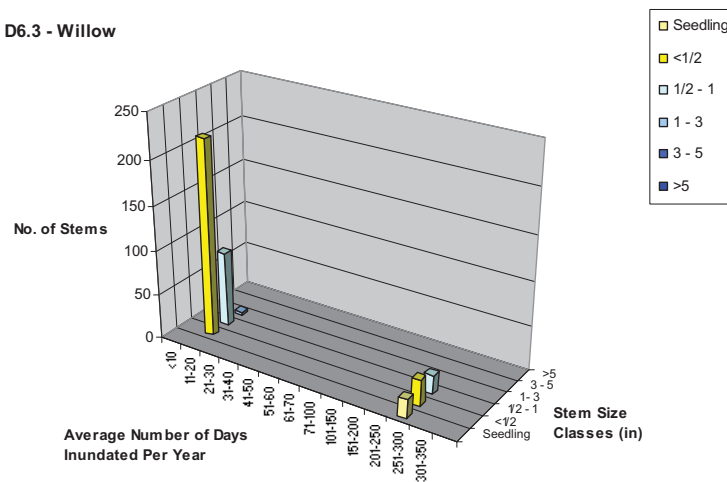
Figure B-2. Shrub and Tree Size Class Distributions in Relation to Inundation Frequency by Species at the Bypass and Comparison Stream Study Sites.

Small Bypass and Comparison Stream Study Sites
Duncan Creek

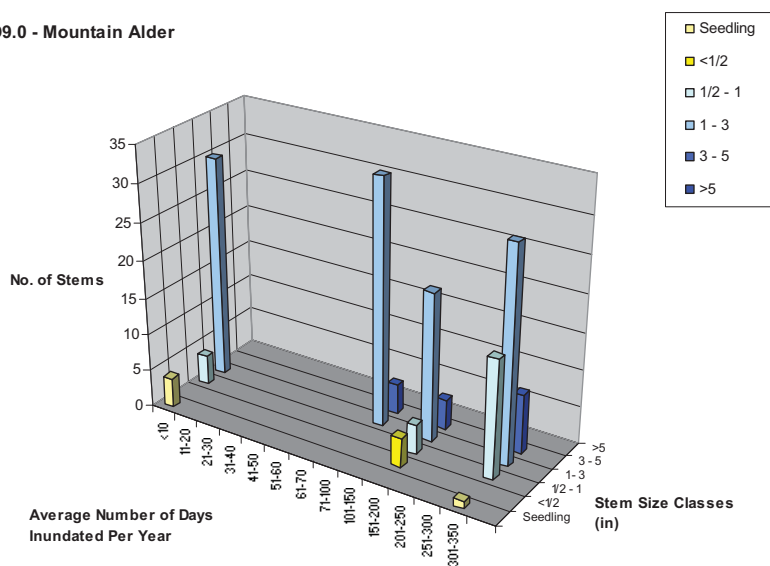
D6.3 - Mountain Alder



D6.3 - Willow



D9.0 - Mountain Alder



D9.0 - Willow

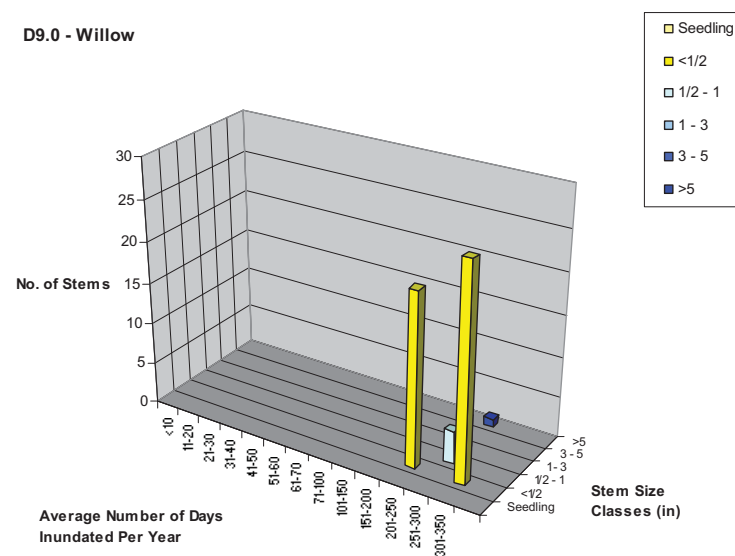
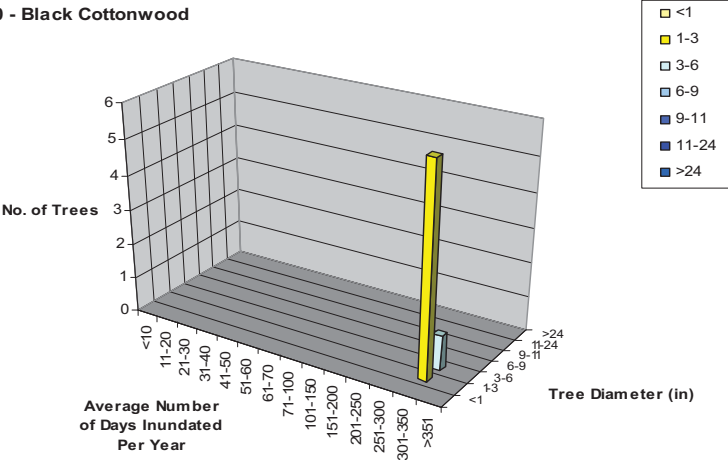


Figure B-2. Shrub and Tree Size Class Distributions in Relation to Inundation Frequency by Species at the Bypass and Comparison Stream Study Sites (continued).

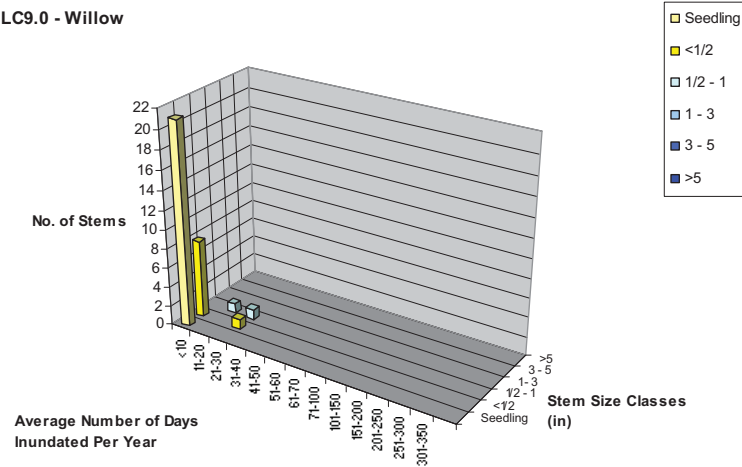
Small Bypass and Comparison Stream Study Sites
Duncan Creek (continued)

D9.0 - Black Cottonwood



Long Canyon Creeks

LC9.0 - Willow



SFLC2.3 - Willow

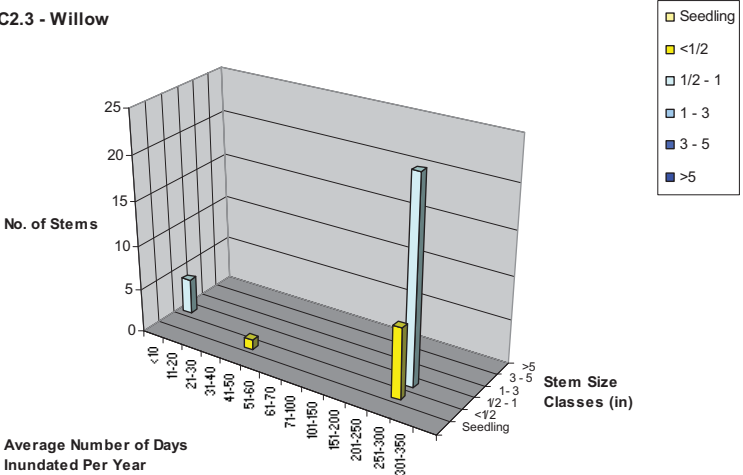
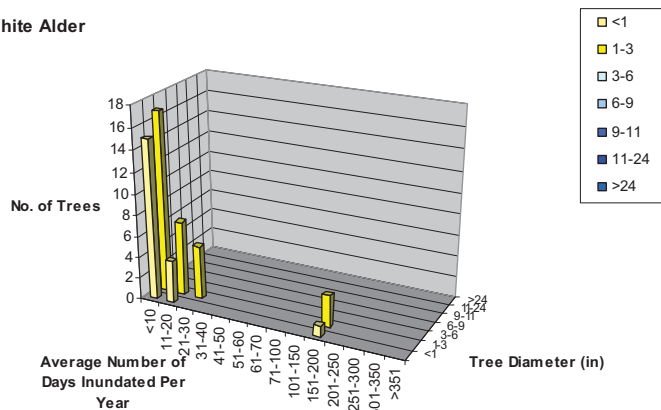


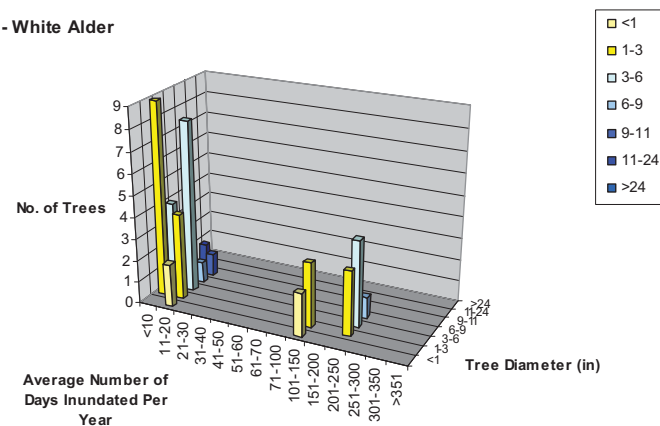
Figure B-2. Shrub and Tree Size Class Distributions in Relation to Inundation Frequency by Species at the Bypass and Comparison Stream Study Sites (continued).

Small Bypass and Comparison Stream Study Sites
Long Canyon Creeks (continued)

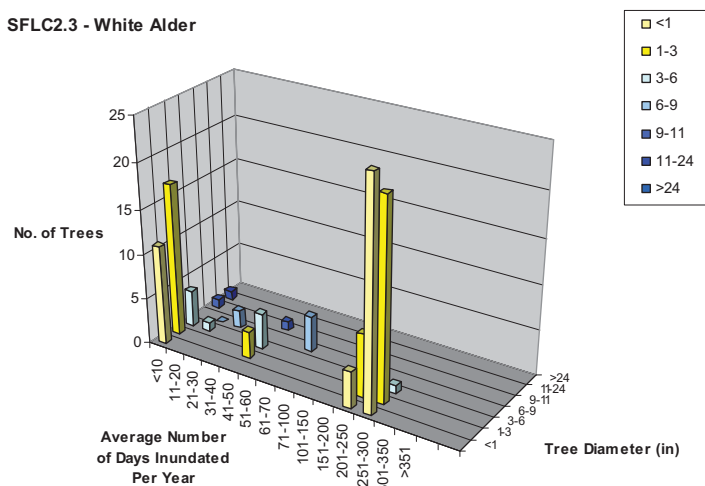
LC9.0 - White Alder



NFLC1.9 - White Alder



SFLC2.3 - White Alder



SFLC4.2 - White Alder

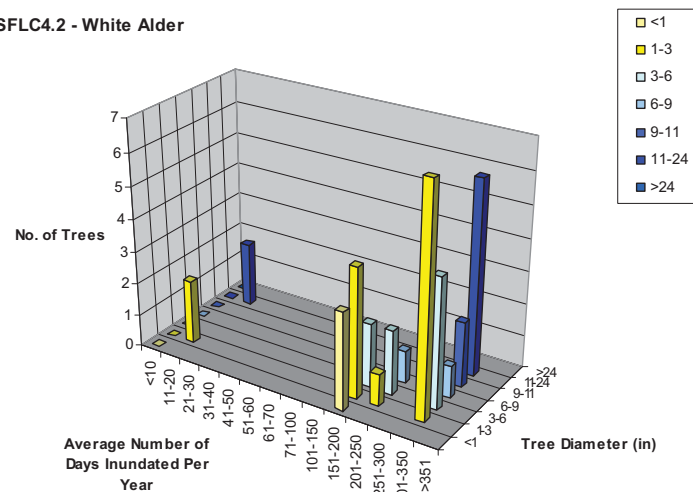
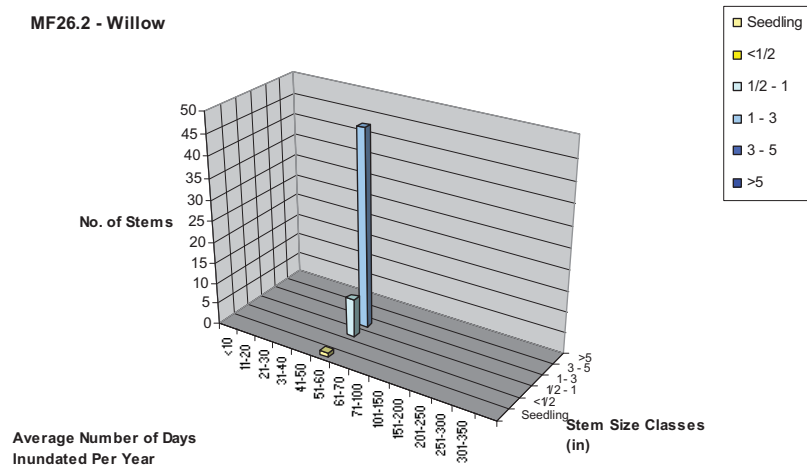


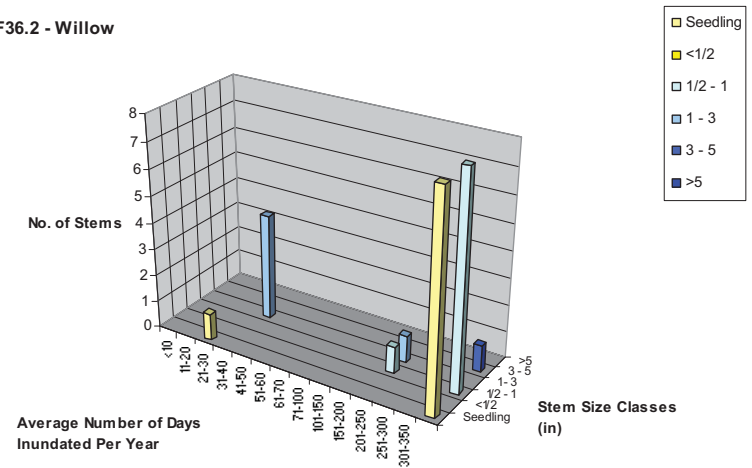
Figure B-2. Shrub and Tree Size Class Distributions in Relation to Inundation Frequency by Species at the Bypass and Comparison Stream Study Sites (continued).

Large Bypass and Peaking and Comparison Reach Study Sites
Middle Fork American River - Bypass Study Sites

MF26.2 - Willow



MF36.2 - Willow



MF44.7 - Willow

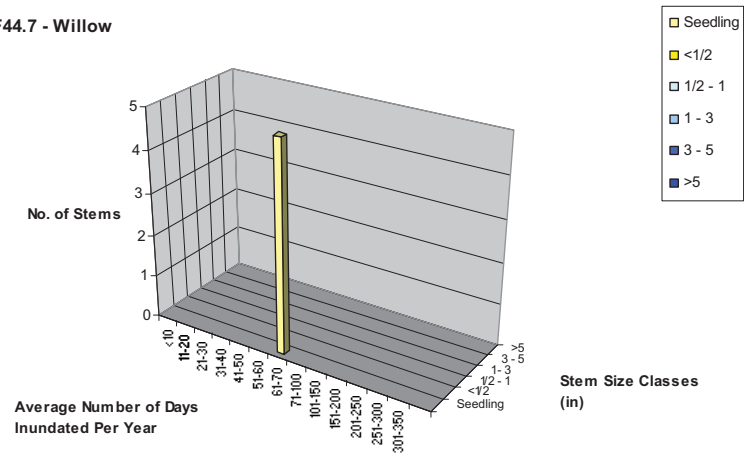
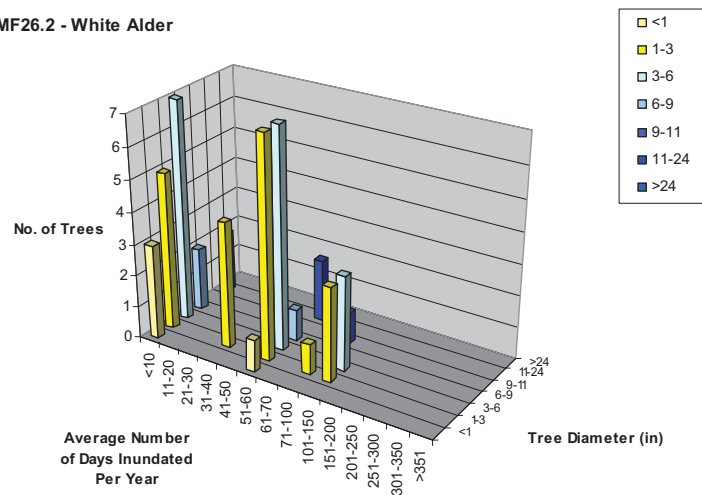


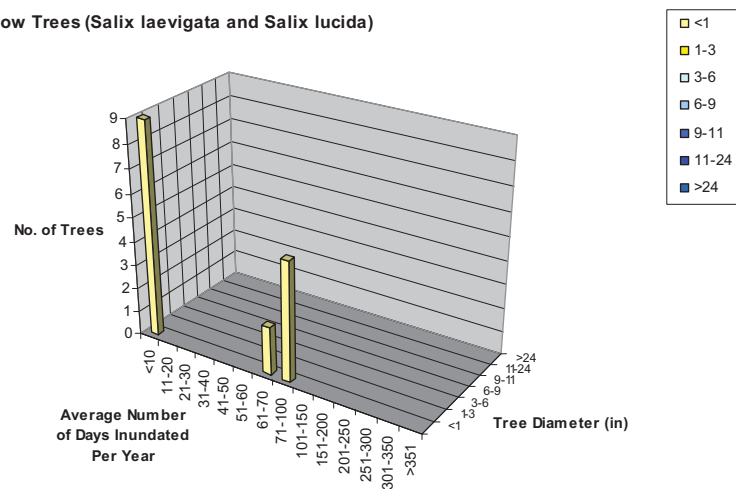
Figure B-2. Shrub and Tree Size Class Distributions in Relation to Inundation Frequency by Species at the Bypass and Comparison Stream Study Sites (continued).

Large Bypass and Peaking and Comparison Reach Study Sites
Middle Fork American River - Bypass Study Sites (continued)

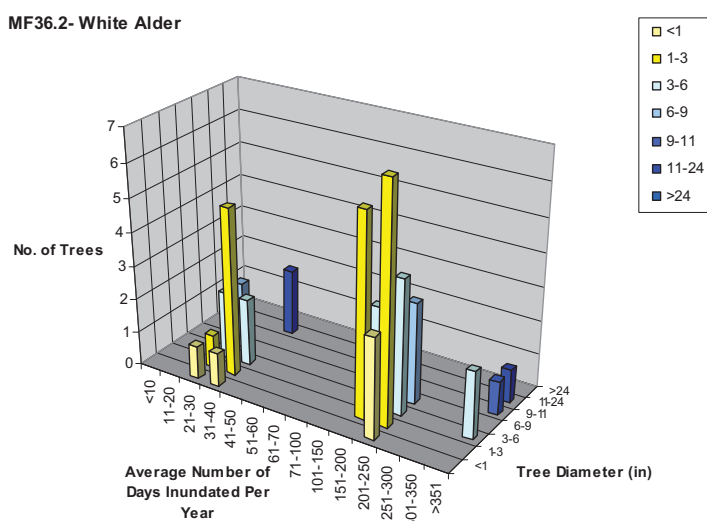
MF26.2 - White Alder



MF26.2 - Willow Trees (*Salix laevigata* and *Salix lucida*)



MF36.2- White Alder



MF36.2- Willow Trees (*Salix laevigata* and *Salix lucida*)

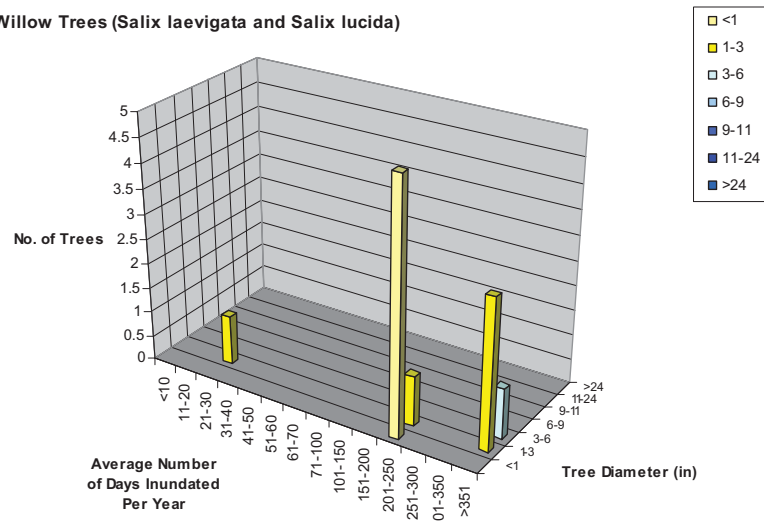
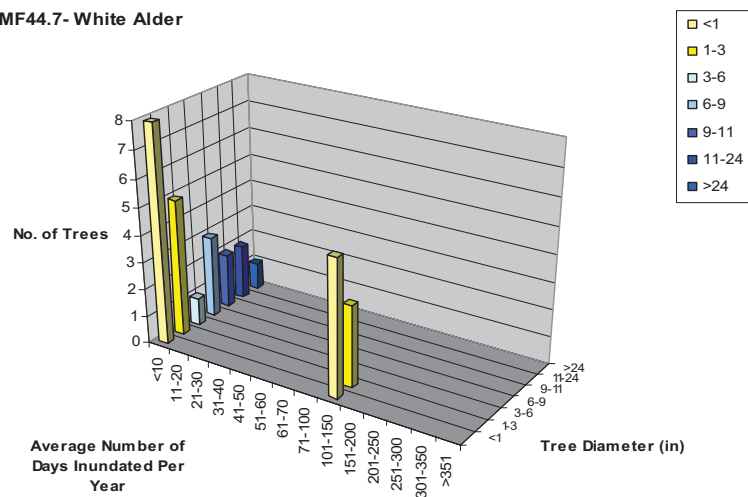


Figure B-2. Shrub and Tree Size Class Distributions in Relation to Inundation Frequency by Species at the Bypass and Comparison Stream Study Sites (continued).

Large Bypass and Peaking and Comparison Reach Study Sites
Middle Fork American River - Bypass Study Sites (continued)

MF44.7- White Alder



Middle Fork American River Peaking Reach

R3.5 - Willow

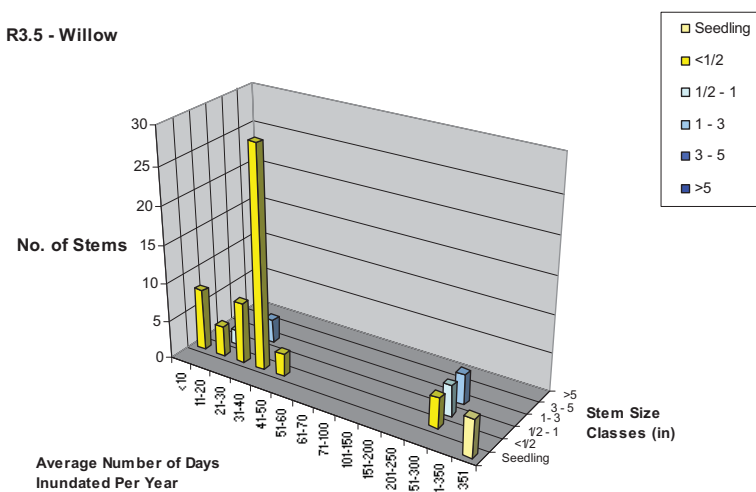
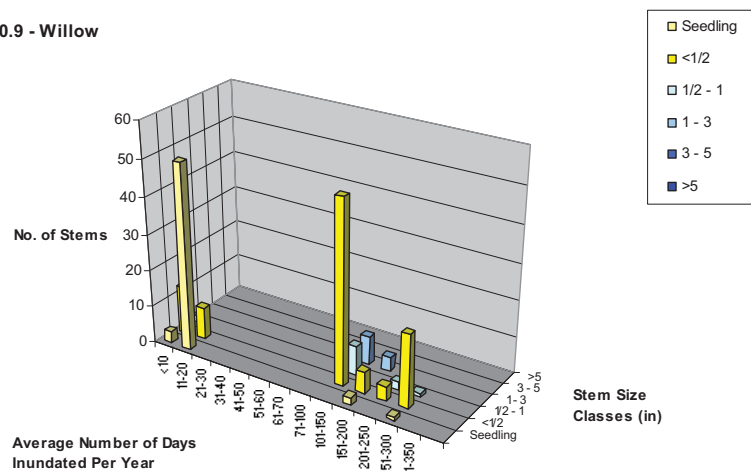


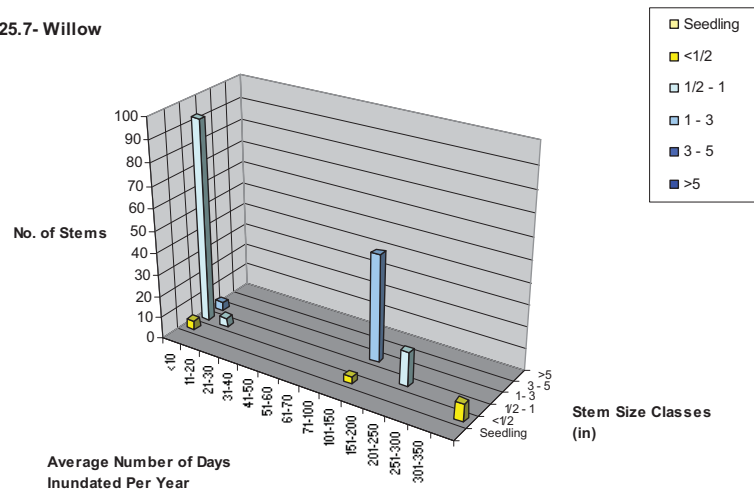
Figure B-2. Shrub and Tree Size Class Distributions in Relation to Inundation Frequency by Species at the Bypass and Comparison Stream Study Sites (continued).

Large Bypass and Peaking and Comparison Reach Study Sites
Rubicon River

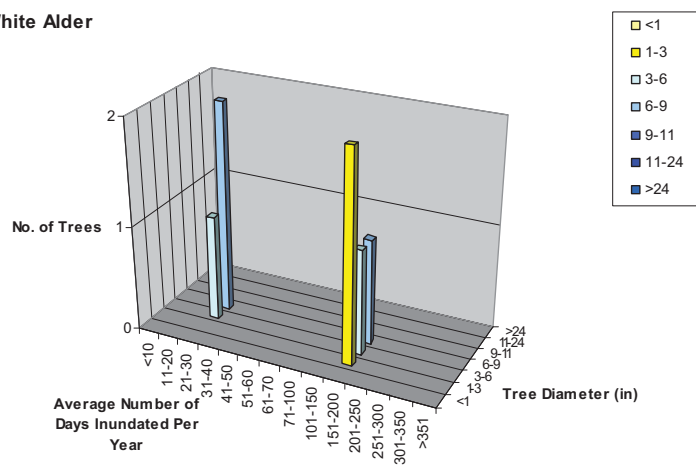
R20.9 - Willow



R25.7- Willow



R3.5 - White Alder



R3.5 - Salix laevigata (SALA3)

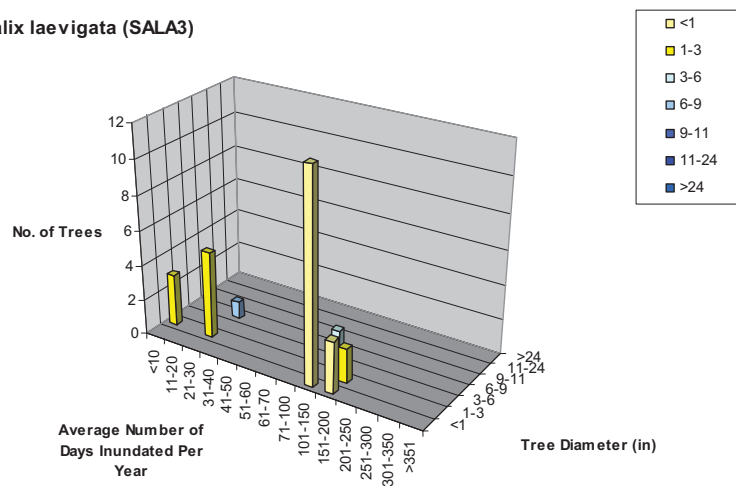
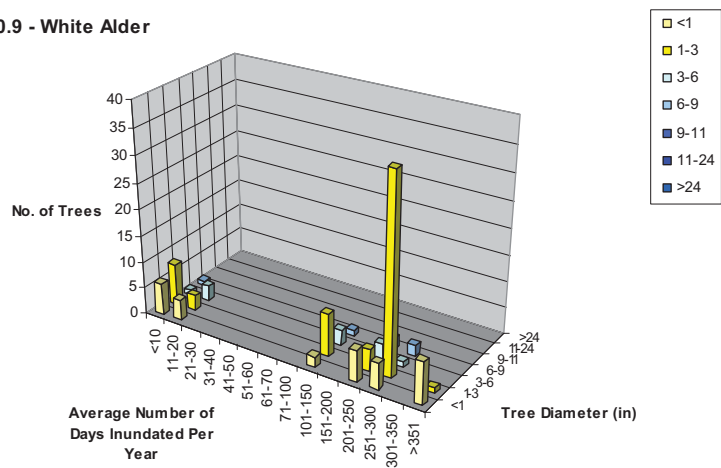


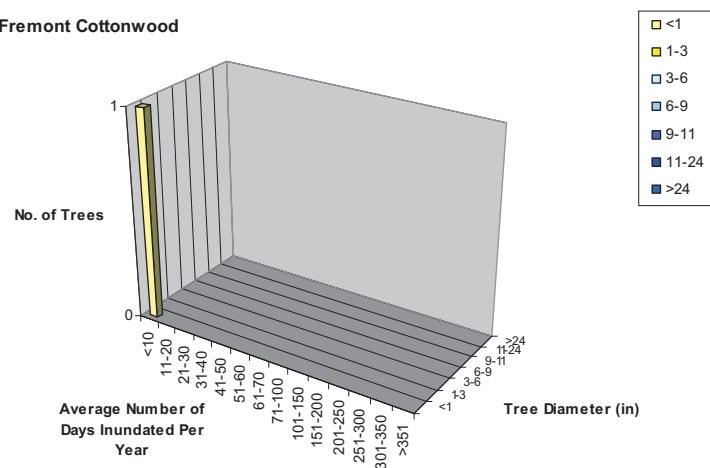
Figure B-2. Shrub and Tree Size Class Distributions in Relation to Inundation Frequency by Species at the Bypass and Comparison Stream Study Sites (continued).

Large Bypass and Peaking and Comparison Reach Study Sites
Rubicon River (continued)

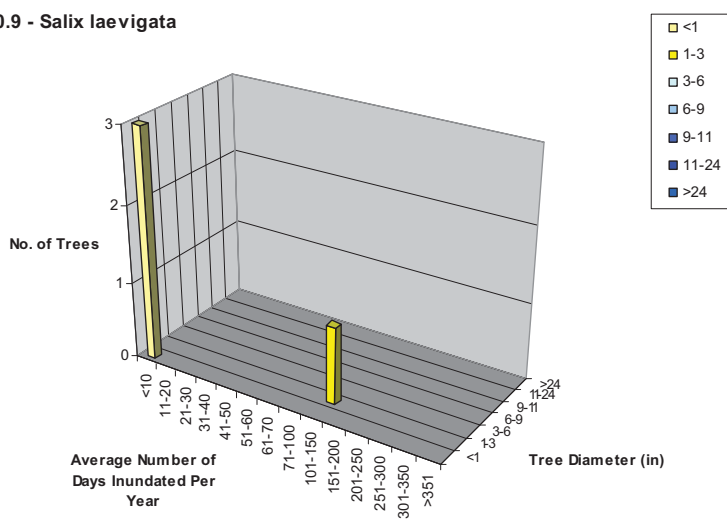
R20.9 - White Alder



R20.9 - Fremont Cottonwood



R20.9 - Salix laevigata



R25.7 - White Alder

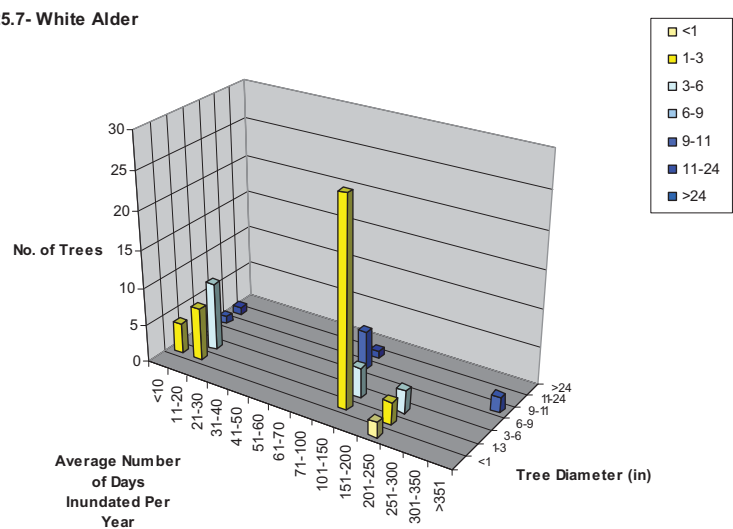


Figure B-2. Shrub and Tree Size Class Distributions in Relation to Inundation Frequency by Species at the Bypass and Comparison Stream Study Sites (continued).

Large Bypass and Peaking and Comparison Reach Study Sites
North Fork American River

NF31.3 - Willow

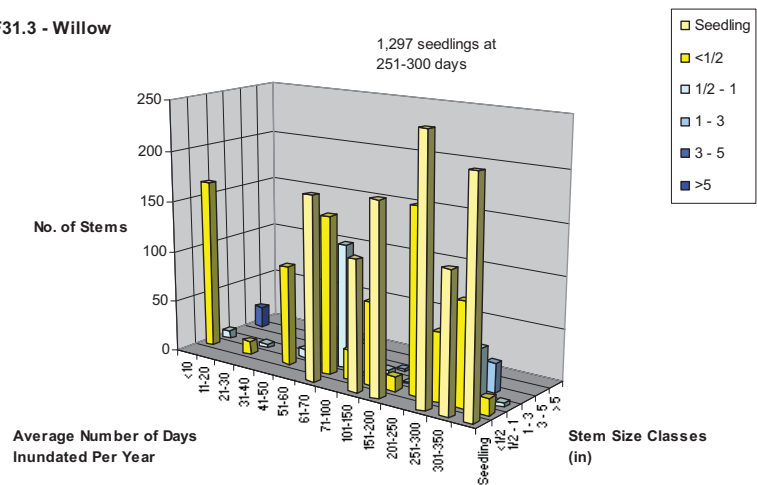
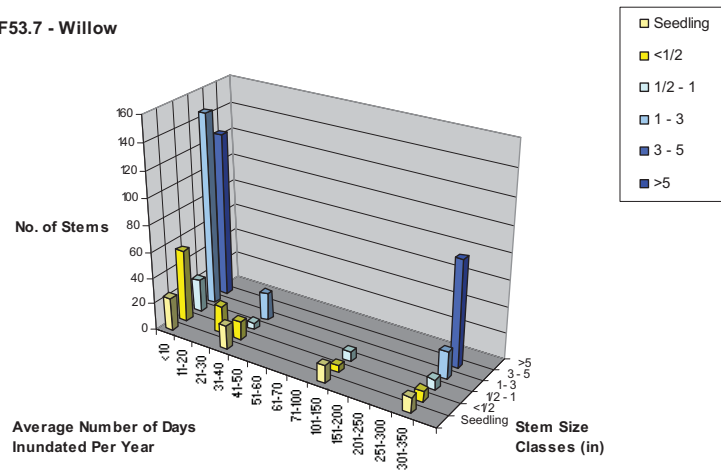


Figure B-2. Shrub and Tree Size Class Distributions in Relation to Inundation Frequency by Species at the Bypass and Comparison Stream Study Sites (continued).

Large Bypass and Peaking and Comparison Reach Study Sites
North Fork American River (continued)

NF53.7 - Willow



NF53.7- White Alder

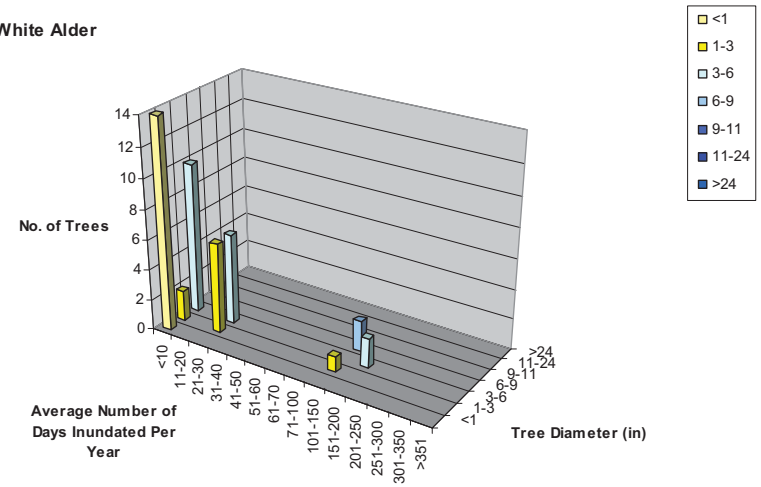
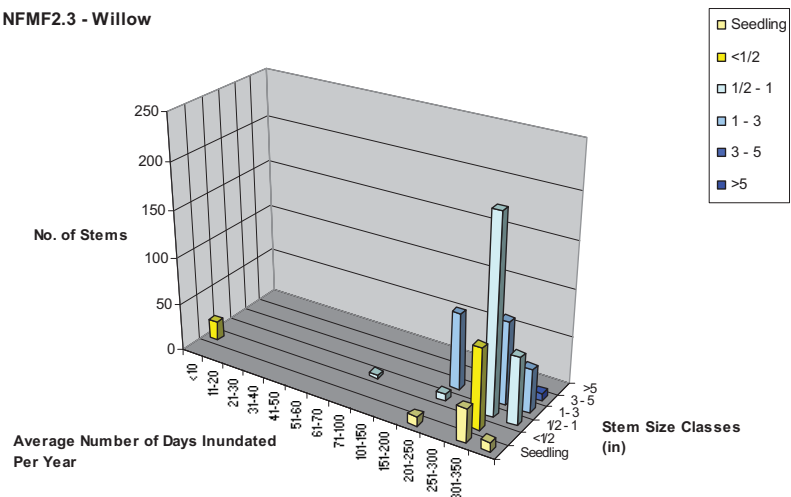


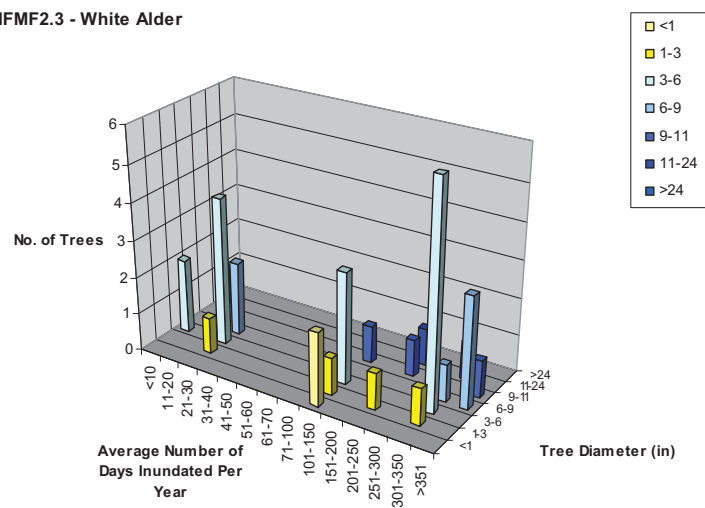
Figure B-2. Shrub and Tree Size Class Distributions in Relation to Inundation Frequency by Species at the Bypass and Comparison Stream Study Sites (continued).

Large Bypass and Peaking and Comparison Reach Study Sites
North Fork of the Middle Fork American River

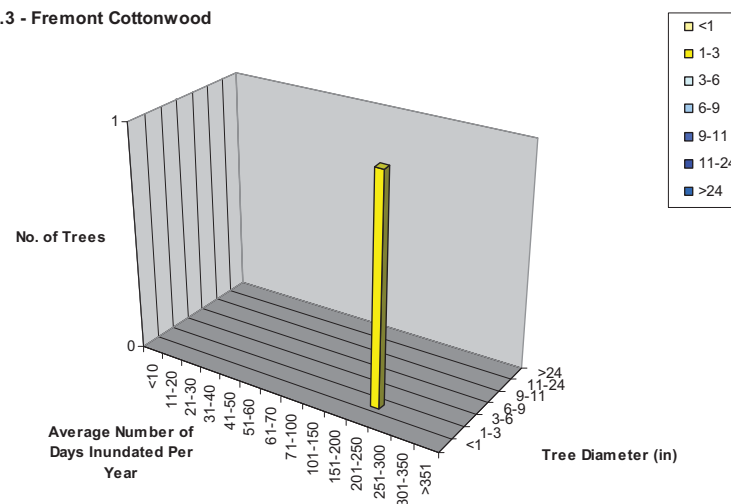
NFMF2.3 - Willow



NFMF2.3 - White Alder



NFMF2.3 - Fremont Cottonwood



APPENDIX C

Plants Identified During Riparian Studies (2006–2008)

Plants Identified During Riparian Studies (2006-2008)

Appendix C. Plants Identified During Riparian Studies (2006-2008).

[illegible]

Appendix C. Plants Identified During Riparian Studies (2006-2008) (continued).

[illegible]

Appendix C. Plants Identified During Riparian Studies (2006-2008) (continued).

[illegible]

Appendix C. Plants Identified During Riparian Studies (2006-2008) (continued).

[illegible]

Appendix C. Plants Identified During Riparian Studies (2006-2008) (continued).

[illegible]

Appendix C. Plants Identified During Riparian Studies (2006-2008) (continued).

[illegible]

Appendix C. Plants Identified During Riparian Studies (2006-2008) (continued).

[illegible]

¹ Scientific names from Hickman (1993) unless noted; common names from Hickman (1993) and Calflora (2006).

² From USFWS (1988) or, when indicated, from USFWS (1997).

³From Winward (2000) and Potter (2005).

⁴ From Calfora (2006).

⁶ Source: California Invasive Plant Inventory (Cal-IPC 2006).

Cal-IPC Rating:

High - These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.

Moderate - These species have substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution generally range from limited to widespread.

Limited - These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

Source: Noxious Weed Pest Ratings (CDFA 2004).

CDFA Rating:

A - An organism of known economic importance subject to state (or commissioner when acting as a state agent) enforced action involving: eradication, quarantine, containment, rejection, or other holding action.

B - An organism of known economic importance subject to: eradication, containment, control or other holding action at the discretion of the individual county agricultural commissioner, OR

An organism of known economic importance subject to state endorsed holding action and eradication only when found in a nursery.

C - An organism subject to no state enforced action outside of nurseries except to retard spread. At the discretion of the commissioner. OR An organism subject to no state enforced action except to provide for pest cleanliness in nurseries.

⁷ Source: California Native Plant Society (CNPS 2006)

4 - Plants of limited distribution - a watch list

3 - Not very endangered in California (<20% of occurrences threatened or no current threats known)

^a Dominance is based on plot data or line-intercept data (for surveys on the tributary inflows into Hell Hole Reservoir and upstream and downstream from the North Fork and South Fork Long Canyon diversions). Dominance is determined with greater than 25% cover in a plot and is indicated with a XD.

⁹ Only trees and shrubs were surveyed at the site. Herbaceous species were not surveyed.

APPENDIX D

Summary of the Life History Strategies of Cottonwood, Alder, and Willow Species Found in the Study Area

Tables

Table D-1.	Life History Strategies of Dominant Woody Riparian Species Found in the Study Area.
Table D-2.	Timing of Seed Dispersal for Common Woody Riparian Species in the Study Area.

TABLES

Table D-1. Life History Strategies of Dominant Woody Riparian Species Found in the Study Area.

ATTRIBUTE		SPECIES				
		Cottonwood		Willow	Alder	
		Fremont	Black		White	Mountain
Initiation ¹						
Reproduction	Flowering Timing	Mar to June (Stella et al. 2006)	Apr to May (as cited in Braatne et al. 1996)	Apr to May; depends on location/ elevation and species (USDA-FS 2009; Zasada et al. 2009)	Mar (Harrington et al. 2009)	Early spring. Mar/ Apr (USDA-NRCS 2009; Uchytíl 1989b)
	Seed Dispersal Timing	Seed Dispersal Timing is provided in Table C-2.				
	Seed Dispersal Agent ²	Hydrochoric and anemochoric				Hydrochoric and zoochoric
	Asexual Traits	Crown breakage and flood-related disturbance (e.g. tree fall) (Braatne et al. 1996)	Root suckering and crown breakage (Braatne et al. 1996)	Root sprouts and sprouting of broken stem and root pieces transported during high flows, and layering of stems (Zasada et al. 2009)	Root or trunk resprouting; layering (Uchytíl 1989a)	Rhizomes and root sprouts (Uchytíl 1989b)
Germination and Establishment ³	Seed Viability (in natural conditions)	1 to 3 weeks (as cited in Braatne et al. 1996)	1 to 2 weeks (as cited in Braatne et al. 1996)	A few days to a week, no more than 3 weeks (Anderson 2006)	Not a limiting factor (e.g. many months) (Harrington et al. 2009)	
	Germination	24 hours in moist, bare soil (Braatne et al. 1996)	24 hours in moist, bare soil (Braatne et al. 1996)	12 to 24 hours (USDA-FS 2009; Karrenberg et al. 2002)	Can germinate immediately in favorable conditions (Uchytíl 1989a and 1989b)	
	Seedling Root Growth Rate (and Recession Rate Associated with Establishment)	Seedling root growth rate: 4 to 12 mm/day (as cited in Braatne et al. 1996); can reach 40 cm length in 30 days (Braatne et al. 1996) Recession rate: 2.5 to 4 cm/day (up to 10 cm/day) (Mahoney and Rood 1998; Amlin and Rood 2002; Roberts et al. 2002; Stella et al. 2006)	Seedling root growth rate: 6 to 12 mm/day (as cited in Braatne et al. 1996; USDA-FS 2009); can reach 40 cm length in 30 days (Braatne et al. 1996)	Recession rate: 1 to 2.5 cm/day (Amlin and Rood 2002)	Rapid (similar to cottonwoods with water table declining rates of 1 to 3 cm/day); require continuously moist substrates to successfully establish (Uchytíl 1989a and 1989b; USDA-NRCS 2009; as cited in Braatne et al. 1996)	

Table D-1. Life History Strategies of Dominant Woody Riparian Species Found in the Study Area (continued).

ATTRIBUTE		SPECIES				
		Cottonwood		Willow	Alder	
		Fremont	Black		White	Mountain
Dormant Season	Rooting Depth of Sapling, first growing season	75 to 150 cm (Braatne et al. 1996)		40 to 60 cm (Karrenberg et al. 2002)	Root growth rates similar to cottonwoods	
Maturation ⁴						
	Age at Reproductive Maturity	5 to 10 years (as cited in Braatne et al. 1996)	8 to 10 years (as cited in Braatne et al. 1996)	5 to 10 years (Zasada et al. 2009)	10 years, can be earlier (Harrington et al. 2009)	3 to 4 years
	Rooting Depth of Mature Stands/ Depth to Groundwater	3 to 5+ m (as cited in Braatne et al. 1996)	3 to 5+ m (Braatne et al. 1996)	Less than 3 m	1 m (Uchytíl 1989b)	
	Lifespan	130+ years (as cited in Braatne et al. 1996)	100 to 200 years (as cited in Braatne et al. 1996)	Varies depending on species. Stems survive 10 to 20 years (USDA-FS 2009)	100 years	60 to 100 years
	Tree Height (mature tree)	12 to 35 m (USDA-NRCS 2008)	8 to 13.5 m (as cited in Braatne et al. 1996)	Variable, depends on species	15 to 24 m (Uchytíl 1989a)	1 to 9 m (Harrington et al. 2009)
	Diameter at Breast Height (mature tree)	30 to 150 cm USDA-NRCS 2008)	8 to 11.7 cm (as cited in Braatne et al. 1996)	Variable, depends on species	28 to 60 cm (Uchytíl 1989a)	Typically 10 to 20 cm (Uchytíl 1989b)
Germination/Recruitment Microsite Characteristics						
	Depth to Water Table or Elevation above Baseflow	Elevation above baseflow: 1 to 3 m (Mahoney and Rood 1998; Roberts et al. 2002)	Elevation above water table: 0.7 to 3 m (Law et al. 2000; Jamison and Braatne 2001)	Elevation above baseflow: 0.6 to 3 m (Mahoney and Rood 1998; Jamison and Braatne 2001)	Elevation above baseflow: 0.4 m above baseflow (Lisle 1989)	Depth to water table: 1 m (Uchytíl 1989b)
	Substrate	Bare, moist sandy, humous, or gravelly soils -with silts and clays.	Bare, moist sandy, humous, or gravelly soils - with silts and clays.	Bare, moist sandy, humous, or gravelly soils -with silts and clays.	Sunny, wet mineral sites exposed from receding flood waters; cobbles, gravels and sands (Uchytíl 1989a and 1989b)	
	Location on Floodplain	Point bars, cut off channels, lower terraces	Gravel bars, floodplains, and terraces	Point bars and cut off channels; water's edge	Sandbars or other fresh alluvium exposed by receding flood waters (Uchytíl 1989a and 1989b)	

¹ Initiation refers to seed dispersal, germination, and initial seedling growth.

² Hydrochroic: water-dispersed; Anemochoric: wind-dispersed; Zoochoric: animal-dispersed.

³ Establishment refers to the continued survival and growth of seedlings and saplings over several years until the tree reaches maturity.

⁴ Maturity (sexual) occurs once a tree begins to flower and produce seed.

Table D-2. Timing of Seed Dispersal for Common Woody Riparian Species in the Study Area.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Seed Dispersal¹												
COTTONWOODS												
Fremont Cottonwood (<i>Populus fremontii</i>)												
Sacramento												
Sacramento River												
San Joaquin and Tuolumne Rivers												
Trinity River												
Black Cottonwood (<i>Populus balsamifera</i>)												
Trinity River												
ALDERS												
White Alder (<i>Alnus rhombifolia</i>)												
San Joaquin and Tuolumne Rivers												
Trinity River												
Mountain Alder (<i>Alnus incana</i> ssp. <i>tenuifolia</i>)												
WILLOWS												
Arroyo Willow (<i>Salix lasiolepis</i>)												
San Joaquin and Tuolumne Rivers												
Trinity River												
Gooding's Willow (<i>Salix gooddingii</i>)												
San Joaquin and Tuolumne Rivers												
San Joaquin and Tuolumne Rivers												
Shining Willow (<i>Salix lucida</i>)												
Trinity River												
Narrowleaf Willow (<i>Salix exigua</i>)												
Trinity River												
San Joaquin and Tuolumne Rivers												
San Joaquin and Tuolumne Rivers												

¹References and elevation data for the different studies are:

San Joaquin River and Tuolumne River (< 650 feet elevation) (Stella et al 2006)

Sacramento River (< 300 feet elevation) (CALFED 1999)

San Joaquin River (< 600 feet elevation) (as reported in McBain and Trush 2002)

Sacramento River (< 300 feet elevation) (Roberts et al 2002 (TNC))

Trinity River (< ~1500 feet elevation) (McBain and Trush 1997)

General Source (Uchytel 1989b and as cited in Braatne et al 1996 for POBA)



APPENDIX E

Comparison Rivers – Photographs and Vegetation Summary Tables and Figures

Riparian Community Characteristics – Study Site Comparison

Tables

Table E-1.	Riparian Community Width, Species Richness, Percent Native Species, and Percent Hydric Species at the Comparison Stream Study Site Transects.
Table E-2.	Riparian Community Composition along the Greenline at the Comparison Stream Study Sites.
Table E-3.	Noxious Weeds at the Comparison Stream Study Sites.
Table E-4.	Riparian Tree and Shrub Species Coverage at the Comparison Stream Study Sites.
Table E-5.	Regeneration Along the Stream Banks at the Comparison Stream Study Sites.
Table E-6.	Tree Densities within the Comparison Stream Study Site Riparian Communities.
Table E-7.	Riparian Tree and Canopy Cover at the Comparison Stream Study Sites.
Table E-8.	Decadence within Riparian Zone along the Comparison Streams.
Table E-9.	Summary of Vegetation Characteristics of the Riparian Corridor on the North Fork Long Canyon Creek and South Fork Long Canyon Creek Upstream and Downstream from the Diversions.

Figures

Figure E-1.	Photographs of Riparian Vegetation at the Comparison Stream Study Sites.

Riparian Community Characteristics – Study Site Comparison

Riparian vegetation community composition, age class structure, coverage types, presence of noxious weed and special-status plant species, and riparian corridor width at the comparison river study sites are summarized in Tables AQ 10-2 and Tables E-1–E-8. The summaries of the riparian surveys, including photographs, along the bypass and peaking reach study sites are provided in the 2006 Physical Habitat Characterization Report (PCWA 2007b). Comparisons of the dominant species present, species richness, the proportion of native species, and hydric species at the bypass, peaking, and comparison reach study sites are shown in Figures AQ 10-2 and 10-3. Composition and age class structure in relation to inundation frequency at the comparison and bypass stream reach study sites are presented in Figures B-1 and B-2. This information is provided in Figures F-1 and F-2 for the peaking reach study sites. Vegetation community patterns on the North Fork and South Forks Long Canyon creeks are summarized in Table E-9. The riparian vegetation characteristics on the bypass and peaking reaches are compared to those on the appropriate comparison stream reach below.

Middle Fork American River Bypass Reach – The riparian vegetation at the study sites on the Middle Fork American River bypass reach and the unimpaired comparison river study site (NFMF2.3) was situated within steep valley walls that control the width of the riparian zone. White alder was a dominant species at all the bypass reach and comparison reach study sites (Figure AQ 10-3). A range of size classes were present at both the bypass and comparison study sites, including seedlings and sprouts, as well as individuals with diameters greater than eleven inches. Willows were also a dominant species at NFMF2.3, and were a less prominent species within the communities along the Middle Fork American River bypass reach. The majority of the willows on the Middle Fork American River and at NFMF2.3 had fairly small stems (<3 inches in diameter). Species richness and the proportion of hydric species were greater in all the bypass reach sites than the NFMF2.3 comparison river study site. Only 44% of the species in NFMF2.3 were riparian and wetland species compared to at least 66% in the bypass reach study sites. Almost all the species found in the bypass and comparison reach study sites were native (Figure AQ 10-2).

Middle Fork American River Peaking Reach – The riparian vegetation along the peaking reach (MF4.8 and MF14.1) and the comparison reach (NF31.3) was established on large sand, gravel, and cobble bars (Figures B-1, E-1, and E-2). Along the river in the peaking reach study sites, the bars were generally sparsely vegetated, with willows and alders along the bar perimeters, as well as some patches of willows within the bars along high flow channels. A mix of alders, willow trees, black locust, and some cottonwoods were also present along straighter reach sections and on the cut banks (Figure AQ 10-3). The majority the willow stems was small (<1 inch in diameter). For alders, a range of sizes of trees were present, from seedlings to mature individuals. Alder, cottonwood, and black locust seedlings and young individuals were also observed. Hundreds of willow seedlings and young willows were observed on the bars. The riparian community at the unimpaired comparison river study site NF31.3 was also

dominated by willows, with alders and cottonwoods interspersed. Seedlings and young willows tended to be established on the lower bar surfaces, while the larger and more mature willows were established on higher bar surfaces. Alders and cottonwoods were typically not established along the bar perimeters, but were rooted farther back at higher elevations on the bars. The alders and cottonwoods were typically young and mature (less than 6 inches in diameter). Hundreds of willow seedlings and young individuals, as well as alder and cottonwood seedlings and young individuals, were observed on the bars at NF31.3.

Species richness was higher at the comparison study site (NF31.3, 76 species) compared to the three peaking reach sites (31 to 52 species) (Figure AQ 10-2). The lowest species richness was in the study site within the Ruck-a-Chucky Falls reach, which was more confined with coarser substrate and more bedrock compared to the other study sites in the peaking reach and NF31.3. The proportion of riparian and wetland species was similar in the two wider study sites in the peaking reach and the comparison study site (56, 57, and 59%) and slightly greater in the site in the Ruck-a-Chucky Falls reach (71%). The proportion of native species was slightly greater in the peaking reach than in NF31.3 (68 versus 70 to 77%).

Rubicon River – The riparian community along the Rubicon River bypass reach (see Table AQ 10-1 for the sites) and in the comparison river site (NF53.7) were both dominated by alders and willows on wide, sparsely vegetated coarse cobble and boulder bars (Figures AQ 10-3 and B-1). Alders interspersed with willows commonly lined the stream channel at the Rubicon River. Few individuals were established at higher elevations up on the coarse bars. In comparison, at the unimpaired comparison river study site NF53.7, the majority of the individuals and the larger trees and shrubs were established near the base of the valley walls, rather than along the channel margins. A range of willow and alder age classes, including seedlings and sprouts, were present at the study sites on the Rubicon River and North Fork American River (NF53.7). Species richness was lower in the Rubicon River bypass reach study sites (27 to 43 species) than the unimpaired comparison river study site (NF53.7, 45 species). Approximately two-thirds of the species were riparian and wetland species, with slightly higher proportions found in the first three study sites upstream from Ralston Afterbay (R1.2, R2.6, and R3.5). The majority of species present were native (82%), with slighter lower nativity in the sites just upstream from Ralston Afterbay compared to the bypass reach sites farther upstream and NF53.7 (Figure AQ 10-2).

South Fork Long Canyon Creek – White alder was the dominant species within the riparian corridor upstream and downstream from the diversion. All age classes were present upstream and downstream from the diversions, with younger individuals interspersed with a few older ones. Willows were commonly interspersed, and were more common in the bypass reach than in the comparison reach upstream. Indian rhubarb was abundant in patches downstream from the diversion, and was a sub-dominant species within the community upstream from the diversion. Black cottonwood was a component of the riparian community both upstream and downstream from the diversion. The upland overstory species were typically incense cedar and Douglas fir

(Figure AQ 10-3). The substrate downstream from the diversion varied considerably; portions were comprised of bedrock, while other sections were composed of fines with a layer of litter. Upstream from the diversion, the majority of the reach was cobble-dominated, with two sections of bedrock channel. The reach downstream from the diversion was a little steeper (3.5%) than the surveyed reach upstream from the diversion (2.1%) (Table E-9). The channel was braided in the upper portion of the surveyed reach where it flows through an old debris flow; all channels were dry during the summer 2007 survey.

Species richness was variable at the study sites downstream (43 and 73 species) and upstream (50 and 61 species) from the diversion. Species diversity was greatest along the surveyed reach immediately downstream from the diversion. The proportion of riparian and wetland species was slightly greater downstream (56 and 60%) than upstream (48 and 49%) from the diversion. The majority of all the species present were native (>90%) (Figure AQ 10-2).

North Fork Long Canyon Creek – The riparian corridor was dominated by a Douglas fir canopy with fairly continuous coverage by Indian rhubarb within the channel both upstream and downstream (the first 1,225 feet) from the diversion (Table E-9). Only a few willows and no alders were observed upstream from the diversion. In comparison, mature willows and willow seedlings were interspersed throughout the riparian corridor downstream from the diversion. Downstream of 1,225 feet from the diversion, the remainder of the surveyed reach was dominated by mature white alders, typically with 100% cover within the riparian corridor (Figure AQ 10-3). All age classes were observed. The channel was primarily comprised of boulders and cobbles upstream and downstream from the diversion. The reach upstream from the diversion was considerably steeper (7.8%) compared to the surveyed reach downstream from the diversion (4.5%).

The total number of species was higher immediately downstream from the diversion (72 species) than upstream (54 species), and were lowest at the study site (NFLC1.9) farther downstream (45 species). A slightly greater proportion of riparian and wetland species were present upstream of the diversion (57%) compared to downstream (47 and 51%). The majority of all the species present were native (>92%) (Figure AQ 10-2).

Long Canyon Creek – Willows and white alder were the most common riparian species within the riparian corridor at the two study sites (LC9.0 and LC0.0). Fremont cottonwood was also present. In general, the riparian community was comprised of fairly young individuals, with most trees less than six inches in diameter. The willows also tended to be relatively small with fewer than 30 stems per individual. Willow and alder seedlings and saplings were observed at both sites. The total number of species at the two sites on Long Canyon Creek was 35 and 53 species, with greater richness found at the upper study site. The majority of all the species present were native (>90%) and were typically riparian and wetland species (Figure AQ 10-2).

Duncan Creek – Alder was the dominant riparian species at all of the Duncan Creek study sites (comparison and bypass reaches). Black cottonwood was also present at all of the study sites. Willows were a minor component in the riparian communities (<15%) (Figure AQ 10-3). The willows were typically young (most stems <1 inch in diameter) and small (<30 stems per individual). Seedlings and young individuals (alder, willow, and/or cottonwood) were present at all the study sites. Woody riparian vegetation tended to be sparse in areas with boulder dominated substrates (Figure B-1). The riparian corridor had a conifer overstory, comprised of Douglas fir and incense cedar, with white fir and ponderosa pine also present. Indian rhubarb commonly occurred within the channel and along the channel margins at D6.3 and D9.0 (Figure B-1). Species richness was higher upstream of the diversion (52 species) compared to downstream from the diversion (31 to 37 species). However, fewer species were riparian and wetland species (28%) upstream of the diversion compared to downstream (62 to 68%). The majority of all the species present at the four study sites were native species (>90%) (Figure AQ 10-2).

TABLES

Table E-1. Riparian Community Width,¹ Species Richness, Percent Native Species, and Percent Hydric Species at the Comparison Stream Study Site Transects.

Study Site	Riparian Width (m) and (ft)				Species Richness	% Native Species Present	No. Obligate Species ²	No. Facultative Wetland Species	No. Facultative Species	% Hydric Species Present
	Mean	Max	Min	Range						
South Fork Long Canyon Creek										
SFLC4.2	4.7 (15.4)	4.84 (15.9)	4.65 (15.26)	0.2 (0.66)	50	96	9	8	7	48
Duncan Creek										
D9.0	5.6 (18.4)	7.9 (25.9)	2.7 (8.9)	5.2 (17.1)	52	98	10	13	5	28
North Fork of the Middle Fork American River										
NFMF2.3	11.2 (36.8)	16 (52.5)	6 (19.7)	10 (32.8)	27	85	3	8	1	44
North Fork American River										
NF53.7	23.3 (76.4)	53.1 (174.2)	5 (16.4)	48.1 (157.8)	45	82	6	17	7	67
NF31.3	19.1 (62.1)	37.4 (122.7)	8.5 (27.9)	28.9 (94.8)	76	68	15	20	10	59

¹ Riparian community width along each bank.

² Obligate (OBL) species are found in wetlands 99% of the time.

Facultative Wetland (FACW) species usually occur in wetlands (estimated probability 67%-99%), but occasionally are found in non-wetlands.

Facultative (FAC) species are equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%).

Table E-2. Riparian Community Composition along the Greenline at the Comparison Stream Study Sites.

	Community Type ¹	Left Bank		Right Bank	
		Cumulative Distance m (ft)	% Total Distance	Cumulative Distance m (ft)	%Total Distance
South Fork Long Canyon Creek					
SFLC4.2 (T1) ²	Vegetation				
	White alder/Indian rhubarb Plant Association	77 (251)	77	62 (203)	63
	Douglas fir-Incense cedar-White alder Plant Association	24 (77)	24	36 (117)	36
	Total Greenline Length ³	100 (328)		98 (322)	
	Substrate				
	Boulder, cobble	48 (157)	48	51 (166)	52
	Fines, bedrock			17 (57)	18
	Gravel, fines			11 (37)	11
	Cobble, boulder	35 (114)	35	18 (60)	19
	Cobble, gravel	17 (57)	17		
	Total Greenline Length	100 (328)		98 (322)	
	Duncan Creek				
D9.0	Vegetation				
	Thinleaf alder Alliance			43 (141)	37
	White fir-Incense cedar/Arrowleaf groundsel Plant Association			36 (119)	31
	Bedrock and Boulder Alliance Group			26 (86)	23
	Jepson's willow-redosier dogwood Plant Association	24 (77)	21	11 (35)	9
	Douglas fir-Incense cedar-White alder Plant Association	48 (159)	43		
	Redosier dogwood/Arrowleaf groundsel Plant Association	41 (134)	36		
	Total Greenline Length ³	113 (370)		116 (381)	
	Substrate				
	Cobble, gravel, fines			13 (41)	11
	Boulder, cobble	52 (170)	46	34 (110)	29
	Bedrock			46 (150)	39
	Bedrock, boulder	53 (175)	47	11 (35)	9
	Bedrock, gravel	8 (25)	7	14 (45)	12
	Total Greenline Length	113 (370)		116 (381)	
North Fork of the Middle Fork American River					
NFMF2.3 (T1/T2)	Vegetation				
	White alder-Sedge Plant Association	104	100	101 (330)	100
	Total Greenline Length	104 (340)		101 (330)	
	Substrate				
	Boulder, bedrock, gravel			14 (45)	14
	Boulder, cobble	100 (328)	97	57 (186)	57
	Boulder, gravel	4 (12)	4	30 (99)	30
	Total Greenline Length	104 (340)		101 (330)	

Table E-2. Riparian Community Composition along the Greenline at the Comparison Stream Study Sites (continued).

	Community Type ¹	Left Bank		Right Bank	
		Cumulative Distance m (ft)	% Total Distance	Cumulative Distance m (ft)	%Total Distance
North Fork American River					
NF53.7 (T3)	Vegetation				
	White alder/Sedge Plant Association	88 (291)	73	89 (291)	81
	Arroyo willow/Douglas' sagewort Plant Association	9 (30)	8	21 (69)	19
	Miscellaneous willow Alliance Group	24.1 (79)	20		
	Total Greenline Length	122 (400)		110 (360)	
	Substrate ⁴				
	Fines, cobble			29 (94)	26
	Fines, gravel, cobble, boulder, bedrock			18 (60)	17
	Boulder, fines	24 (78)	20	63 (206)	57
	Boulder, cobble	24 (79)	20		
	Bedrock, fines	44 (145)	36		
	Bedrock, boulder, fines	30 (98)	25		
	Total Greenline Length	122 (400)		110 (360)	
	NF31.3 (T4)	Vegetation			
White alder/Narrowleaf willow Plant Association		51 (167)	47	104 (340)	100
Miscellaneous willow Alliance Group		14 (45)	13		
Fremont cottonwood-Red willow Plant Association		44 (143)	40		
Total Greenline Length		108 (355)		104 (340)	
Substrate ⁴					
Fines, boulder				15 (49)	15
Fines, cobble, boulder				24 (77)	23
Cobble, fines		26 (85)	24		
Cobble, boulder, fines				65 (214)	63
Boulder, cobble, fines		39 (128)	36		
Bedrock		13 (44)	12		
Bedrock, boulder		30 (99)	28		
Total Greenline Length		108 (355)		104 (340)	

¹ Riparian plant community classifications based on Potter (2005).

² Transect nearest the greenline.

³ Greenline lengths were occasionally less than 100 meters.

⁴ Dominant size class is **bolded**.

Table E-3. Noxious Weeds at the Comparison Stream Study Sites¹.

Study Site	Code	Scientific Name	Common Name	Dominant?	Cal-IPC Status ²	CDFA Status ³	UTM ¹		
							Zone	Easting	Northing
South Fork Long Canyon Creek									
SFLC4.2	RUAC3	<i>Rumex acetosella</i>	sheep sorrel	No	Moderate	-	10 N	677456	431788
Duncan Creek									
D9.0	RUDI2	<i>Rubus armeniacus</i> (= <i>Rubus discolor</i>)	Himalayan blackberry	Yes	High	-	10 N	718214	4335259
North Fork of the Middle Fork American River									
NFMF2.3	BRDI3	<i>Bromus diandrus</i>	ripgut grass	No	Moderate	-	10 N	699925	4321349
	SAOF4	<i>Saponaria officinalis</i>	bouncing bet	No	Limited	-	10 N	723845	4334743
	TOAR	<i>Torilis arvensis</i>	field hedge parsley	No	Moderate	-	10 N	697376	4321943
North Fork American River									
NF53.7	LASE	<i>Lactuca serriola</i>	prickly wild lettuce	No	Eval/No List	-	10 N	691232	4338701
	SAOF4	<i>Saponaria officinalis</i>	bouncing bet	No	Limited	-	10 N	691285	4338809
NF31.3	AVFA	<i>Avena fatua</i>	wild oat	No	Moderate	-	10 N	677381	4317908
	BRMA	<i>Briza maxima</i>	greater rattlesnake grass	No	Limited	-	10 N	678585	4319250
	BRTE	<i>Bromus tectorum</i>	cheat grass	No	High	-	10 N	677456	4317988
	CHJU	<i>Chondrilla juncea</i>	skeletonweed	Yes	Moderate	A	10 N	677381	4317908
	CYDA	<i>Cynodon dactylon</i>	Bermuda grass	Yes	Moderate	C	10 N	677381	4317908
	HYPE	<i>Hypericum perforatum</i>	Klamath weed	No	Moderate	C	10 N	677381	4317908
	ROPS	<i>Robinia pseudoacacia</i>	black locust	Yes	Limited	-	10 N	677381	4317908
	RUAC3	<i>Rumex acetosella</i>	sheep sorrel	No	Moderate	-	10 N	697376	4321943
	RUDI2	<i>Rubus armeniacus</i> (= <i>Rubus discolor</i>)	Himalayan blackberry	Yes	High	-	10 N	677381	4317908
	RUDI2	<i>Rubus armeniacus</i> (= <i>Rubus discolor</i>)	Himalayan blackberry	Yes	High	-	10 N	678468	4318977
	TOAR	<i>Torilis arvensis</i>	field hedge parsley	No	Moderate	-	10 N	678585	4319250
	VETH	<i>Verbascum thapsus</i>	wooly mullein	No	Limited	-	10 N	678468	4318977
	VETH	<i>Verbascum thapsus</i>	wooly mullein	No	Limited	-	10 N	678585	4319250
	VUMY	<i>Vulpia myuros</i>	rat-tail fescue	No	Moderate	-	10 N	677456	431788

¹ Noxious weeds were recorded when found near transects at the study sites. UTM coordinates were taken at the transect.

² Source: California Invasive Plant Inventory (Cal-IPC 2006).

Cal-IPC Rating:

High - These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.

Moderate - These species have substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution generally range from limited to widespread.

Limited - These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

²Source: Noxious Weed Pest Ratings (CDFA 2004).

³ Source: Noxious Weed Pest Ratings (CDFA 2004).

CDFA Rating:

A - An organism of known economic importance subject to state (or commissioner when acting as a state agent) enforced action involving: eradication, quarantine, containment, rejection, or other holding action.

B - An organism of known economic importance subject to: eradication, containment, control or other holding action at the discretion of the individual county agricultural commissioner. OR

An organism of known economic importance subject to state endorsed holding action and eradication only when found in a nursery.

C - An organism subject to no state enforced action outside of nurseries except to retard spread. At the discretion of the commissioner. OR An organism subject to no state enforced action except to provide for pest cleanliness in nurseries.

Table E-4. Riparian Tree and Shrub Species Coverage at the Comparison Stream Study Sites.

Study Site	Species	Scientific Name	Common Name	Species Percent Cover ¹			
				Median	Mean	Min	Max
SFLC4.2	Tree Species						
	ABCO	<i>Abies concolor</i>	white fir	0	7	0	90
	ALRH2	<i>Alnus rhombifolia</i>	white alder	0	23	0	95
	CADE27	<i>Calocedrus decurrens</i>	incense cedar	0	4	0	60
	Quercus spp.	<i>Quercus</i> spp.	oak	0	0	0	3
	Shrub Species						
	CONU4	<i>Cornus nuttallii</i>	mountain dogwood	0	3	0	50
	RIAM	<i>Ribes amarum</i>	bitter gooseberry	0	0	0	5
	RINE	<i>Ribes nevadense</i>	Sierra currant	0	1	0	14
	RUPA	<i>Rubus parviflorus</i>	thimbleberry	0	0	0	5
SYMO	<i>Symphoricarpos mollis</i>	creeping snowberry	0	2	0	25	
D9.0	Tree Species						
	ABCO	<i>Abies concolor</i>	white fir	0	3	0	30
	CADE27	<i>Calocedrus decurrens</i>	incense cedar	0	3	0	80
	POBAT	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood	0	3	0	30
	PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir	0	8	0	90
	Shrub Species						
	ALINT	<i>Alnus incana</i> ssp. <i>tenuifolia</i>	mountain alder	0	18	0	95
	AMPU5	<i>Amelanchier pumila</i>	dwarf serviceberry	0	1	0	10
	CHSE	<i>Chamaesyce serpyllifolia</i> ssp. <i>serpyllifolia</i>	thyme-leaved sandmat	0	1	0	35
	COSE16	<i>Cornus sericea</i> ssp. <i>sericea</i>	redosier dogwood, American dogwood	0	6	0	58
	LEDA	<i>Leucothoe davisiae</i>	Sierra laurel	0	1	0	15
	Salix spp.	<i>Salix</i> spp.	willow	0	2	0	40
	SYMO	<i>Symphoricarpos mollis</i>	creeping snowberry	0	0	0	10
	NFMF2.3	Tree Species					
ALRH2		<i>Alnus rhombifolia</i>	white alder	0	24	0	100
POFR2		<i>Populus fremontii</i> ssp. <i>Fremontii</i>	Fremont cottonwood	0	1	0	40
QUCH2		<i>Quercus chrysolepis</i>	canyon live oak	0	1	0	20
Shrub Species							
ARDO3		<i>Artemisia douglasiana</i>	Douglas' sagewort (mugwort)	0	0	0	10
BRCA3		<i>Brickellia californica</i>	brickellbush	0	3	0	25
CHUM		<i>Chimaphila umbellata</i>	pipsissewa	0	1	0	15
EPCA3		<i>Epilobium canum</i> ssp. <i>latifolium</i>	California fuchsia	0	1	0	15
MIPU3		<i>Diplacus puniceus</i> (= <i>Mimulus puniceus</i>)	red bush monkeyflower	0	1	0	15
PHLE4		<i>Philadelphus lewisii</i>	wild mock orange	0	4	0	80
RHTO		<i>Frangula tomentella</i> (= <i>Rhamnus tomentella</i> ssp. <i>tomentella</i>)	mountain coffeeberry	0	17	0	80
RULE		<i>Rubus leucodermis</i>	whitebark raspberry	0	4	0	30
SALA6		<i>Salix lasiolepis</i> /spp.	arroyo willow	25	29	0	85
SAME2		<i>Salix exigua</i> / <i>Salix melanopsis</i>	dusky willow	0	8	0	60
SAOF4		<i>Saponaria officinalis</i>	bouncing bet	0	0	0	5
TODI		<i>Toxicodendron diversilobum</i>	poison oak	0	0	0	5
VICA5		<i>Vitis californica</i>	California wild grape	0	17	0	95

Table E-4. Riparian Tree and Shrub Species Coverage at the Comparison Stream Study Sites (continued).

Study Site	Species	Scientific Name	Common Name	Species Percent Cover ¹			
				Median	Mean	Min	Max
NF53.7	Tree Species						
	ACMA3	<i>Acer macrophyllum</i>	big leaf maple	0	2	0	45
	ALRH2	<i>Alnus rhombifolia</i>	white alder	0	12	0	70
	Shrub Species						
	BRCA3	<i>Brickellia californica</i>	brickellbush	0	0	0	4
	RHTO	<i>Frangula tomentella</i> (=Rhamnus tomentella ssp. tomentella)	mountain coffeeberry	0	0	0	5
	RUD12	<i>Rubus armeniacus</i> (=Rubus discolor)	Himalayan blackberry	0	7	0	67
	SAME2	<i>Salix exigua</i> / <i>Salix melanopsis</i>	dusky willow	0	6	0	50
	VICA5	<i>Vitis californica</i>	California wild grape	0	1	0	25
NF31.3	Tree Species						
	ALRH2	<i>Alnus rhombifolia</i>	white alder	0	6	0	65
	FRLA	<i>Fraxinus latifolia</i>	Oregon ash	0	0	0	10
	POFR2	<i>Populus fremontii</i> ssp. <i>Fremontii</i>	Fremont cottonwood	0	5	0	70
	ROPS	<i>Robinia pseudoacacia</i>	black locust	0	1	0	25
	Shrub Species						
	BRCA3	<i>Brickellia californica</i>	brickellbush	0	1	0	30
	CEOC2	<i>Cephalanthus occidentalis</i> var. <i>californicus</i>	California button willow	0	2	0	35
	RUD12	<i>Rubus armeniacus</i> (=Rubus discolor)	Himalayan blackberry	0	5	0	100
	SAEX	<i>Salix exigua</i>	narrow leaf willow	0	7	0	56
	Salix spp.	<i>Salix</i> spp.	willow	0	2	0	25
	SAME2	<i>Salix exigua</i> / <i>Salix melanopsis</i>	dusky willow	0	17	0	95
	VICA5	<i>Vitis californica</i>	California wild grape	0	3	0	40

¹Mean percent cover of each species per 108 square feet (10 square meters). Mean, median, minimum, and maximum values describe coverages by the individuals for each species. Descriptive statistics are based on data collected in 5x2 meter plots.

Table E-5. Regeneration Along the Stream Banks at the Comparison Stream Study Sites.

Study Site	Species Code	Scientific Name	Common Name	Left Bank		Right Bank	
				No. Saplings/Young	No. Seedlings/Sprouts	No. Saplings/Young	No. Seedlings/Sprouts
South Fork Long Canyon Creek							
SFLC4.2	ALRH2	<i>Alnus rhombifolia</i>	white alder	6	14	7	15
Total Greenline Length (m)				100		100	
Duncan Creek							
D9.0	ALINT	<i>Alnus incana</i> ssp. <i>tenuifolia</i>	mountain alder	7	0	4	7
	POBAT	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood	16	5	7	41
	SAJE	<i>Salix jepsonii</i>	Jepson's willow	6	0	0	0
Total Greenline Length (m)				113		116	
North Fork of the Middle Fork American River							
NFMF2.3	ALRH2	<i>Alnus rhombifolia</i>	white alder	3	2	2	4
	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow	4	3	2	4
	SAME2	<i>Salix exigua</i> / <i>Salix melanopsis</i>	dusky willow	8	6	1	0
	SALA3	<i>Salix laevigata</i>	red willow	1	0	0	0
	POFR2	<i>Populus fremontii</i> ssp. <i>Fremontii</i>	Fremont cottonwood	0	1	2	0
Total Greenline Length (m)				101		104	
North Fork American River							
NF53.7	SAME2	<i>Salix exigua</i> / <i>Salix melanopsis</i>	dusky willow	109	82	19	12
	SALU	<i>Salix lucida</i>	shining willow	5	1	7	4
	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow	2	5	3	0
	ALRH2	<i>Alnus rhombifolia</i>	white alder	13	6	0	0
	POFR2	<i>Populus fremontii</i> ssp. <i>Fremontii</i>	Fremont cottonwood	0	0	0	2
	SAEX	<i>Salix exigua</i>	narrow leaf willow	0	0	1	0
Total Greenline Length (m)				122		110	
NF31.3	ALRH2	<i>Alnus rhombifolia</i>	white alder	3	0	2	1
	POFR2	<i>Populus fremontii</i> ssp. <i>Fremontii</i>	Fremont cottonwood	1	9	1	2
	Salix spp.	<i>Salix</i> spp.	willow	5	1	2	0
	SAME2	<i>Salix exigua</i> / <i>Salix melanopsis</i>	dusky willow	40	40	60	30
	SAEX	<i>Salix exigua</i>	narrow leaf willow	56	80	220	260
	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow	0	1	0	0
Total Greenline Length (m)				108		104	

Table E-6. Tree Densities within the Comparison Stream Study Site Riparian Communities.

South Fork Long Canyon Creek											
SFLC4.2	Total Density ¹					Species ²		Species Density ¹			
	Median	Mean	Min	Max	Total #		Total#	Median	Mean	Min	Max
	0	2.7	0	75	372	ABCO	22	0	0.8	0	10
						ALRH2	334	3	12.4	0	75
						CADE27	14	0	0.5	0	4
						QUKE	1	0	0.0	0	1
					QUCH2	1	0	0.0	0	1	
Duncan Creek											
D9.0	Total Density ¹					Species		Species Density ¹			
	Median	Mean	Min	Max	Total #		Total#	Median	Mean	Min	Max
	0	0.2	0	4	29	ABCO	10	0	0.2	0	2
						CADE27	2	0	0.1	0	1
						PIPO	4	0	0.3	0	2
						POBAT	7	0	0.2	0	4
					PSME	6	0	0.2	0	1	
North Fork of the Middle Fork American River											
NFMF2.3	Total Density ¹					Species		Species Density ¹			
	Median	Mean	Min	Max	Total #		Total#	Median	Mean	Min	Max
	0	0.5	0	5	40	ALRH2	38	1.5	1.4	0	5
						POFR2	1	0	0.1	0	1
QUCH2						1	0	0.1	0	1	
North Fork American River											
NF53.7	Total Density ¹					Species		Species Density ¹			
	Median	Mean	Min	Max	Total #		Total#	Median	Mean	Min	Max
	0.3	1.1	0	11	55	ALRH2	54	0.5	2.1	0	11
						ACMA3	1	0	0	0	1
NF31.3	Total Density ¹					Species		Species Density ¹			
	Median	Mean	Min	Max	Total #		Total#	Median	Mean	Min	Max
	0	0.2	0	6	45	ALRH2	22	0	0.5	0	5
						FRLA	4	0	0.1	0	3
						POFR2	15	0	0.3	0	6
					ROPS	4	0	0.1	0	2	

¹Total density per 108 square feet (10 square meters). Descriptive statistics are based on data collected in 5x2 meter plots.

² Species Present:

Scientific Name	Common Name	Species Code
Abies concolor	white fir	ABCO
Acer macrophyllum	big leaf maple	ACMA3
Alnus rhombifolia	white alder	ALRH2
Calocedrus decurrens	incense cedar	CADE27
Fraxinus latifolia	Oregon ash	FRLA
Quercus kelloggii	California black oak	QUKE
Quercus chrysolepis	canyon live oak	QUCH2
Pinus ponderosa	ponderosa pine	PIPO
Populus balsamifera ssp. trichocarpa	black cottonwood	POBAT
Populus fremontii ssp. Fremontii	Fremont cottonwood	POFR2
Pseudotsuga menziesii var. menziesii	Douglas fir	PSME
Robinia pseudoacacia	black locust	ROPS

Table E-7. Riparian Tree and Canopy Cover at the Comparison Stream Study Sites.

Study Site	% Total Canopy Cover			% Ground Layer			% Shrub Layer			% Tree Layer		
	Median	Mean	Range	Median	Mean	Range	Median	Mean	Range	Median	Mean	Range
South Fork Long Canyon Creek												
SFLC4.2	1 x 1 m Plots											
	100	96	95	20	32	95	0	7	95	100	98	20
	5 x 2 m Plots											
							0	9	70	100	96	34
Duncan Creek												
D9.0	1 x 1 m Plots											
	80	75	85	10	31	100	25	36	100	55	60	88
	5 x 2 m Plots											
							40	47	95	50	56	82
North Fork of the Middle Fork American River												
NFMF2.3	1 x 1 m Plots											
	98	85	95	20	32	100	38	44	100	93	77	95
	5 x 2 m Plots											
							68	61	100	85	78	100
North Fork American River												
NF53.7	1 x 1 m Plots											
	30	44	100	5	30	100	5	29	100	0	26	95
	5 x 2 m Plots											
							33	41	99	5	29	90
NF31.3	1 x 1 m Plots											
	50	52	100	5	24	100	35	41	100	12	24	98
	5 x 2 m Plots											
							45	53	100	11	25	90

Table E-8. Decadence within Riparian Zone along the Comparison Streams.

Study Site	% Decadence of Tree Layer ¹				% Decadence of Shrub Canopy			
	Median	Mean	Min	Max	Median	Mean	Min	Max
SFLC4.2	1	4	0	20	0	2	0	60
D9.0	10	10	0	30	5	11	0	90
NFMF2.3	5	9	0	40	20	24	0	75
NF53.7	0	2	0	10	0	3	0	20
NF31.3	0	2	0	15	5	12	0	100

Study Site	Species	Scientific Name	Common Name	Species % Decadence ²					
				Mode	Median	Mean	Min	Max	No. Individuals
South Fork Long Canyon Creek									
SFLC4.2	Tree Species								
	ABCO	<i>Abies concolor</i>	white fir	0	1	2	0	15	39
	ALRH2	<i>Alnus rhombifolia</i>	white alder	0	0	1	0	5	393 ³
	CADE27	<i>Calocedrus decurrens</i>	incense cedar	0	0	0	0	3	45
	QUKE	<i>Quercus kelloggii</i>	California black oak	-	-	-	0	0	1
	QUCH2	<i>Quercus chrysolepis</i>	canyon live oak	-	-	-	0	0	1
	Shrub Species								
	CONU4	<i>Cornus nuttallii</i>	mountain dogwood	-	25	25	1	50	9
	RIAM	<i>Ribes amarum</i>	bitter gooseberry	5	5	5	5	5	3
	RINE	<i>Ribes nevadense</i>	Sierra currant	10	10	12	2	40	13
	SALU	<i>Salix lucida</i>	shining willow	-	-	-	1	1	1
SYMO	<i>Symphoricarpos mollis</i>	creeping snowberry	25	9	12	1	25	24	
Duncan Creek									
D9.0	Tree Species								
	ABCO	<i>Abies concolor</i>	white fir	1	34	0	0	100	10
	CADE27	<i>Calocedrus decurrens</i>	incense cedar	-	-	-	30	30	2
	PIPO	<i>Pinus ponderosa</i>	ponderosa pine	0	0	0	0	0	4
	POBAT	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood	0	3	4	0	10	7
	PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir	0	20	24	0	70	6
	Shrub Species								
	ALINT	<i>Alnus incana</i> ssp. <i>tenuifolia</i>	mountain alder	0	10	15	0	50	37
	AMPU5	<i>Amelanchier pumila</i>	dwarf serviceberry	-	-	-	50	50	1
	CHSE	<i>Chamaesyce serpyllifolia</i> ssp. <i>serpyllifolia</i>	thyme-leaved sandmat	-	-	-	0	5	2
	COSE16	<i>Cornus sericea</i> ssp. <i>sericea</i>	redosier dogwood, American dogwood	0	0	1	0	5	55
	EPCA3	<i>Epilobium canum</i> ssp. <i>latifolium</i>	California fuchsia	-	-	-	0	0	2
	LEDA	<i>Leucothoe davisiae</i>	Sierra laurel	0	0	0	0	0	11
	SAJE	<i>Salix jepsonii</i>	Jepson's willow	0	1	11	0	40	11
	SALU	<i>Salix lucida</i>	shining willow	1	1	1	1	1	4
	SYMO	<i>Symphoricarpos mollis</i>	creeping snowberry	-	-	-	50	50	1

Table E-8. Decadence within Riparian Zone along the Comparison Streams (continued).

Study Site	Species	Scientific Name	Common Name	Species % Decadence ²					
				Mode	Median	Mean	Min	Max	No. Individuals
North Fork of the Middle Fork American River									
NFMF2.3	Tree Species								
	ALRH2	<i>Alnus rhombifolia</i>	white alder	5	5	14	0	100	38
	POFR2	<i>Populus fremontii</i> ssp. <i>Fremontii</i>	Fremont cottonwood	-	-	-	0	0	2
	Shrub Species								
	ARDO3	<i>Artemisia douglasiana</i>	Douglas' sagewort (mugwort)	-	-	-	50	50	1
	BRCA3	<i>Brickellia californica</i>	brickellbush	0	7.5	23	0	75	7
	EPCA3	<i>Epilobium canum</i> ssp. <i>latifolium</i>	California fuchsia	15	15	10	0	15	3
	MIPU3	<i>Diplacus puniceus</i> (= <i>Mimulus puniceus</i>)	red bush monkeyflower	-	-	-	50	50	1
	PHLE4	<i>Philadelphus lewisii</i>	wild mock orange	0	5	17	0	50	6
	RHTO	<i>Frangula tomentella</i> (= <i>Rhamnus tomentella</i> ssp. <i>tomentella</i>)	mountain coffeeberry	5	5	24	0	70	8
	RULE	<i>Rubus leucodermis</i>	whitebark raspberry	30	30	30	0	60	5
	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow	10	10	21	0	100	44
	SAME2	<i>Salix exigua</i> / <i>Salix melanopsis</i>	dusky willow	5	5	4	0	5	32
	SAOF4	<i>Saponaria officinalis</i>	bouncing bet	-	-	-	0	0	1
	TODI	<i>Toxicodendron diversilobum</i>	poison oak	-	-	-	0	0	1
	VICA5	<i>Vitis californica</i>	California wild grape	10	15	27	0	90	8
North Fork American River									
NF53.7	Tree Species								
	ACMA3	<i>Acer macrophyllum</i>	big leaf maple	-	-	-	0	0	1
	ALRH2	<i>Alnus rhombifolia</i>	white alder	0	5	5	0	20	52
	Shrub Species								
	BRCA3	<i>Brickellia californica</i>	brickellbush	0	0	0	0	0	14
	RHTO	<i>Frangula tomentella</i> (= <i>Rhamnus tomentella</i> ssp. <i>tomentella</i>)	mountain coffeeberry	-	-	-	0	20	2
	RUDI2	<i>Rubus armeniacus</i> (= <i>Rubus discolor</i>)	Himalayan blackberry	0	0	3	0	20	48
	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow	0	0	1	0	5	20
	SAME2	<i>Salix exigua</i> / <i>Salix melanopsis</i>	dusky willow	0	0	5	0	0	98
	VICA5	<i>Vitis californica</i>	California wild grape	0	0	0	0	0	3
NF31.3	Tree Species								
	ALRH2	<i>Alnus rhombifolia</i>	white alder	0	0	2	0	5	19
	FRLA	<i>Fraxinus latifolia</i>	Oregon ash	0	10	10	10	10	4
	POFR2	<i>Populus fremontii</i> ssp. <i>Fremontii</i>	Fremont cottonwood	0	3	3	0	5	13
	ROPS	<i>Robinia pseudoacacia</i>	black locust	-	-	-	2	2	2
	Shrub Species								
	BRCA3	<i>Brickellia californica</i>	brickellbush	15	15	15	15	15	22
	CEOC2	<i>Cephalanthus occidentalis</i> var. <i>californicus</i>	California button willow	0	0	0	0	0	22
	RUD12	<i>Rubus armeniacus</i> (= <i>Rubus discolor</i>)	Himalayan blackberry	5	5	15	0	95	31
	SAEX	<i>Salix exigua</i>	narrow leaf willow	5	5	8	0	50	134
	SALA3	<i>Salix laevigata</i>	red willow	5	5	5	5	5	3
	SALA6	<i>Salix lasiolepis</i> /spp.	arroyo willow	10	10	10	10	10	4
	SAME2	<i>Salix exigua</i> / <i>Salix melanopsis</i>	dusky willow	0	5	7	0	50	1696 ³
	SAME2xSALA6	SAME2xSALA6	willow	0	5	5	0	10	8
	VICA5	<i>Vitis californica</i>	California wild grape	0	3	5	0	15	13

¹Percent decadence for the canopy layer overhanging the 5x2 meter plots.²Percent decadence of tree or shrub individuals.³The majority of the individuals is seedlings.

Table E-9. Summary of Riparian Corridor Surveys on the North Fork Long Canyon Creek and South Fork Long Canyon Creek Upstream and Downstream from the Diversions.

Plant Community Classification ¹	Dominant Species (>25% cover) [Age Classes Present ^{2,3}]	Subdominant Species	Dominant Substrate	Start Distance from Diversion (ft)	End Distance from Diversion (ft)	Notes
North Fork Long Canyon Creek - Upstream from Diversion						
Douglas fir-Incense cedar-White alder Plant Association	PSME (80%) [S,Y,O], CADE27 (50%) [S,Y,O]	POPH, BOMA3, ASORC, LOOB2, MILE2, EPCI, MICA3, GAFR, DRAR3, RUAC3, DAPE, STAJ, GITR2	Boulder, cobble	0	138	Started just above dam. Lots of upland species on boulder/gravel bar. Little to no vegetation in channel.
Shining Willow/ Common horsetail Plant Association	SALU (50%) [M], SALA6 (50%) [S,M]	CADE27 (5%), LOOB2, BOMA3, RUAC3, CAAM10	Boulder, cobble	138	174	No interstitial vegetation.
Douglas fir-Incense cedar-White alder Plant Association	PSME (90%) [S,Y,M,O], CADE27 (25%) [S,Y]	ACMA3 (20%), DIFO, CALE9, EPCI, MILE2, MICA3, POPH	Boulder, gravel	174	259	
Douglas fir-Incense cedar-White alder Plant Association	CONU4 (90%) [S,Y], PSME (70%) [S,Y,O], ABCO (50%) [Y,O], CADE (25%) [S,Y]	CALE9, LOOB2, MIMO3, SETR, EPCI, BOMA3,CAAM10, STAJ, MICA3, CILA2	Boulder, cobble	259	397	30-50% cover by DAPE within channel.
Douglas fir-Incense cedar-White alder Plant Association	PSME (90%) [Y,M,O], CADE27 (40%) [S,O], ACMA3 (25%) [Y,M]	DAPE, BOMA3, MICA3, LOOB2, EPCI, LAJE, MIMO3, STAJ, ATFI	Boulder, gravel	397	574	DAPE cover up to 50% cover within channel.
White alder/Indian rhubarb Plant Association	DAPE (90%) [N/A], PSME (60%) [Y,O], CADE27 (45%) [Y,M]	ATFI, RUPA, BOMA3, SETR, HEBI, LOOB2, POPH, STAJ, POGL9, CILA2, MILE2, SMRA, RINE, ROCU	Boulder, gravel	574	922	DAPE cover within channel ranges from 50-90%.
Redosier dogwood/Arrowleaf groundsel Plant Association	COSE16 (70%) [N/A], DAPE (50%) [N/A], PSME (45%) [Y,O]	LOOB2, BOMA3, AGUR, MIMO3, RINE, POPH, EPCI, CILA2, LAJE, EPAN2	Boulder, cobble	922	1027	DAPE cover within channel: 25%.
Douglas fir-Incense cedar-White alder Plant Association	PSME (50%) [O], CADE27 (40%) [O], PILA (40%) [O]	DAPE, EPCI, BOMA3, MIGU, RUPA, Moss	Gravel, silt	1027	1152	Vertical cut bank at 1027 ft. Eroded bank. LWD on right bank. DAPE 25% cover within channel.
White alder/Indian rhubarb Plant Association	DAPE (85%) [N/A], CADE27 (40%) [Y,S,M,O]	BOMA3, LAJE, CILA2, EPCI, EPAN2, AQFO, CAAM10	Boulder, cobble	1152	1224	70% cover instream by DAPE.
Douglas fir-Incense cedar-White alder Plant Association	PSME (80%) [Y,M,O], CADE27 (30%) [M,O]	SALA6, ELTR7, BOMA3, EPCI, LOOB2, RUPA	Sand, boulder	1224	1299	Steep cut bank (left bank).
Douglas fir-Incense cedar-White alder Plant Association	CADE27 (40%) [Y,M,O]	ACMA3 (10%), Moss, LAJE, EPCI, EQAR, MICA3, MIMO3, SETR, RUPA, JUPHP	Boulder, cobble	1299	1394	DAPE about 50-60% cover within channel.
Douglas fir-Incense cedar-White alder Plant Association	PSME (45%) [Y,O], DAPE (25%) [N/A], CADE27 (25%) [Y,O]	ACMA3 (10%), MICA3, EPCI, LAJE, COSE16, POPH	Boulder, cobble	1394	1667	Low water depth near top. DAPE cover is <50% in channel.
White alder/Indian rhubarb Plant Association	DAPE (90%) [N/A], PSME (65%) [S,Y,M,O], CADE27 (30%) [S,Y,M,O], ABCO (25%) [O]	PTAQP2, SYMO, BOMA3, LAJE, ATFI, POGL9, RUPA, CALE9, CILA2, RINE, SALA3, SETR, EPCI, AGUR, MIMO3, EPAN2, COCA5, GADI2, MILE2,PHHAC,ERLA6, AGEX, MICA3, SALU'	Boulder, cobble	1667	2316	DAPE cover in channel is 60%. SALU patch from 2231 - 2316 ft.
White alder/Indian rhubarb Plant Association	CADE27 (70%) [S,Y,M,O], DAPE (60%) [N/A], ABCO (30%) [O]	PIPO (5%), PSME (15%), EPCI, STAJ, ATFI, MILE2	Boulder, cobble	2316	2631	Large woody debris at 2500 - 2598 ft. Seep/tributary at 2539 ft.
Shining Willow/ Common horsetail Plant Association	SALU (30%) [M,S]		Boulder, cobble	2631	2740	Big large woody debris pieces 4 ft high.

Table E-9. Summary of Riparian Corridor Surveys on the North Fork Long Canyon Creek and South Fork Long Canyon Creek Upstream and Downstream from the Diversions (continued).

Plant Community Classification ¹	Dominant Species (>25% cover) [Age Classes Present ²]	Subdominant Species	Dominant Substrate	Start Distance from Diversion (ft)	End Distance from Diversion (ft)	Notes
North Fork Long Canyon Creek - Downstream from Diversion						
Douglas fir-Incense cedar-White alder Plant Association	PSME (60%) [M, O]	CADE27 (<5%), PIPO (<5%), BOMA3, LOOB2, RUPA, DAPE, MICA3, AGEX, SETR, CALE9, LANEN, MILE2, EPCI, MIGU, STAJ, RINE, POPH	Boulder, cobble	0	69	PSME overhanging riparian zone.
White alder/Indian rhubarb Plant Association	DAPE (90%) [N/A], PSME (50%) [S, Y, M, O]	CADE27 (5%), EPAN2, BOMA3, VIAMA3, SETR, LOOB2, ELTR7, MIGU, POGL9	Boulder, sand, cobble	69	184	Downed log at 69 ft. Interstitial sand/gravel above water's edge. One willow. One CADE27/PSME on forest edge overhang.
Douglas fir-Incense cedar-White alder Plant Association	PSME (25%) [O]	CADE27 (5%), BOMA3, EPCI, MICA3, ELTR7, LAJE, DAPE	Boulder, cobble, fines	184	299	Right bank had no riparian trees--conifers overhanging and rooted in bank. Widely vegetated (DAPE). Right bank was steep/erodible. Dammed log at 219 ft., exposed roots under outer bank, eroded at 226 ft.
White alder/Indian rhubarb Plant Association	DAPE (90%) [N/A], PSME (60%) [Y, O]	PILA (20%), ABCO (15%), BOMA3, EPCI, MIGU, MICA3, SETR, ELTR7, DRAR3, ATFI, HEBI	Boulder, cobble	299	446	Right bank bar ends at 364 ft. Interstitial sands.
White alder/Indian rhubarb Plant Association	CADE27 (75%) [Y, O], DAPE (75%) [N/A]	PSME (<5%), BOMA3, EPCI, MICA3, ATFI, CALE9, PLDIL, PHHAC, MILE2, GATR3, AQFO, ARGL, POGL9, COSE16, CEORC2, POPH, STAJ, PTAQP2, ADBI, CEIN3	Boulder, cobble.	446	659	Root wad and sand bar at 479 ft. One SALU clump, sickly (30 stems). 2 clumps total. Interstitial sands.
Douglas fir-Incense cedar-White alder Plant Association	PSME (30%) [S, M, O]	CADE27 (15%), ABCO (15%), DAPE, BOMA3, MIGU, CALE9, EPCI, LAJE, GATR3, STAJ, ROCU	Boulder, cobble	659	817	Fallen conifer, eroded bank at 659 ft. Lots of interstitial fines at 741 ft.
White alder/Indian rhubarb Plant Association	CADE27 (85%) [S, Y, M, O], ACMA3 (75%) [Y], DAPE (85%) [N/A]	PTAQP2, EPCI, MICA3, LOOB2, MIGU, BOMA3, JUPHP, POGL9, GNPA, EPCA3, ATFI, MAGR3	Boulder, cobble	817	906	Evidence of recent grazing.
Douglas fir-Incense cedar-White alder Plant Association	CADE27 (90%) [Y, S, M, O], PSME (60%) [Y, M, O]	AGUR, BOMA3, SETR, ELTR7, MICA3, MIMO3, STAJ, DAPE, EQAR, GADI2, GNPA, AQFO, AGEX, EPAN2, POPH, CIVU, CILA2, SAME2, LOOB2, ASOCY, MEIN2, CHBO2.	Boulder, cobble	906	1056	Willow at 994 ft. Interstitial sand and gravel on banks. Mid channel bar with CADE27 at 1060 ft. Evidence of recent grazing.
White Alder/ Narrowleaf Willow Plant Association	SALU (25%) [S, M], SAME2 (25%) [S, M], PSME (50%) [S, Y, M, O], CADE27 (60%) [S, Y, M]	DAPE, LOOB2, EPCI, CONU4, CEIN3, CILA2, MIGU, MICA3, POGL9, EQLA, CHBO2	Boulder, cobble	1056	1175	
Douglas fir-Incense cedar-White alder Plant Association	PSME (60%) [O]	EPCI, MICA3, DAPE, BOMA3, CALE9, RUPA	Cobble, bedrock	1175	1227	Alders started at 1224 ft. downstream from diversion.
Douglas fir-Incense cedar-White alder Plant Association	ALRH2 (80%) [S, Y, M, O]	PSME (20%), CADE27 (15%), DRAR3, BOMA3, DAPE, TAOF, MICA3, EPCI, AGUR, EPAN2, ELTR7, AGEX, ATFI, LOCO6, GAFF, SANIC6, PRVU, CHBO2, POPH, MIMO3, CONU4, MILE2, DIFO, ERLA6, PHHAC, RUAC3	Boulder, cobble	1227	1519	Evidence of recent grazing. Seep at 1289 ft. Fines on bank. Left bank lowered over flow channel/bar. Log jam at 1430 ft. Gravel bar with upland species at 1449 ft.
White alder/Indian rhubarb Plant Association	ALRH2 (85%) [S, Y, M, O], SALU (25%) [M]	PSME (15%), CADE27 (20%), DRAR3, PTAQP2, EPCI, DAPE, SETR	Boulder, cobble	1519	1631	Willow fallen over pool. Seep: 1562 ft.
Douglas fir-Incense cedar-White alder Plant Association	PSME (25%) [M, O]	DAPE, MICA3, EPCI, MIGU, RUPA	Boulder, cobble, silt	1631	1729	PSME overhanging.
White alder/Sedge Plant Association	ALRH2 (90%) [S, Y, M, O]	AQFO, CILA2, SETR, MICA3, COSE16, ATFI, GATR3, CALE9, AGEX, SCCA3	Boulder, cobble	1729	1890	
Douglas fir-Incense cedar-White alder Plant Association	ALRH2 (95%) [S, Y, M, O]	PSME (10%), SALU (5%), CADE27 (10%), EPCI, MIGU, MICA3, CALE9, DAPE, PTAQP2, LAJE, JUPHP, BOMA3, EPCI, CILA2, DRAR3	Boulder, cobble, interstitial gravel	1890	2159	Continued evidences of recent grazing. Lots of new alder germinants in left bank cobble bar--no seedlings yet.
Shining Willow/ Common horsetail Plant Association	SALU (25%) [Y]	DAPE	Boulder, cobble	2159	2192	

Table E-9. Summary of Riparian Corridor Surveys on the North Fork Long Canyon Creek and South Fork Long Canyon Creek Upstream and Downstream from the Diversions (continued).

Plant Community Classification ¹	Dominant Species (>25% cover) [Age Classes Present ²]	Subdominant Species	Dominant Substrate	Start Distance from Diversion (ft)	End Distance from Diversion (ft)	Notes
North Fork Long Canyon Creek - Downstream from Diversion (continued)						
Douglas fir-Incense cedar-White alder Plant Association	ALRH2 (100%) [S,Y,M,O]	PSME (15%), CADE27 (5%), CALE9, ATFI, AQFO, BOMA3, AGUR, LOOB2, GATR3, SETR, MICA3, DAPE, ELTR7	Cobble, boulder	2192	2533	
White alder/Indian rhubarb Plant Association	ALRH2 (100%) [S,Y,M,O]	SALU (5%), MICA3, ARCA2, STAJ, CILA2, DAPE, POPH, BOMA3, SETR, COSE16, ATFI, EPCI, CHBO2, MILE2, MIMO3, MILE2, CAAM10,	Bedrock, cobble	2533	3041	Split channel at 2772 ft. At 2034 ft., right bank turns to a bedrock different left bank becomes a wide 20-ft boulder/cobble bar with 8-12" ALRH2. Evidence of recent grazing. Mid-channel cobble bar, debris jams, stagnant water.
South Fork Long Canyon Creek - Upstream from Diversion						
Ponderosa pine-White alder Plant Association	QUKE (> 25%) [Y,M], QUCH2 (> 25%) [Y,M], ALRH2 (> 25%) [S,M,O], PIJE (> 25%) [Y]	SALU, CHBO2, ARPA, CALE9, AGUR, ARDO3, ARPA6, GNPA, GAER2, ROCU2, JUPHP, HYPE, EPCI, MICA3, RINE, EQAR, MIGU	Bedrock, cobble, sand	0	249	Adjacent to diversion pool. HYPE and VETH upstream 70 ft. upstream from dam. High level of alder decadence. 15 ALRH2 seedlings.
White alder/Narrowleaf willow Plant Association	ALRH2 (90%) [Y,M], SALU (80%) [Y,M]	PSME (15%), ARDO3, CHBO2, POPH, GNPA, MICA3, RUCR, ERLA6, EPCI, LOOB2, MIMO3	Cobble, gravel	249	367	Cobble bank
Shining Willow/ Common horsetail Plant Association		SALU, EPCI, JUPHP, MIGU, AMPU5, CILA2	Bedrock	367	489	
White alder/Narrowleaf willow Plant Association	ALRH2 (99%) [S,Y,M]	POBAT (10%), SALU (10%), DAPE, CILA2, MICA3, MIGU, EQAR, EPCA3, PRVU, LOOB2, LAJE, ARDO3, BOMA3	Cobble, gravel, fines	489	584	Open-bedrock above and across-cobble bar/bank with drift and some ponding.
Douglas fir-Incense cedar-White alder Plant Association	ALRH2 (85%) [S,Y,M,O], PSME (30%) [O]	CADE27 (20%), ABCO (20%), PILA 5%, ARDO3, CILA2, LOOB2, DAPE, ELTR7, CALE9, JUPHP, SALA3, PRVU	Cobble, gravel	584	781	BOMA3,MIGU,CIALP2. Upland species in litter/fines.
White alder/Indian rhubarb Plant Association	ALRH2 (35%) [S,Y,M], DAPE (25%) [N/A]	PSME (20%), CADE27 (5%), LOOB2, GATR3, CALE9, JUPHP, MICA3, MIGU, ARDO3, RICE Seedlings	Bedrock, cobble	781	853	ALRH2 seedlings.
Douglas fir-Incense cedar-White alder Plant Association	PSME (50%) [O], ALRH2 (45%) [S,Y,M]	FRVI, RUAC3, EPCI, GATR3, CADE27, CILA2, PRVU, EQAR, MIGU, KEBR, ADBI, BOMA3	Cobble, fines	853	965	Conifer overstory
White alder/Narrowleaf willow Plant Association	ALRH2 (95%) [S,Y,M], SALU (60%) [S,Y,M]	SALA6 (5%), BOMA3, JUPHP, CILA2, LOOB2, MIGU, DAPE, EPCI, LAJE, MICA3, PTAQP2, VIGL, GATR3, ARDO3, RICE, ELTR7, ARDO3, DRAR3, VETH	Cobble, boulder	965	1365	Open area, mature conifers close to channel are dead. Riparian vegetation near the channel is young and dense, not very tall. Wide cobble channel with a cobble terrace with more mature ALRH2 and SALU. Channel changes to bedrock at 1217 ft. VETH at 1349 ft. Evidence of recent grazing.
White alder/Indian rhubarb Plant Association	ALRH2 (90%) [S,Y,M]	CADE27 (10%), PIJE (10%), JUPHP, RUPA, DAPE, RICE, ARDO3, AQFO, LOOB2, POPH, LAJE, MIGU, PTAQP2, MIMO3, EPCI, CIAL2, ABCO, PSME, MICA3, GNPA, CHBO2	Cobble	1365	1565	
Black cottonwood Plant Association	ALRH2 (> 25%) [S,Y,M,O], CADE27 (> 25%) [S,Y], POBAT (> 25%) [S,M,O]	COSE16, VEAM2, CALE9, GATR3, CIAL2, MIGU, BOMA3, CILA2, PRVU, QUCH2, LOOB2, VIGL, ABCO seedlings, QUKE, DRAR3, EQAR, RICE	Cobble	1565	2001	CADE27 seedlings and young mixed with mature ALRH2 (about 10). CADE27 seedlings on bar (about 20). CIVU at 1955 ft. VETH at 2067 ft.. Channel branches at 1999 ft. Left branch is at higher elevation than the right branch, with stagnant water. Evidence of recent grazing and recreation within riparian corridor.
Douglas fir-Incense cedar-White alder Plant Association	ALRH2 (80%) [Y, M]	PIJE (20%), RUCR, HAN2, ERLA6, SETR, MIGU, CIVU, VETH	Cobble	2001	2244	Left branch of split channel. Water goes subsurface at end of section. Channel very constricted at 2150 ft. CIVU at 2150-2203 ft.

Table E-9. Summary of Riparian Corridor Surveys on the North Fork Long Canyon Creek and South Fork Long Canyon Creek Upstream and Downstream from the Diversions (continued).

Plant Community Classification ¹	Dominant Species (>25% cover) [Age Classes Present ²]	Subdominant Species	Dominant Substrate	Start Distance from Diversion (ft)	End Distance from Diversion (ft)	Notes
South Fork Long Canyon Creek - Upstream from Diversion (continued)						
Black cottonwood Plant Association	POBAT (> 25%) [Y,O], ALRH2 (> 25%) [Y,M,O], CADE27 (> 25%) [Y], PIJE (> 25%) [O]	MICA3, MIGU, AQFO, ARDO3, RUCR, PRVU	Cobble	2001	2264	Right branch of split channel. Downed logs.
Incense cedar-White alder Plant Association	CADE27 (25%) [S,Y,M]	ARDO3, CIVU, RICE, EPCA3, CECO, EPCI, RUAC3, POPH	Cobble	2264	2352	Multiple channels with no obvious active channel. Flow is subsurface. Surveyed channel with lowest elevation. Channel vegetated with varied aged ALRH2.
White alder/Narrowleaf willow Plant Association	ALRH2 (50%) [S,Y]	Salix sp. (15%), PIJE (5%), CADE27, AQFO, EPCA3, VETH, EPCI, ABCO, LAJE, CHBO2, PHHAC, POPH, FRVI, ARDO3, SALA6, RULE, PHHAC, MIGU, MICA3, STME2	Cobble	2352	2694	VETH continues from below split at a low density. SALIX has beetle damage.
South Fork Long Canyon Creek - Downstream from Diversion						
White Alder-Red Willow Plant Association	ALRH2 (80%) [S,Y,M,O], SALA3 (25%) [S,Y,M], LOOB2 (25%) [N/A]	ARDO3, PRVU, EQAR, MIGU, MICA3	Boulder, cobble, bedrock	0	125	
White alder/Indian rhubarb Plant Association	ALRH2 (80%) [S,Y,M], DAPE (70%) [N/A], PSME (35%) [O]	CADE27 (5%), CIVU, EPCI, ARDO3, ELTR7, EQAR, LOOB2, MICA3, PTAQP2, BOMA3, MIGU, KEBR, MILE2, MYLA, MIPR, CALE9, DRAR3	Bedrock, sand, gravel, cobble	125	561	PSME overhang, ALRH2 seedlings on cobble-sand bar.
Shining Willow/ Common horsetail Plant Association	SALU (30%) [O], ALRH2 (30%) [S,Y]	PSME (5%), QUCH2 (5%), DAPE, ARDO3, SYMO, AMPU5, JUPHP, LAJE, QUCH2, EQAR, PIJE, MICA3	Bedrock	561	830	QUKE overhang - from high up on the bedrock.
White alder/Indian rhubarb Plant Association	ALRH2 (90%) [Y,M], DAPE (90%) [N/A]	SALU (15%), QUCH2 (5%), POBAT (10%), CADE27 (5%)	Cobble, litter	830	997	ALRH2 seedlings on gravel bar.
White alder/Indian rhubarb Plant Association	ALRH2 (80%) [S,Y,M,O], DAPE (40%) [N/A], PSME (30%) [O]	CADE27 (15%),POBAT (10%), CAAM10, LAJE, MICA3, JUPHP, MIGU, BOMA3, CILA2, COSE16, SALA6, CANU5, DRAR3, AQFO, STME2, JUEFP, SALA3	Cobble, gravel, litter	997	1634	ALRH2 seedlings in bedrock (2-3). ALRH2 seedlings on gravel bar (200+). PILA log across creek at 1047 ft; log jam at 1263 ft. Evidence of recent grazing. CIVU,VETH at 1263-1391 ft. Also present: LASE, ROCU2, RUAC3, VIGL,PRVU,LOOB2
White Alder/ Narrowleaf Willow Plant Association	SAEX (> 25%) [Y,M,O], ALRH2 (> 25%) [S,Y], SALA3 (> 25%) [M,O], PIJE (> 25%) [O]	PIPO (O), SALU (M,O), CADE27, LOOB2, ARDO3, VETH, CAAM10, JUPHP, GNPA, CILA2, MICA3, CALE9, JUBU, MIGU, DAPE	Fines, litter	1634	1949	VETH at 1709 ft. CIVU 1 at 1879 ft. Open overstory. Evidence of recent grazing.
Douglas fir-Incense cedar- White alder Plant Association		ABCO (20%), PSME (20%), CADE27 (10%), EPCI, RUPA, MIGU, MICA3, CAAM10, ALRH2 seedling, JUPHP, CILA2, LOOB2, MIMO3, FRVI, ARPA6, MOGL	Fines, litter	1949	2156	VETH, CIVU, HYPE, and RUCR within reach.
Incense cedar-White alder Plant Association	ALRH2 (90%) [S,Y,M], CADE27 (25%) [S]	SALA6 (10%), SALU (10%), VETH, CIVU, MIGU, AGPA8, MICA3, JUPHP, LOOB2, RUAC3, ELTR7, ARDO3, RUPA, FRVI, MIMO3, ARGL, JUEFP, EPCA3, GAER2, CHSES, CHBO2, PIJE, HYPE, PHHAC, ERNU3, AQFO, DAPE, HYAN2, CEIN3	Cobble	2156	2667	ABCO seedlings. CADE27 seedlings on cobble bar ALRH2 seedlings 120+ CIVU at 2112 ft. and 2508 ft. HYPE at 2508 ft. Campsite and litter within reach.
Douglas fir-Incense cedar- White alder Plant Association	PSME (40%) [O], CADE27 (30%) [Y,M], ABCO (25%) [Y,M]	CIVU, LOOB2, MIGU, CHBO2, EPCI, PTAQP2, GADI2, SETR	Fines, cobble, litter	2667	2697	

¹Community Classifications developed using Potter (2005) from ENTRIX field data collect during surveys.

²Age Codes:

(S) Seedlings

(Y) Young: Shrubs with less than 10 stems per individual, or trees with diameters (diameter at breast height (DBH) less than 3 inches).

(M) Medium-Aged: Shrubs with between 10 and 60 stems per individual, trees with DBHs between 3 and 9 inches.

(O) Mature/Old: Shrubs with more than 60 stems per individual, trees with DBHs greater than 9 inches.

Bold indicates dominant size present.

Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name
ATFIC (ATFI)	<i>Athyrium filix-femina</i> var. <i>cyclosorum</i>	lady fern	JUBU	<i>Juncus bufonius</i>	toad rush
ABCO	<i>Abies concolor</i>	white fir	JUEFP	<i>Juncus effusus</i> var. <i>pacificus</i>	common rush
ACMA3	<i>Acer macrophyllum</i>	big leaf maple	JUPHP	<i>Juncus phaeocephalus</i> var. <i>paniculatus</i>	brown headed rush
ADBI	<i>Adenocaulon bicolor</i>	trail plant	KEBR	<i>Keckelia breviflora</i>	gaping beardtongue
AGEX	<i>Agrostis exarata</i>	spike bentgrass	LAJE	<i>Lathyrus jepsonii</i>	tule pea
AGPA8	<i>Agrostis pallens</i>	bent grass	LANEN	<i>Lathyrus nevadensis</i> var. <i>nevadensis</i>	Sierra Nevada pea
AGUR	<i>Agastache urticifolia</i>	horsemint	LOCO6	<i>Lotus corniculatus</i>	bird's foot trefoil
ALRH2	<i>Alnus rhombifolia</i>	white alder	LOOB2	<i>Lotus oblongifolius</i> var. <i>oblongifolius</i>	streambank trefoil
AQFO	<i>Aquilegia formosa</i>	western columbine	MAGR3	<i>Madia gracilis</i>	gumweed madia
ARCA2	<i>Aralia californica</i>	California spikenard (elk clover)	MARAR (SMRA)	<i>Maianthemum racemosum</i> ssp. <i>racemosum</i> (= <i>Smlacina racemosa</i>)	false Solomon's seal
ARGL	<i>Aralis glabra</i>	smooth rock cress	MEIN2	<i>Mellilotus indicus</i>	sourclover
ARPA6	<i>Arctostaphylos patula</i>	Greenleaf manzanita	MICA3	<i>Mimulus cardinalis</i>	crimson monkeyflower
BOMA3	<i>Boykinia major</i>	large boykinia	MIGU	<i>Mimulus guttatus</i>	sheep monkeyflower
CAAM10	<i>Carex amplifolia</i>	big leaf sedge	MILE2	<i>Mimulus lewisii</i>	Lewis's monkeyflower
CADE27	<i>Calocedrus decurrens</i>	incense cedar	MIMO3	<i>Mimulus moschatus</i>	musky monkeyflower
CALE9	<i>Carex leporinella</i>	Sierra hare sedge	MIPR	<i>Mimulus primuloides</i>	primrose monkeyflower
CANU5	<i>Carex nudata</i>	torrent sedge	MYLA	<i>Myosotis laxa</i>	baby forget me not
CEIN3	<i>Ceanothus integerrimus</i>	deerbrush	PHHAC	<i>Phacelia hastata</i> var. <i>compacta</i>	compact phacelia
CEOR9	<i>Cercis occidentalis</i> (= <i>Cercis orbiculata</i>)	California/ western redbud	PIJE	<i>Pinus jeffreyi</i>	Jeffrey pine
CHANA2 (EPAN2)	<i>Chamenon angustifolium</i> (= <i>Epilobium angustifolium</i> ssp. <i>circumvagum</i>)	fireweed	PILA	<i>Pinus lambertiana</i>	sugar pine
CHBO2	<i>Chenopodium botrys</i>	Jerusalem oak	PIPO	<i>Pinus ponderosa</i>	ponderosa pine
CHSE5	<i>Chamaesyce serpyllifolia</i> ssp. <i>serpyllifolia</i>	thyme-leaved sandmat	PLDIL	<i>Platanthera dilatata</i> var. <i>leucostachys</i>	Sierra bog orchid
CILA2	<i>Cinna latifolia</i>	wood reedgrass	POBAT	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood
CIVU	<i>Cirsium vulgare</i>	bull thistle	POGL9	<i>Potentilla glandulosa</i>	gland cinquefoil
COCAS	<i>Coryza canadensis</i>	Canada horseweed	POPH	<i>Polygonum phytolaccifolium</i>	poke knotweed
CONU4	<i>Cornus nuttallii</i>	mountain dogwood	PRVU	<i>Prunella vulgaris</i>	self-heal
COSE16	<i>Cornus sericea</i> ssp. <i>sericea</i>	redosier dogwood, American dogwood	PSME	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir
DAPE	<i>Darmera peltata</i>	Indian rhubarb	PTAQP2	<i>Pteridium aquilinum</i> var. <i>pubescens</i>	bracken fern
DIFO	<i>Dicentra formosa</i>	bleeding heart	QUCH2	<i>Quercus chrysolepis</i>	canyon live oak
DRAR3	<i>Dryopteris arguta</i>	wood fern	QUIKE	<i>Quercus kelloggii</i>	California black oak
ELTR7	<i>Elymus trachycaulus</i>	slender wheatgrass	RICE	<i>Ribes cereum</i>	wax currant
EPCA3	<i>Epilobium canum</i> ssp. <i>latifolium</i>	California fuchsia	RINE	<i>Ribes nevadense</i>	Sierra currant
EPCI	<i>Epilobium ciliatum</i>	hairy willow herb	ROCU	<i>Rorippa curvisiliqua</i>	curvepod yellowcress
ERLA6	<i>Eriophyllum lanatum</i> var. <i>achillaeoides</i>	woolly sunflower	ROCU2	<i>Rorippa curvipes</i>	bluntleaf yellowcress
ERNJ3	<i>Eriogonum nudum</i>	naked buckwheat	RUAC3	<i>Rumex acetosella</i>	sheep sorrel
FRVI	<i>Fragaria virginiana</i>	mountain strawberry	RUPA	<i>Rubus parviflorus</i>	thimbleberry
GADIZ	<i>Gayophytum diffusum</i>	spreading ground smoke	SAEX	<i>Salix exigua</i>	narrow leaf willow
GAER2	<i>Gayophytum eriospermum</i>	Coville's ground smoke	SALA3	<i>Salix laevigata</i>	red willow
GAFR	<i>Garrya fremontii</i>	Fremont's silktassel	SALA6	<i>Salix lasiolepis</i> /ssp.	arroyo willow
GATR3	<i>Galium triflorum</i>	sweet-scented bedstraw	SALU	<i>Salix lucida</i>	shining willow
GITR2	<i>Gilia tricolor</i>	bird's eye gilia	SAME2	<i>Salix exigua</i> / <i>Salix melanopsis</i>	dusky willow
GNPA	<i>Gnaphalium palustre</i>	western marsh cudweed	SANIC6	<i>Sambucus nigra</i> ssp. <i>caerulea</i> (= <i>Sambucus mexicana</i>)	blue elderberry
HEBI	<i>Helenium bigelovii</i>	sneezeweed	SCCA3	<i>Scutellaria californica</i>	California skullcap
HYAN2	<i>Hypericum anagalloides</i>	inker's penny	SEORC2 (ASORC)	<i>Sericarpus oregonensis</i> var. <i>californicus</i> (= <i>Aster oregonensis</i> ssp. <i>californicus</i>)	Oregon flat-topped aster
HYPE	<i>Hypericum perforatum</i>	Klamath weed	SETR	<i>Senecio triangularis</i>	arrowleaf groundsel
			STAJ	<i>Stachys ajugoides</i>	hedge nettle
			STME2	<i>Stellaria media</i>	common chickweed
			SYMO	<i>Symphoricarpos mollis</i>	creeping snowberry
			SYSPS (ASOCY)	<i>Symphoricarpos spathulatum</i> var. <i>yosemitarum</i> (= <i>Aster occidentalis</i>)	mountain aster
			TAOF	<i>Taraxacum officinale</i>	common dandelion
			VETH	<i>Verbascum thapsus</i>	wooly mullein
			VIAMA3	<i>Vicia americana</i> var. <i>americana</i>	American vetch

FIGURES

Figure E-1. Photographs of Riparian Vegetation at the Comparison Stream Study Sites.

Duncan Creek – D9.0



Transect 1, facing upstream.



Alders established along the stream margin on the left bank (Transect 1).



Transect 2, facing upstream.



View towards right bank from upstream on Transect 2 from center of stream channel.



Transect 3, facing downstream.



View towards right bank from left bank, Transect 3.

Figure E-1. Photographs of Riparian Vegetation at the Comparison Stream Study Sites (continued).

South Fork Long Canyon Creek – SFLC4.2



Transect 1, facing downstream.



Transect 1, facing upstream.



Transect 2, facing downstream.



Transect 2, facing upstream.



Transect 3, facing downstream.



Transect 3, right bank facing upstream.

Figure E-1. Photographs of Riparian Vegetation at the Comparison Stream Study Sites (continued).

North Fork of the Middle Fork American River – NFMF2.3



Transect 1, facing upstream.



Transect 1, facing the left bank.



Transect 2, facing upstream.



Transect 2, facing the right bank.



Transect 3, facing upstream.



Transect 3, facing the left bank.

Figure E-1. Photographs of Riparian Vegetation at the Comparison Stream Study Sites (continued).

North Fork American River – NF31.3



Transect 1, facing the left bank, looking upstream.



View of Transect 1 from above.



Transect 2, facing the right bank.



Transect 2, facing the right bank.

Figure E-1. Photographs of Riparian Vegetation at the Comparison Stream Study Sites (continued).

North Fork American River – NF31.3 (continued)



Transect 3, facing the left bank and downstream.



Transect 4, facing the left bank.



Transect 3, facing downstream from above.



Transect 4, from above facing from right bank to left bank.

Figure E-1. Photographs of Riparian Vegetation at the Comparison Stream Study Sites (continued).

North Fork American River – NF53.7



Transect 1, facing downstream.



Transect 1, view of the left bank.



Transect 2, facing downstream.



Transect 2, from mid-channel.



Transect 3, facing downstream.



Transect 3, facing the left bank.

APPENDIX F

Riparian Vegetation at the Peaking Reach Study Sites (Otter Creek – MF14.1 and Buckeye Bar – MF4.8)

Tables

- Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).
- Table F-2. Summary of Riparian Vegetation Composition and Age Class Structure at the Study Sites on the Middle Fork American River.

Figures

- Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8).
- Figure F-2. Changes in Stage with Flow at the Peaking Reach Study Sites (MF14.1 and MF4.8).

Maps

- Map F-1. Vegetation Polygon IDs at Fords Bar (MF14.1).
- Map F-2. Vegetation Polygon IDs at Buckeye Bar (MF4.8).
- Map F-3. Riparian Vegetation Composition at Fords Bar (MF14.1).
- Map F-4. Riparian Vegetation Composition at Buckeye Bar (MF4.8).
- Map F-5. Riparian Vegetation Age Structure at Fords Bar (MF14.1).
- Map F-6. Riparian Vegetation Age Structure at Buckeye Bar (MF4.8).

TABLES

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
MF14.1 - Otter Creek					
1	ROPS, ALRH2	M		0.01	595
2	ALRH2, SALIX	M	VICA5	0.01	346
3	POFR2, ALRH2, SALIX	M		0.00	151
4	HERB	-	VICA5	0.00	23
5	ALRH2	M		0.01	405
6	ALRH2	M	DAPE	0.00	50
7	ALRH2	M	VICA5	0.00	46
8	SALIX	Y		0.00	42
9	POFR2	Y		0.00	35
10	SALIX	Y		0.00	77
11	ALRH2	Y		0.01	260
12	PINUS	M		0.00	76
13	ALRH2	M		0.00	204
14	ALRH2, SALIX	M		0.01	308
15	HERB	-	VICA5	0.00	52
16	ALRH2, SALIX	M		0.01	456
17	ALRH2, SALIX	M		0.01	249
18	HERB	-	VICA5	0.00	27
19	ALRH2, SALIX	M		0.02	917
20	ALRH2, SALIX	M		0.01	302
21	ALRH2, SALIX	M		0.01	283
22	SALIX	M		0.00	56
23	ALRH2	Y		0.00	140
24	ALRH2	M		0.00	53
25	SALIX	S		0.00	54
26	HERB	-	blackberry	0.00	10
27	ALRH2, SALIX	M	blackberry	0.02	827
28	SALIX	S		0.00	75
29	ALRH2	O		0.00	59
30	ALRH2, SALIX	M, O	blackberry	0.04	1,828
31	ALRH2	S		0.00	49
32	ALRH2	S		0.00	13
33	ABIES	M	VICA5 & blackberry	0.00	102
34	ABIES	M	VICA5 & blackberry	0.03	1,179
35	ABIES	M	VICA5 & blackberry	0.00	80
36	SALIX	Y		0.00	39
37	ALRH2, SALIX	M	blackberry	0.20	8,847
38	QUERCUS	M		0.01	330
39	SALIX	Y		0.01	436
40	ALRH2	M, O		0.00	89
41	SALIX	M, O		0.06	2,485
42	ALRH2	S		0.00	9
43	SALIX	S		0.01	323
44	HERB	-	Various grasses and herbs	0.70	30,535
45	SALIX	M		0.01	255
46	ALRH2	M		0.00	137

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
47	ALRH2, SALIX	M	blackberry	0.03	1,284
48	ALRH2	M		0.00	75
49	SALIX	S		0.00	168
50	ALRH2	O		0.02	1,070
51	SALIX	S		0.00	28
52	ALRH2, SALIX	Y		0.00	94
53	ALRH2, SALIX	M	blackberry	0.06	2,437
54	SALIX	M		0.00	112
55	SALIX	Y		0.00	15
56	SALIX	Y		0.00	20
57	SALIX	Y		0.00	18
58	SALIX	Y, M		0.01	280
59	SALIX	S, Y		0.01	248
60	SALIX	Y		0.00	76
61	SALIX	M		0.00	105
62	ALRH2, SALIX	M	blackberry	0.02	1,002
63	ROPS	M		0.00	29
64	ALRH2	M		0.00	205
65	ALRH2	M	VICA5	0.15	6,367
66	SALIX	M		0.00	157
67	SALIX	M		0.00	43
68	SALIX	M		0.00	38
69	SALIX	M		0.00	93
70	SALIX	M		0.01	396
71	SALIX	M		0.00	199
72	SALIX	M		0.01	250
73	SALIX	M		0.00	114
74	SALIX	M		0.00	135
75	SALIX	M		0.00	70
76	SALIX	M		0.00	100
77	SALIX	M		0.00	80
78	SALIX	M		0.00	137
79	SALIX	M		0.00	38
80	SALIX	M		0.00	71
81	SALIX	O		0.01	324
82	SALIX	O		0.00	77
83	SALIX	M		0.00	37
84	SALIX	M		0.00	38
85	SALIX	M		0.00	27
86	SALIX	Y		0.00	46
87	SALIX	Y		0.00	16
88	SALIX	Y		0.00	110
89	SALIX	Y		0.00	90
90	POFR2	O		0.02	675
91	SALIX	Y, M		0.04	1,839
92	SALIX	Y, M		0.02	1,002
93	SALIX	M		0.00	99

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
94	SALIX	Y, M		0.00	169
95	ALRH2, SALIX	Y		0.00	62
96	SALIX	Y		0.00	159
97	ALRH2, SALIX	Y, M		0.00	209
98	SALIX	Y		0.00	13
99	POFR2	M		0.00	127
100	FRLA	M		0.00	24
101	ALRH2, SALIX	Y, M		0.00	167
102	ALRH2	M		0.00	171
103	ALRH2	M		0.00	62
104	ALRH2	M	blackberry	0.00	188
105	SALIX	M		0.00	143
106	CADE27	Y		0.00	20
107	SALIX	Y		0.00	20
108	CADE27	Y		0.00	12
109	HERB	-	VICA5	0.00	68
110	HERB	-	Carex	0.00	199
111	SALIX	S		0.00	25
112	HERB	-	Carex	0.01	434
113	ALRH2, SALIX	Y		0.01	392
114	SALIX	S		0.00	24
115	CADE27	Y		0.00	11
116	ALRH2, SALIX	Y		0.01	535
117	POFR2	Y		0.00	51
118	SALIX	S		0.00	11
119	SALIX	S		0.00	10
120	SALIX	S		0.00	5
121	ALRH2, SALIX	Y	blackberry	0.02	789
122	SALIX	S		0.00	36
123	ALRH2, SALIX	S		0.00	41
124	ALRH2	Y		0.00	26
125	ALRH2, SALIX	S	Carex	0.00	118
126	ALRH2, SALIX	Y		0.00	120
127	ALRH2, SALIX	S, Y		0.00	34
128	SALIX	Y		0.00	12
129	SALIX	S		0.00	18
130	ALRH2	Y		0.00	89
131	PINUS	M		0.00	58
132	CADE27	Y		0.00	33
133	ALRH2	Y		0.00	80
134	SALIX	Y		0.00	15
135	ALRH2	Y		0.00	81
136	FRLA	Y		0.00	31
137	ALRH2, SALIX	S		0.00	159
138	ALRH2	Y		0.00	22
139	SALIX	S		0.00	7
140	SALIX	S		0.00	7

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
141	ALRH2	Y		0.00	80
142	ALRH2	Y		0.00	153
143	SALIX	Y		0.00	13
144	SALIX	Y		0.00	24
145	SALIX	Y		0.00	12
146	FRLA	Y		0.00	24
147	ALRH2	Y		0.00	61
148	SALIX	M		0.00	111
149	SALIX	M		0.00	63
150	ALRH2	M		0.01	395
151	SALIX	M		0.00	45
152	ALRH2	Y	Carex	0.00	78
153	ALRH2	M		0.00	53
154	ALRH2	Y		0.00	12
155	SALIX	Y		0.00	50
156	ALRH2	Y		0.00	18
157	ALRH2	S		0.01	370
158	ALRH2	S		0.00	44
159	SALIX	S		0.00	7
160	ALRH2	Y		0.00	58
161	ALRH2	Y		0.01	490
162	SALIX	S		0.00	36
163	ALRH2, SALIX	Y		0.00	117
164	ALRH2	Y		0.00	91
165	ALRH2	Y		0.00	33
166	ALRH2, SALIX	S, Y		0.00	198
167	ALRH2	Y		0.00	40
168	SALIX	Y		0.00	22
169	SALIX	S		0.00	14
170	ALRH2, SALIX	S, Y		0.00	45
171	ALRH2	Y		0.00	193
172	SALIX	Y		0.00	51
173	HERB	-	blackberry	0.00	27
174	ALRH2	M		0.02	772
175	FRLA, ROPS	Y		0.00	109
176	ALRH2, SALIX	Y		0.02	768
177	ALRH2, SALIX	Y, M		0.00	118
178	ROPS	Y		0.01	401
179	ALRH2, SALIX	Y		0.00	29
180	ROPS, ALRH2	O		0.01	410
181	ALRH2, SALIX	Y		0.01	302
182	ROPS	Y		0.00	51
183	HERB	-	Carex	0.03	1,477
184	ALRH2	M		0.02	911
185	ALRH2	M		0.04	1,870
186	ALRH2	M		0.03	1,420
187	ALRH2	M		0.00	50

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
188	ALRH2	M		0.00	70
189	ALRH2	S, Y		0.00	12
190	ALRH2, SALIX	Y		0.00	99
191	ALRH2	M		0.00	55
192	ALRH2	Y		0.00	142
193	SALIX	M		0.00	75
194	HERB	-	Carex	0.01	403
195	ALRH2	M		0.01	389
196	ALRH2	Y		0.00	42
197	HERB	-	Carex	0.00	72
198	ALRH2	Y, M	DAPE	0.01	615
199	ALRH2	Y		0.00	37
200	ALRH2	Y		0.00	41
201	POFR2, ALRH2, SALIX	Y, M	DAPE	0.02	935
202	HERB	-	DAPE	0.00	160
203	ALRH2, SALIX	Y, M		0.04	1,667
204	ALRH2	Y		0.00	98
205	ALRH2, SALIX	S		0.00	57
206	ALRH2	Y		0.00	86
207	SALIX	Y		0.00	7
208	ALRH2	Y		0.00	129
209	ALRH2, SALIX	S		0.00	57
210	ALRH2	Y		0.00	79
211	SALIX	Y		0.01	355
212	ALRH2	Y		0.00	49
213	FRLA, ALRH2	M		0.03	1,421
214	FRLA, ALRH2	M, O		0.01	412
215	HERB	-	Carex and DAPE	0.01	227
216	ALRH2	Y		0.00	135
217	ALRH2	Y		0.00	148
218	POFR2, ROPS	Y, M		0.11	4,637
219	HERB	-	Carex	0.00	18
220	SALIX	M		0.00	134
221	SALIX	Y, M		0.00	214
222	SALIX	Y, M		0.00	33
223	SALIX	Y, M		0.00	109
224	ROPS	O		0.01	653
225	SALIX	M		0.00	77
226	ROPS	M		0.00	84
227	SALIX	Y, M	grasses and low herbs	0.05	1,975
228	SALIX	M		0.01	286
229	SALIX	Y, M	grasses and low herbs	0.06	2,722
230	SALIX	S		0.00	39
231	SALIX	Y		0.01	297
232	ALRH2, SALIX	M		0.06	2,556
233	SALIX	Y, M	grass	0.01	598
234	SALIX	M		0.00	62

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
235	SALIX	O		0.02	1,046
236	PINUS	M		0.00	49
237	ROPS	O		0.00	196
238	ROPS	O		0.01	324
239	ALRH2, SALIX	Y, M	blackberry	0.03	1,463
240	ALRH2, SALIX	Y		0.04	1,672
241	SALIX	S		0.00	10
242	HERB	-	sedge	0.00	15
243	HERB	-	sedge	0.00	32
244	ALRH2, SALIX	Y		0.01	620
245	SALIX	Y		0.00	74
246	ALRH2, SALIX	Y, M		0.01	504
247	ALRH2	Y, M		0.04	1,773
248	POFR2	O		0.00	178
249	HERB	-	sedge	0.00	95
250	SALIX	Y		0.00	28
251	SALIX	S		0.00	41
252	ALRH2, SALIX	M		0.03	1,161
253	HERB	-	sedge	0.00	183
254	ALRH2, SALIX	M		0.15	6,372
255	Large woody debris	-	Large woody debris	0.00	190
256	POFR2	O		0.01	271
257	ALRH2	M		0.01	222
258	SALIX	M		0.00	151
259	SALIX	M	VICA5	0.00	159
260	ALRH2	M	VICA5	0.06	2,415
261	ALRH2, SALIX	M		0.09	3,773
262	ALRH2	Y		0.01	273
263	ALRH2	Y		0.00	18
264	ALRH2	Y		0.00	33
265	ALRH2, SALIX	Y		0.00	32
266	ALRH2, SALIX	Y		0.00	52
267	ALRH2, SALIX	Y		0.01	376
268	ALRH2, SALIX	S, Y		0.01	230
269	ALRH2	Y		0.00	41
270	ALRH2, SALIX	Y		0.01	458
271	ROPS	M		0.01	298
272	ALRH2	S, Y		0.01	478
273	SALIX	S		0.00	26
274	SALIX	S		0.00	42
275	ROPS, ALRH2	Y		0.01	379
276	ALRH2, SALIX	M		0.01	310
277	ALRH2	Y		0.00	29
278	SALIX	Y		0.00	179
279	SALIX	S		0.00	17
280	ROPS	M		0.00	145
281	ALRH2	M		0.02	683

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
282	ALRH2, SALIX	Y		0.01	354
283	POFR2, ALRH2, SALIX	S		0.00	204
284	ALRH2	O		0.01	317
285	PINUS	M		0.01	427
286	ALRH2, SALIX	M	blackberry	0.11	4,960
287	ALRH2	M		0.01	418
288	SALIX	M		0.00	78
289	ALRH2	S, Y		0.01	405
290	SALIX	M		0.01	333
291	ALRH2, SALIX	M, O		0.01	537
292	ALRH2	S		0.00	32
293	SALIX	M		0.00	201
294	ALRH2	M		0.00	201
295	ALRH2	S	herbs	0.00	12
296	ALRH2	Y		0.00	44
297	SALIX	Y		0.00	90
298	ALRH2	Y		0.03	1,358
299	ALRH2, SALIX	Y, M		0.02	1,053
300	ALRH2, SALIX	Y, M	blackberry	0.03	1,378
301	SALIX	S		0.00	74
302	SALIX	Y		0.00	103
303	SALIX	S		0.00	179
304	SALIX	S		0.00	19
305	SALIX	Y		0.00	68
306	SALIX	S		0.01	544
307	POFR2	O		0.00	34
308	SALIX	S		0.00	114
309	SALIX	Y		0.00	43
310	SALIX	Y		0.00	36
311	SALIX	Y		0.00	21
312	SALIX	Y		0.00	24
313	SALIX	Y		0.00	15
314	SALIX	Y		0.00	47
315	SALIX	Y		0.00	39
316	SALIX	M		0.02	742
317	SALIX	M		0.00	204
318	ALRH2	O		0.01	367
319	SALIX	O		0.02	702
320	ALRH2, SALIX	M		0.02	788
321	ALRH2, SALIX	M, O	blackberry	0.08	3,387
322	ALRH2	S		0.00	42
323	ALRH2	O		0.01	441
324	ALRH2, SALIX	M		0.08	3,509
325	SALIX	M		0.05	2,018
326	SALIX	S, Y		0.01	277
327	ROPS	M		0.04	1,900
328	SALIX	M		0.00	147

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
329	SALIX	M		0.00	128
330	ALRH2	M		0.01	336
331	ALRH2, SALIX	M		0.01	368
332	SALIX	Y		0.00	137
333	ALRH2	M		0.02	754
334	CEOR9	Y		0.00	54
335	SALIX	M		0.02	804
336	SALIX	Y		0.00	7
337	SALIX	Y		0.00	10
338	SALIX	M		0.01	247
339	ROPS	M		0.00	163
340	SALIX	M		0.02	666
341	ALRH2, SALIX	Y, M		0.12	5,101
342	SALIX	Y		0.01	306
343	SALIX	S		0.00	68
344	ALRH2, SALIX	S		0.00	193
345	SALIX	Y		0.00	82
346	SALIX	M		0.04	1,690
347	SALIX	M		0.02	746
348	ALRH2	M		0.02	805
349	HERB	-	herbs, grass, perennials	0.58	25,307
350	HERB	-	Carex	0.00	65
351	SALIX	M		0.00	138
352	SALIX	M		0.01	465
353	ABIES	Y		0.00	92
354	FRLA	O		0.01	233
355	ALRH2, SALIX	M	VICA5	0.08	3,271
356	ALRH2, SALIX	O	VICA5	0.07	3,220
357	CEOR9	Y		0.00	71
358	HERB	-	grass	2.04	88,764
359	FRLA	M		0.01	243
360	ALRH2	M		0.01	278
361	ALRH2	M		0.01	333
362	SALIX	Y		0.00	78
363	SALIX	M		0.00	172
364	SALIX	Y		0.01	322
365	SALIX	M		0.01	541
366	SALIX	M		0.01	545
367	ALRH2, SALIX	Y		0.01	322
368	ALRH2, SALIX	S		0.00	59
369	SALIX	M		0.01	561
370	ALRH2, SALIX	M		0.02	1,044
371	ALRH2, SALIX	S	herbs	0.01	416
372	SALIX	M		0.03	1,247
373	SALIX	M		0.01	298
374	SALIX	S		0.00	62
375	ALRH2	M		0.01	387

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
376	HERB	-	blackberry	0.00	62
377	SALIX	M		0.00	125
378	ALRH2	M		0.00	211
379	ALRH2	M		0.01	236
380	SALIX	S		0.00	17
381	SALIX	Y		0.01	391
382	SALIX	M		0.00	176
383	SALIX	M		0.00	164
384	SALIX	M		0.00	112
385	SALIX	M		0.01	545
386	FRLA	Y		0.00	36
387	SALIX	Y		0.08	3,573
388	SALIX	M		0.01	427
389	SALIX	S		0.00	47
390	SALIX	S		0.01	510
391	SALIX	S		0.00	49
392	ALRH2	Y		0.00	10
393	ALRH2	Y		0.00	18
394	SALIX	Y, M		0.00	54
395	ROPS	M		0.01	245
396	HERB	-	blackberry	0.00	203
397	SALIX	S		0.00	54
398	ALRH2	S		0.00	19
399	ALRH2	Y		0.00	10
400	SALIX	Y		0.00	87
401	ALRH2	M		0.00	181
402	POFR2	Y		0.00	56
403	SALIX	Y		0.00	87
404	SALIX	M, O	VICA5	0.05	2,068
405	ROPS	M		0.00	108
406	SALIX	O		0.02	1,019
407	SALIX	M		0.00	190
408	FRLA	Y		0.00	112
409	SALIX	M, O		0.01	561
410	SALIX	M, O		0.03	1,220
411	ALRH2	M		0.00	130
412	SALIX	M, O	VICA5	0.04	1,648
413	ROPS	M		0.02	958
414	SALIX	M		0.00	182
415	ROPS, SALIX	M, O		0.03	1,364
416	SALIX	M		0.00	97
417	SALIX	Y		0.00	15
418	SALIX	M		0.02	741
419	SALIX	Y		0.00	9
420	SALIX	M		0.00	164
421	SALIX	S		0.00	19
422	SALIX	M		0.01	329

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species				
	Dominant Species Present ²	Structure ³	Ground Cover		
423	SALIX	M		0.01	423
424	SALIX	M		0.01	308
425	SALIX	M		0.02	1,044
426	SALIX	Y		0.01	311
427	SALIX	S, Y		0.00	137
428	HERB	-	VICA5 & blackberry	0.04	1,741
429	ALRH2, SALIX	M		0.02	985
430	ALRH2	M		0.00	89
431	SALIX	Y		0.00	53
432	ROPS, ALRH2	S		0.00	80
433	FRLA	Y		0.00	38
434	ALRH2	M		0.00	178
435	ALRH2	M		0.00	166
436	ALRH2	M		0.00	129
437	SALIX	S		0.00	18
438	ALRH2, SALIX	M		0.03	1,141
439	SALIX	M		0.01	273
440	FRLA, SALIX	M		0.02	914
441	HERB	-	blackberry	0.00	77
442	SALIX	M		0.00	114
443	SALIX	M		0.00	83
444	ROPS	Y		0.00	59
445	ROPS	M		0.00	100
446	FRLA	Y		0.00	56
447	ALRH2, SALIX	M, O	blackberry	0.01	500
448	ALRH2, SALIX	M		0.03	1,265
449	ROPS	Y		0.00	88
450	FRLA	Y	blackberry	0.00	51
451	ALRH2, SALIX	M	blackberry	0.12	5,394
452	ROPS	O		0.02	735
453	SALIX	M		0.00	96
454	ROPS	O		0.01	465
455	FICA	O		0.00	33
456	ROPS	Y		0.01	244
457	SALIX	Y		0.00	78
458	SALIX	Y		0.00	56
459	ROPS	Y, M		0.00	149
460	ROPS, SALIX	Y		0.01	498
461	ROPS	Y		0.01	272
462	SALIX	O		0.01	465
463	HERB	-	grass	0.06	2,451
464	ALRH2	M, O		0.05	2,000
465	ALRH2, SALIX	M		0.02	728
466	HERB	-	Carex	0.01	439
467	ALRH2	Y		0.00	36
468	HERB	-	Carex	0.00	61
469	ALRH2	M		0.02	937

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
470	HERB	-	Carex	0.01	461
471	ALRH2	M		0.13	5,492
472	ALRH2, SALIX	Y		0.00	91
473	SALIX	Y		0.00	28
474	HERB	-	Carex	0.00	77
475	SALIX	M		0.00	65
476	SALIX	Y		0.00	74
477	HERB	-	Carex	0.00	57
478	POFR2, ALRH2	M		0.02	854
479	HERB	-	Carex	0.00	24
480	ALRH2	M		0.00	62
481	ALRH2	Y		0.03	1,423
482	HERB	-	Carex	0.01	465
483	ALRH2, SALIX	Y		0.01	481
484	SALIX	Y	Carex	0.00	141
485	ALRH2	Y		0.01	486
486	ALRH2	M		0.02	740
487	ALRH2	Y		0.00	66
488	ALRH2	Y	Carex	0.00	59
489	ALRH2	Y	Carex	0.00	55
490	ALRH2	Y	Carex	0.00	16
491	ALRH2	Y	Carex	0.00	34
492	HERB	-	Carex	0.00	21
MF4.8 - Buckeye Bar		-			
1	SALIX	S	herbs	0.01	328
2	SALIX	O		0.02	767
3	SALIX	M		0.00	62
4	SALIX	Y		0.00	28
5	SALIX	Y		0.00	7
6	SALIX	Y		0.00	3
7	SALIX	O		0.02	875
8	SALIX	Y		0.00	29
9	HERB	-	VICA5	0.00	148
10	SALIX	Y		0.00	10
11	SALIX	Y		0.00	8
12	HERB	-	grasses	1.46	63,704
13	SALIX	M		0.06	2,596
14	HERB	-	blackberry	0.00	140
15	ROPS	Y		0.00	34
16	SALIX	M		0.01	482
17	ALRH2	M		0.01	259
18	SALIX	Y		0.00	51
19	SALIX	M	blackberry	0.01	599
20	HERB	-	blackberry	0.01	268
21	HERB	-	blackberry	0.02	946
22	ROPS	M		0.01	243
23	SALIX	M		0.00	33

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
24	SALIX	M		0.00	17
25	SALIX	Y		0.00	25
26	ROPS	M		0.00	146
27	SALIX	M		0.01	224
28	SALIX	M		0.00	58
29	QUERCUS	Y		0.00	20
30	SALIX	O		0.00	142
31	SALIX	M		0.00	167
32	HERB	-	blackberry	0.00	184
33	SALIX	O		0.01	531
34	SALIX	O		0.02	745
35	SALIX	Y		0.00	94
36	SALIX	O		0.01	484
37	SALIX	O		0.01	357
38	SALIX	Y		0.00	78
39	ALRH2	M		0.00	140
40	HERB	-		0.00	21
41	HERB	-		0.00	34
42	HERB	-		0.00	18
43	HERB	-		0.00	45
44	HERB	-		0.00	98
45	HERB	-		0.00	25
46	SALIX	O		0.00	13
47	PINUS	O		0.01	487
48	POFR2	O		0.00	212
49	PINUS	O		0.02	701
50	PINUS	O		0.00	139
51	SALIX	O		0.01	325
52	SALIX	Y		0.00	80
53	SALIX	O		0.01	341
54	HERB	-		0.29	12,719
55	SALIX	Y, M, O		0.35	15,099
56	PINUS	O		0.02	816
57	SALIX	M		0.04	1,621
58	SALIX	M		0.04	1,908
59	HERB	-	blackberry	0.01	374
60	SALIX	Y		0.00	25
61	SALIX	M	blackberry	0.02	1,083
62	ROPS	M		0.00	83
63	HERB	-	grass	1.00	43,689
64	ALRH2, SALIX	M	blackberry	0.15	6,481
65	PINUS	M		0.00	99
66	HERB	-	blackberry	0.01	588
67	FRLA	M		0.00	198
68	ALRH2	M		0.00	143
69	SALIX	Y, M	VICA5, blackberry	0.11	4,701
70	SALIX	O		0.00	98

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
71	SALIX	O		0.00	82
72	SALIX	O		0.00	115
73	HERB	-	grass	0.29	12,500
74	POFR2	O		0.00	46
75	FRLA	M		0.00	82
76	SALIX	M, O		0.02	947
77	ALRH2	M		0.00	77
78	ALRH2	M		0.00	71
79	ALRH2	Y		0.00	39
80	SALIX	Y		0.00	33
81	ALRH2	Y		0.00	10
82	ALRH2	Y		0.00	18
83	SALIX	Y		0.00	22
84	HERB	-	Carex	0.00	146
85	ALRH2	Y		0.00	40
86	ALRH2	Y		0.00	50
87	POFR2	Y		0.00	86
88	ALRH2, SALIX	Y		0.00	184
89	SALIX	Y		0.00	50
90	SALIX	Y		0.01	265
91	ALRH2	Y		0.00	21
92	ALRH2	Y		0.00	14
93	ALRH2	Y		0.00	54
94	ALRH2	Y		0.00	102
95	ALRH2, SALIX	Y	grass	0.01	523
96	POFR2	Y		0.00	19
97	POFR2	Y		0.00	27
98	ALRH2	Y		0.00	80
99	ALRH2, SALIX	M		0.01	579
100	ALRH2, SALIX	Y		0.00	137
101	ALRH2	Y		0.00	51
102	ALRH2	Y		0.00	24
103	SALIX	Y		0.00	60
104	ALRH2, SALIX	Y		0.00	34
105	ALRH2	Y		0.00	59
106	HERB	-	grasses	0.00	116
107	POFR2	O		0.00	135
108	ALRH2	O		0.00	147
109	ALRH2, SALIX	M, O		0.05	2,348
110	SALIX	S		0.00	51
111	HERB	-	herbs	0.00	121
112	POFR2	M		0.00	54
113	ALRH2	O		0.02	915
114	SALIX	Y, M		0.01	288
115	SALIX	Y		0.00	119
116	SALIX	Y	grass	0.02	925
117	HERB	-	herbs	0.00	201

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species				
	Dominant Species Present ²	Structure ³	Ground Cover		
118	HERB	-	grasses, herbs	0.01	309
119	SALIX	O		0.00	122
120	PINUS	Y		0.00	11
121	PINUS	Y		0.00	30
122	HERB	-	VICA5	0.01	375
123	SALIX	S		0.00	160
124	ALRH2	M		0.00	119
125	SALIX	O		0.15	6,451
126	ALRH2	O		0.00	117
127	SALIX	O		0.01	253
128	SALIX	M, O		0.06	2,608
129	HERB	-	herbs	0.05	2,261
130	SALIX	Y, M		0.01	292
131	SALIX	O		0.01	427
132	HERB	-		0.00	169
133	FRLA	Y		0.00	15
134	SALIX	O		0.03	1,254
135	ALRH2	O		0.00	72
136	SALIX	M		0.00	125
137	SALIX	S		0.00	52
138	SALIX	M		0.00	119
139	ALRH2	O		0.01	501
140	ALRH2	M		0.00	181
141	SALIX	S		0.00	105
142	SALIX	Y		0.00	123
143	SALIX	S		0.00	56
144	SALIX	M		0.00	99
145	SALIX	O		0.16	7,066
146	SALIX	O		0.04	1,822
147	Large woody debris	-	Large woody debris	0.01	537
148	SALIX	M		0.00	142
149	SALIX	M		0.00	62
150	SALIX	M		0.00	27
151	SALIX	M		0.00	25
152	SALIX	M		0.00	59
153	SALIX	M		0.00	33
154	SALIX	M		0.02	654
155	SALIX	M		0.00	39
156	SALIX	M		0.00	35
157	SALIX	M		0.00	50
158	ALRH2	M		0.01	223
159	ALRH2, SALIX	Y		0.00	109
160	ALRH2	O		0.02	731
161	SALIX	M		0.01	297
162	SALIX	O		0.02	737
163	HERB	-		0.00	118
164	HERB	-		0.00	38

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
165	ALRH2	M		0.01	245
166	SALIX	M		0.01	224
167	SALIX	M		0.02	687
168	SALIX	M		0.00	92
169	ALRH2	O		0.01	286
170	HERB	-		0.00	85
171	HERB	-		0.00	188
172	HERB	-	blackberry	0.00	89
173	Large woody debris	-	Large woody debris	0.00	42
174	PINUS	Y		0.00	121
175	PINUS	Y		0.00	65
176	ROPS	O		0.01	438
177	HERB	-		0.01	484
178	SALIX	O		0.00	205
179	SALIX	O		0.01	270
180	SALIX	O		0.02	681
181	SALIX	O		0.02	897
182	ALRH2, SALIX	S		0.00	89
183	ALRH2	M		0.01	325
184	SALIX	M		0.01	245
185	ALRH2, SALIX	M, O		0.31	13,669
186	ALRH2	O		0.00	117
187	ALRH2	O		0.00	101
188	ALRH2	O		0.00	180
189	HERB	-	blackberry	0.01	593
190	ALRH2, SALIX	M, O		0.06	2,717
191	SALIX	O		0.03	1,244
192	ALRH2, SALIX	Y		0.01	298
193	ALRH2, SALIX	S	herbs	0.01	317
194	SALIX	Y		0.01	644
195	ALRH2	Y		0.00	149
196	SALIX	M	blackberry	0.06	2,616
197	POFR2	Y		0.00	91
198	HERB	-	herbs, grass	7.18	312,772
199	SALIX	Y		0.00	24
200	HERB	-	herbs, blackberry	0.00	90
201	ALRH2	Y		0.00	26
202	ALRH2, SALIX	S		0.00	124
203	SALIX	Y, M		0.02	816
204	SALIX	M		0.01	334
205	ALRH2	M		0.01	267
206	SALIX	M		0.00	75
207	HERB	-	blackberry	0.00	112
208	SALIX	S		0.00	140
209	HERB	-	blackberry	0.02	797
210	ROPS	Y		0.00	185
211	SALIX	S		0.00	18

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
212	ROPS	Y		0.00	119
213	ROPS	Y		0.00	9
214	SALIX	O		0.01	295
215	SALIX	O		0.03	1,391
216	SALIX	O		0.01	511
217	AIAL	M		0.01	527
218	Large woody debris	-	Large woody debris	0.00	200
219	SALIX	O		0.02	683
220	HERB	-	blackberry	0.00	183
221	HERB	-		0.15	6,437
222	HERB	-		0.02	715
223	ALRH2, SALIX	S	VARIOUS herbs	0.02	728
224	SALIX	O		0.02	866
225	ALRH2	M		0.00	73
226	AIAL	M		0.01	388
227	ALRH2	Y		0.00	11
228	SALIX	M	blackberry	0.01	579
229	ALRH2	S	blackberry	0.00	99
230	HERB	-	blackberry	0.00	60
231	POFR2	M	blackberry	0.01	296
232	SALIX	M, O		0.02	924
233	Large woody debris	-	Large woody debris	0.00	185
234	FRLA	M		0.00	113
235	SALIX	M, O		0.05	2,082
236	Large woody debris	-	Large woody debris	0.00	87
237	HERB	-		0.01	406
238	ALRH2	M	VICA5 & blackberry	0.00	99
239	SALIX	M, O	VICA5 & blackberry	0.27	11,755
240	Large woody debris	-	Large woody debris	0.01	271
241	SALIX	Y		0.00	56
242	SALIX	Y		0.00	61
243	SALIX	O		0.01	218
244	SALIX	S		0.00	80
245	HERB	-	TODI	0.00	84
246	SALIX	O		0.01	299
247	HERB	-		0.00	88
248	SALIX	O		0.01	231
249	SALIX	Y		0.00	25
250	SALIX	Y		0.00	18
251	SALIX	O		0.01	413
252	SALIX	M		0.00	81
253	SALIX	O		0.01	414
254	SALIX	O		0.02	885
255	HERB	-		0.00	143
256	HERB	-		0.00	212
257	PINUS	O		0.03	1,268
258	FRLA	O		0.01	261

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
259	CEOR9	M		0.02	765
260	HERB	-		0.49	21,360
261	HERB	-	grass	4.38	190,587
262	SALIX	M		0.00	17
263	SALIX	O		0.02	766
264	SALIX	Y		0.00	65
265	SALIX	O		0.01	225
266	SALIX	Y		0.00	96
267	SALIX	Y		0.01	278
268	HERB	-		0.00	56
269	FRLA	M		0.00	102
270	ALRH2, SALIX	M, O	VICA5	0.28	12,119
271	SALIX	Y		0.01	399
272	PINUS	O		0.01	574
273	SALIX	O		0.01	465
274	POFR2	O		0.00	162
275	ALRH2	O		0.01	568
276	HERB	-	blackberry	0.01	280
277	Large woody debris	-	Large woody debris	0.00	64
278	SALIX	Y		0.01	373
279	POFR2	M	blackberry	0.00	103
280	SALIX	O		0.00	81
281	POFR2	M	blackberry	0.00	96
282	SALIX	M	blackberry	0.06	2,601
283	HERB	-	blackberry	0.00	19
284	HERB	-	blackberry	0.01	218
285	SALIX	S		0.00	211
286	SALIX	S		0.00	87
287	SALIX	Y		0.00	102
288	SALIX	Y		0.00	78
289	SALIX	S		0.00	26
290	SALIX	M		0.01	277
291	SALIX	M		0.00	125
292	SALIX	Y		0.00	26
293	SALIX	M		0.00	115
294	SALIX	Y		0.00	55
295	SALIX	M		0.00	75
296	HERB	-	grass	0.00	26
297	POFR2	Y		0.00	7
298	SALIX	Y		0.00	32
299	ALRH2	Y, M		0.01	298
300	ALRH2	M		0.00	90
301	HERB	-	Carex	0.00	143
302	SALIX	Y, M	VICA5	0.02	683
303	HERB	-	Carex	0.01	309
304	SALIX	Y		0.00	86
305	SALIX	M		0.00	171

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
306	SALIX	Y		0.00	31
307	SALIX	M		0.00	121
308	SALIX	Y		0.00	161
309	ALRH2	M		0.00	134
310	ALRH2, SALIX	Y		0.00	138
311	POFR2	Y		0.00	74
312	ALRH2, SALIX	M		0.02	1,008
313	FRLA	M		0.01	246
314	ALRH2	M		0.01	312
315	ALRH2	M		0.00	147
316	ALRH2	Y		0.00	17
317	HERB	-	Carex	0.00	195
318	ALRH2	M		0.00	64
319	SALIX	Y		0.00	45
320	ALRH2	M		0.01	312
321	ALRH2	Y		0.00	12
322	ALRH2	Y		0.00	69
323	SALIX	Y		0.00	14
324	ALRH2	Y		0.00	96
325	SALIX	Y		0.00	21
326	ALRH2	Y		0.00	29
327	ALRH2	Y		0.00	24
328	ALRH2	Y		0.00	9
329	ALRH2	Y		0.00	13
330	ALRH2	Y		0.00	117
331	ALRH2	Y		0.00	39
332	SALIX	Y		0.00	10
333	ALRH2	Y		0.00	27
334	ALRH2, SALIX	Y, M		0.01	522
335	SALIX	S		0.00	5
336	SALIX	S		0.00	124
337	ALRH2	M		0.00	134
338	ALRH2	Y		0.00	21
339	HERB	-	Carex	0.00	96
340	ALRH2	M		0.00	213
341	ALRH2	M		0.00	204
342	ALRH2, SALIX	Y		0.00	125
343	HERB	-	Carex	0.00	196
344	ALRH2	Y		0.00	16
345	ALRH2	Y, M		0.00	54
346	ALRH2	Y		0.00	25
347	ALRH2	M		0.00	113
348	ALRH2	M		0.00	61
349	ALRH2	Y, M		0.00	189
350	ALRH2, SALIX	Y		0.00	64
351	ALRH2	Y		0.00	20
352	ALRH2	Y		0.00	89

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
353	ALRH2	Y		0.00	62
354	ALRH2	Y		0.00	106
355	POFR2	Y		0.00	79
356	ALRH2	Y		0.00	12
357	ALRH2	M		0.01	379
358	SALIX	S, Y		0.00	211
359	ALRH2	M		0.00	43
360	ALRH2	M		0.00	42
361	SALIX	M		0.06	2,453
362	SALIX	Y		0.00	52
363	SALIX	M		0.04	1,570
364	SALIX	Y		0.00	24
365	SALIX	M		0.00	25
366	SALIX	M		0.00	57
367	SALIX	Y		0.00	80
368	SALIX	Y		0.00	15
369	HERB	-	herbs	0.10	4,476
370	ALRH2, SALIX	S	herbs	0.21	9,001
371	SALIX	Y		0.00	24
372	SALIX	Y, M		0.07	2,960
373	SALIX	Y, M		0.01	336
374	POFR2	Y		0.00	105
375	SALIX	M		0.08	3,329
376	SALIX	Y, M		0.09	3,704
377	SALIX	M		0.00	122
378	SALIX	O		0.01	463
379	SALIX	M		0.00	114
380	SALIX	O		0.02	715
381	SALIX	O		0.03	1,472
382	SALIX	Y		0.01	342
383	SALIX	M, O		0.05	2,129
384	SALIX	S		0.00	82
385	SALIX	Y		0.00	83
386	ALRH2	Y		0.00	81
387	SALIX	O	blackberry	0.23	10,146
388	SALIX	Y		0.00	187
389	ALRH2	O		0.01	231
390	SALIX	Y		0.00	107
391	ALRH2	M		0.00	55
392	ALRH2	M		0.03	1,095
393	ALRH2	M		0.00	32
394	ALRH2	M		0.00	66
395	SALIX	Y		0.00	18
396	SALIX	Y		0.00	15
397	ALRH2	M		0.00	206
398	ALRH2, SALIX	S		0.00	56
399	SALIX	M		0.01	234

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
400	HERB	-		0.00	68
401	SALIX	M		0.00	17
402	SALIX	M		0.00	33
403	SALIX	Y		0.00	152
404	SALIX	M		0.00	148
405	SALIX	Y, M		0.04	1,532
406	SALIX	S		0.01	279
407	ALRH2	Y		0.00	25
408	SALIX	M		0.01	325
409	SALIX	M		0.00	29
410	SALIX	M		0.02	751
411	SALIX	Y, M		0.06	2,524
412	SALIX	S		0.01	356
413	SALIX	S		0.01	299
414	SALIX	Y		0.01	477
415	SALIX	Y		0.00	48
416	SALIX	Y		0.01	272
417	ALRH2	Y		0.01	328
418	SALIX	S		0.00	15
419	SALIX	Y		0.01	402
420	SALIX	Y		0.00	16
421	SALIX	Y		0.00	69
422	ALRH2	Y		0.00	62
423	ALRH2	S		0.00	3
424	ALRH2	Y		0.00	121
425	ALRH2	Y		0.01	295
426	ALRH2	Y		0.00	8
427	ALRH2	Y		0.00	8
428	ALRH2, SALIX	Y		0.03	1,218
429	HERB	-	herbs, grass	0.03	1,460
430	ALRH2	Y		0.00	128
431	SALIX	Y		0.01	231
432	SALIX	Y		0.00	54
433	ALRH2	M		0.00	49
434	POFR2, SALIX	Y		0.00	213
435	ACMA3	O		0.00	164
436	ALRH2	Y		0.00	177
437	SALIX	Y		0.00	82
438	ALRH2	Y		0.00	73
439	ALRH2	O		0.00	155
440	ALRH2	M		0.00	192
441	ALRH2	Y		0.00	47
442	ALRH2	Y		0.00	61
443	ALRH2, SALIX	Y		0.01	298
444	ALRH2, SALIX	M		0.00	144
445	POFR2	S		0.00	5
446	SALIX	Y		0.00	16

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
447	SALIX	S	grass	0.00	155
448	ALRH2	S	grass	0.00	168
449	ALRH2	Y		0.01	350
450	ALRH2	M		0.01	291
451	ALRH2	M		0.00	216
452	ALRH2	Y		0.00	147
453	ALRH2, SALIX	Y		0.00	148
454	ALRH2	Y		0.00	148
455	ALRH2	Y		0.00	45
456	SALIX	Y		0.00	23
457	ALRH2	Y		0.00	147
458	ALRH2, SALIX	Y		0.01	231
459	ALRH2, SALIX	Y		0.00	113
460	ALRH2, SALIX	Y		0.00	176
461	ALRH2, SALIX	Y		0.01	228
462	SALIX	Y		0.00	17
463	HERB	-	blackberry	0.00	211
464	Large woody debris	-	Large woody debris	0.00	122
465	POFR2	M	blackberry	0.00	44
466	SALIX	Y		0.01	568
467	ALRH2	Y		0.00	5
468	FRLA	Y		0.00	18
469	SALIX	Y		0.00	89
470	ALRH2, SALIX	M, O		0.00	186
471	ALRH2	Y		0.00	39
472	SALIX	O		0.01	569
473	Large woody debris	-	Large woody debris	0.01	257
474	SALIX	O		0.01	224
475	SALIX	M, O		0.35	15,064
476	ALRH2	M		0.00	109
477	SALIX	Y		0.00	47
478	SALIX	Y		0.00	16
479	HERB	-	blackberry	0.00	184
480	SALIX	Y		0.02	990
481	SALIX	O		0.23	10,195
482	POFR2	Y		0.00	51
483	ALRH2	M		0.00	113
484	HERB	-		0.01	442
485	SALIX	O		0.00	189
486	POFR2	O		0.01	391
487	SALIX	Y		0.00	49
488	ALRH2, SALIX	M, O		0.01	566
489	HERB	-	interspersed	6.66	290,182
490	SALIX	M		0.01	452
491	SALIX	M, O		0.01	625
492	ALRH2, SALIX	M	blackberry	0.00	158
493	ALRH2, SALIX	M	blackberry	0.02	764

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
494	ALRH2	M		0.02	1,010
495	ALRH2, SALIX	M		0.03	1,191
496	ALRH2	M, O		0.04	1,926
497	SALIX	O		0.02	939
498	SALIX	O		0.02	804
499	FICA	O		0.00	106
500	Large woody debris	-	Large woody debris	0.00	120
501	ALRH2	M		0.00	105
502	SALIX	M		0.05	2,293
503	ALRH2	M		0.01	397
504	SALIX	M		0.00	30
505	SALIX	Y		0.00	61
506	SALIX	M		0.01	227
507	ALRH2	M		0.01	231
508	SALIX	M		0.00	21
509	ALRH2	Y		0.00	114
510	SALIX	Y		0.00	132
511	SALIX	M		0.00	70
512	ALRH2	M		0.01	266
513	SALIX	Y		0.00	102
514	SALIX	Y		0.01	242
515	Large woody debris	-	Large woody debris	0.00	120
516	HERB	-		0.05	2,207
517	HERB	-		0.00	26
518	HERB	-		0.01	566
519	HERB	-		0.01	331
520	HERB	-	grasses	0.18	7,659
521	HERB	-		0.55	23,794
522	HERB	-		0.24	10,253
523	SALIX	M		0.00	194
524	ALRH2, SALIX	M		0.01	347
525	SALIX	M		0.02	1,083
526	POFR2	M		0.00	81
527	ALRH2	O		0.01	326
528	ALRH2	O		0.01	476
529	SALIX	O		0.01	565
530	ALRH2, SALIX	O	blackberry	0.03	1,119
531	ALRH2	O		0.01	488
532	SALIX	O		0.00	150
533	ALRH2	O		0.01	502
534	SALIX	Y		0.00	40
535	SALIX	M		0.01	629
536	SALIX	Y		0.00	31
537	ALRH2	M		0.00	129
538	SALIX	Y		0.00	91
539	ALRH2, SALIX	O	blackberry	0.01	526
540	SALIX	S		0.00	141

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
541	ALRH2	Y		0.00	216
542	SALIX	S		0.00	119
543	ALRH2	M		0.02	654
544	POFR2	M		0.00	14
545	SALIX	S		0.00	120
546	SALIX	M	blackberry	0.00	87
547	ALRH2	M	blackberry	0.02	754
548	SALIX	M	blackberry	0.01	336
549	SALIX	Y		0.00	95
550	SALIX	M	blackberry	0.00	170
551	ALRH2	M	blackberry	0.00	162
552	HERB	-	blackberry	0.01	254
553	SALIX	M	blackberry	0.01	252
554	HERB	-	VICA5	0.01	264
555	ALRH2, SALIX	M, O	blackberry & VICA5	0.07	2,869
556	SALIX	M	blackberry & VICA5	0.00	123
557	POFR2	M	blackberry & VICA5	0.00	38
558	SALIX	S	blackberry & VICA5	0.00	40
559	SALIX	M	blackberry & VICA5	0.00	79
560	SALIX	M	blackberry & VICA5	0.00	98
561	ALRH2	M, O	blackberry & VICA5	0.02	658
562	SALIX	M, O	blackberry & VICA5	0.01	320
563	PINUS	O		0.00	119
564	SALIX	O		0.00	62
565	SALIX	O		0.00	88
566	SALIX	O		0.00	86
567	SALIX	O		0.00	9
568	SALIX	O		0.00	12
569	SALIX	Y		0.00	86
570	SALIX	O		0.00	58
571	SALIX	O		0.00	15
572	SALIX	O		0.00	8
573	SALIX	O		0.00	20
574	SALIX	O		0.00	182
575	SALIX	Y		0.00	15
576	Large woody debris	-	Large woody debris	0.09	3,906
577	SALIX	O		0.00	51
578	SALIX	O		0.00	76
579	SALIX	O		0.00	20
580	SALIX	Y		0.00	62
581	HERB	-		0.00	43
582	HERB	-		0.00	34
583	SALIX	Y		0.00	128
584	SALIX	M		0.00	101
585	POFR2	Y		0.00	194
586	SALIX	M		0.02	729
587	SALIX	Y		0.00	16

Table F-1. Riparian Vegetation Attribute Data at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Corresponding Map Polygon Number ¹	Attribute			Area (acres)	Area (square feet)
	Dominant Species		Ground Cover		
	Dominant Species Present ²	Structure ³			
588	SALIX	M		0.00	160
589	SALIX	Y		0.00	24
590	SALIX	Y		0.00	94
591	SALIX	M		0.01	282
592	POFR2	Y		0.00	109
593	SALIX	Y		0.00	48
594	POFR2	Y		0.00	39
595	POFR2	Y		0.00	119
596	POFR2	Y		0.00	36
597	POFR2	Y		0.00	27

¹Map polygon numbers refer to the polygons labeled on Maps F-1 and F-2.

²Only woody riparian vegetation were identified to species for the riparian vegetation mapping. Other general types of vegetation were noted, e.g., herbaceous, grass, sedge, indian rhubarb, California wild grape, or blackberry bushes. The woody species present included:

Scientific Name	Common Name	Species Code
<i>Abies sp.</i>	fir	ABIES
<i>Acer macrophyllum</i>	big leaf maple	ACMA3
<i>Ailanthus altissima</i>	tree of heaven	AIAL
<i>Alnus rhombifolia</i>	white alder	ALRH2
<i>Cercis occidentalis</i> (= <i>Cercis orbiculata</i>)	California/ western redbud	CEOR9
<i>Ficus carica</i>	edible fig	FICA
<i>Fraxinus latifolia</i>	Oregon ash	FRLA
<i>Pinus sp.</i>	pine	PINUS
<i>Populus fremontii ssp. Fremontii</i>	Fremont cottonwood	POFR2
<i>Quercus sp.</i>	oak	QUERCUS
<i>Robinia pseudoacacia</i>	black locust	ROPS
<i>Salix sp.</i>	willow	SALIX
<i>Vitis californica</i>	California wild grape	VICA5

³Age Codes:

(S) Seedlings

(Y) Young: Shrubs with less than 10 stems per individual, or trees with diameters (diameter at breast height (DBH) less than 3 inches).

(M) Medium-Aged: Shrubs with between 10 and 60 stems per individual, trees with DBHs between 3 and 9 inches.

(O) Mature/Old: Shrubs with more than 60 stems per individual, trees with DBHs greater than 9 inches.

Table F-2. Summary of Riparian Vegetation Composition and Age Class Structure at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Dominant Species Present	Structure ¹	Total Area (square feet)		Total Area (square feet)
		MF14.1	MF4.8	
White Alder	S	589	270	860
	S, Y	895	-	895
	Y	7,004	4,175	11,179
	Y, M	2,388	541	2,929
	M	29,330	10,599	39,928
	M, O	2,090	2,584	4,673
	O	2,254	5,913	8,168
White Alder Total		44,549	24,083	68,632
White Alder and Willow	S	1,101	10,315	11,416
	S, Y	507	-	507
	Y	7,765	4,024	11,789
	Y, M	11,661	522	12,182
	M	54,884	10,672	65,556
	M, O	6,250	34,474	40,724
	O	3,220	1,646	4,865
White Alder and Willow Total		85,388	61,652	147,040
Oregon Ash	Y	348	34	382
	M	267	741	1,008
	O	233	261	494
Oregon Ash Total		848	1,035	1,883
Oregon Ash and White Alder	M	1,421	-	1,421
	M, O	412	-	412
Oregon Ash and White Alder Total		1,833	0	1,833
Oregon Ash and Black Locust	Y	109	-	109
Oregon Ash and Black Locust Total		109	0	109
Oregon Ash and Willow	M	914	-	914
Oregon Ash and Willow Total		914	0	914
Fremont Cottonwood	S	-	5	5
	Y	143	1,063	1,206
	M	127	726	853
	O	1,159	946	2,105
Fremont Cottonwood Total		1,429	2,740	4,169
Fremont Cottonwood and White Alder	M	854	-	854
Fremont Cottonwood and White Alder Total		854	0	854
Fremont Cottonwood, White Alder, and Willow	S	204	-	204
	Y, M	935	-	935
	M	151	-	151
Fremont Cottonwood, White Alder, and Willow Total		1,290	0	1,290
Fremont Cottonwood and Black Locust	Y, M	4,637	-	4,637
Fremont Cottonwood and Black Locust Total		4,637	0	4,637
Fremont Cottonwood and Willow	Y	-	213	213
Fremont Cottonwood and Willow Total		0	213	213
Black Locust	Y	1,115	348	1,462
	Y, M	149	-	149
	M	4,031	472	4,503
	O	2,373	438	2,811
Black Locust Total		7,668	1,258	8,926

Table F-2. Summary of Riparian Vegetation Composition and Age Class Structure at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Dominant Species Present	Structure ¹	Total Area (square feet)		Total Area (square feet)
		MF14.1	MF4.8	
Black Locust and White Alder	S	80	-	80
	Y	379	-	379
	M	595	-	595
	O	410	-	410
Black Locust and White Alder Total		1,463	0	1,463
Black Locust and Willow	M, O	1,364	-	1,364
	Y	498	-	498
Black Locust and Willow Total		1,862	0	1,862
Willow	S	2,798	3,050	5,848
	S, Y	662	211	873
	Y	8,647	10,565	19,212
	Y, M	8,995	17,836	26,831
	Y, M, O	-	15,099	15,099
	M	21,581	35,673	57,254
	M, O	7,981	36,454	44,435
	O	3,631	61,164	64,795
Willow Total		54,294	180,053	234,348
Bigleaf Maple	O	-	164	164
Bigleaf Maple Total		0	164	164
Herbaceous Vegetation Only ²	-	154,332	1,018,832	1,173,163
Herbaceous Vegetation Only Total		154,332	1,018,832	1,173,163
Oak	Y	-	20	20
	M	330	-	330
Oak Total		330	20	350
Redbud	Y	125	-	125
	M	-	765	765
Redbud Total		125	765	890
Large Woody Debris	-	190	5,911	6,100
Large Woody Debris Total		190	5,911	6,100
Pine	Y	-	227	227
	M	611	99	710
	O	-	4,105	4,105
Pine Total		611	4,430	5,041
Incense Cedar	Y	77	-	77
Incense Cedar Total		77	0	77
Fig	O	33	106	139
Fig Total		33	106	139
Fir	M	1,361	-	1,361
	Y	92	-	92
Fir total		1,453	0	1,453

Table F-2. Summary of Riparian Vegetation Composition and Age Class Structure at the Study Sites on the Middle Fork American River Peaking Reach (MF14.1 and MF4.8).

Dominant Species Present	Structure ¹	Total Area (square feet)		Total Area (square feet)
		MF14.1	MF4.8	
Tree of heaven	M	-	916	916
Tree of heaven Total		0	916	916
Grand Total		364,287	1,302,179	1,666,466

¹Age Codes:

(S) Seedlings

(Y) Young: Shrubs with less than 10 stems per individual, or trees with diameters (diameter at breast height (DBH) less than 3 inches).

(M) Medium-Aged: Shrubs with between 10 and 60 stems per individual, trees with DBHs between 3 and 9 inches.

(O) Mature/Old: Shrubs with more than 60 stems per individual, trees with DBHs greater than 9 inches.

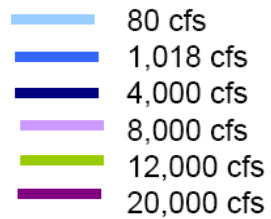
²Can also include blackberry shrubs, California wild grape. See Table F-1.

FIGURES

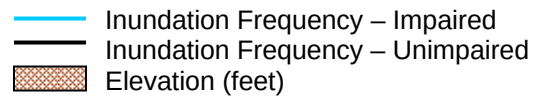
Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8).

Legend

Flow



Inundation



Vegetation

Only dominant species are included in vegetation communities shown on graphs. Sub-dominant species are listed in the tables below the first transect graph for each study site. The same color and vegetation schemes are used in Figure F-2.



Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF14.1

Note vertical exaggeration

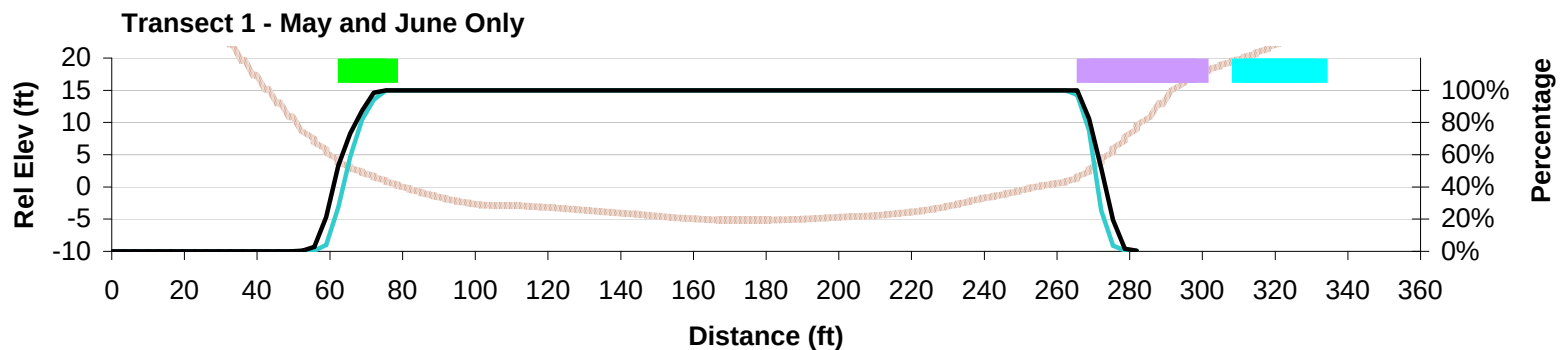
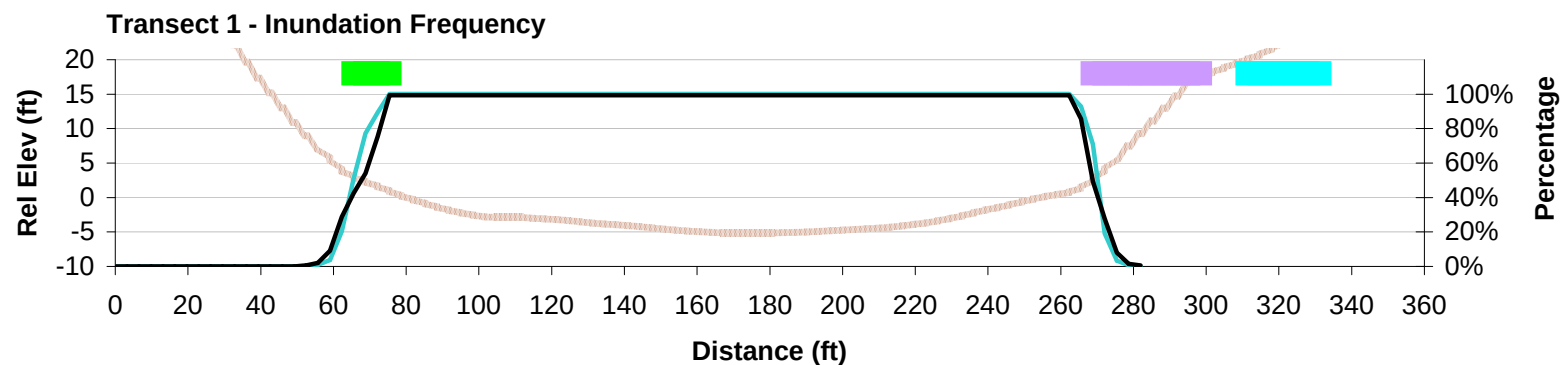


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF14.1

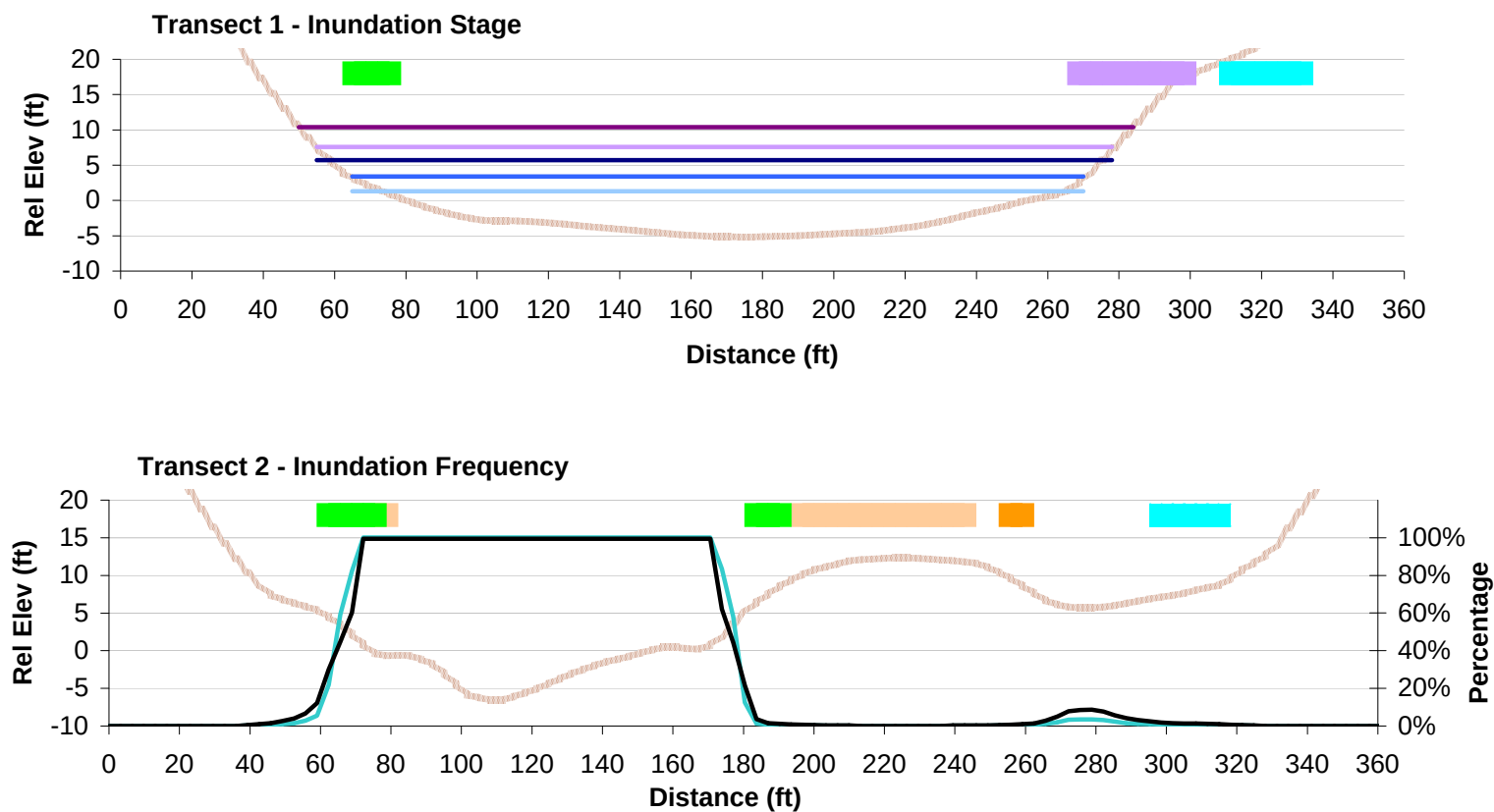


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF14.1

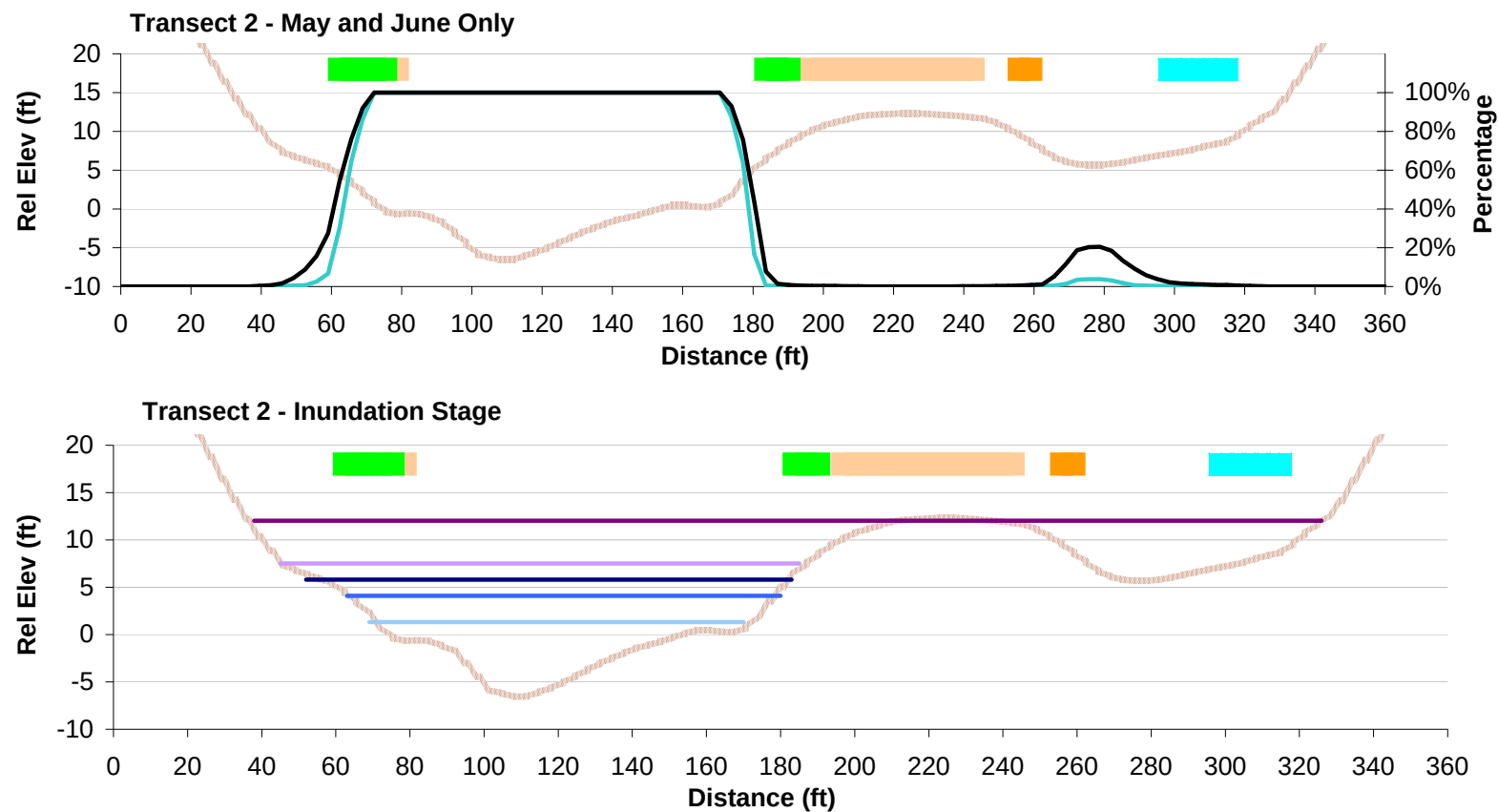


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF14.1

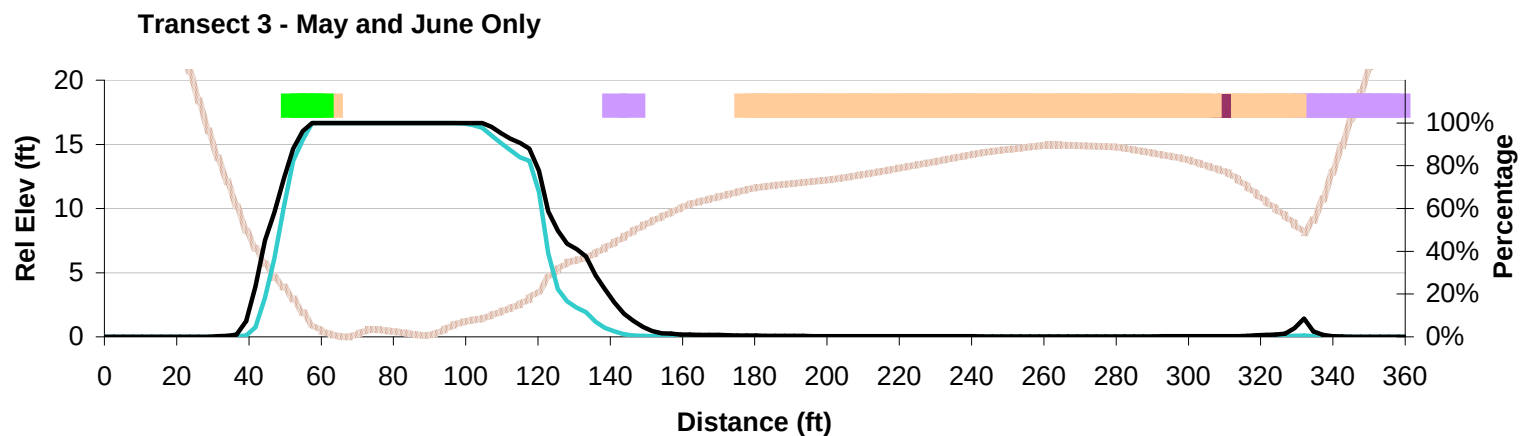
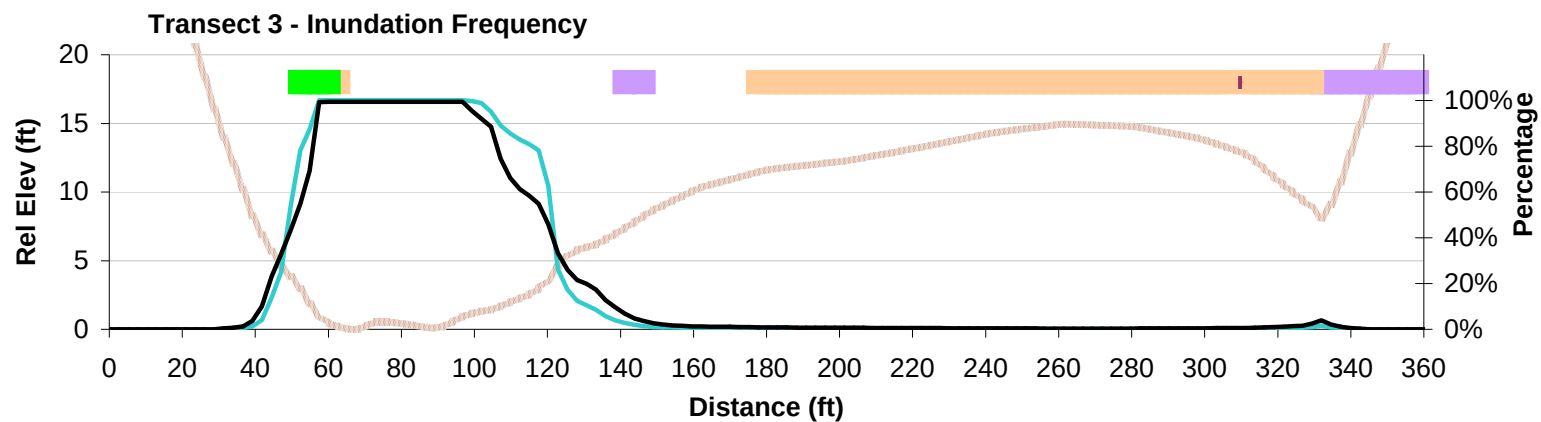


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF14.1

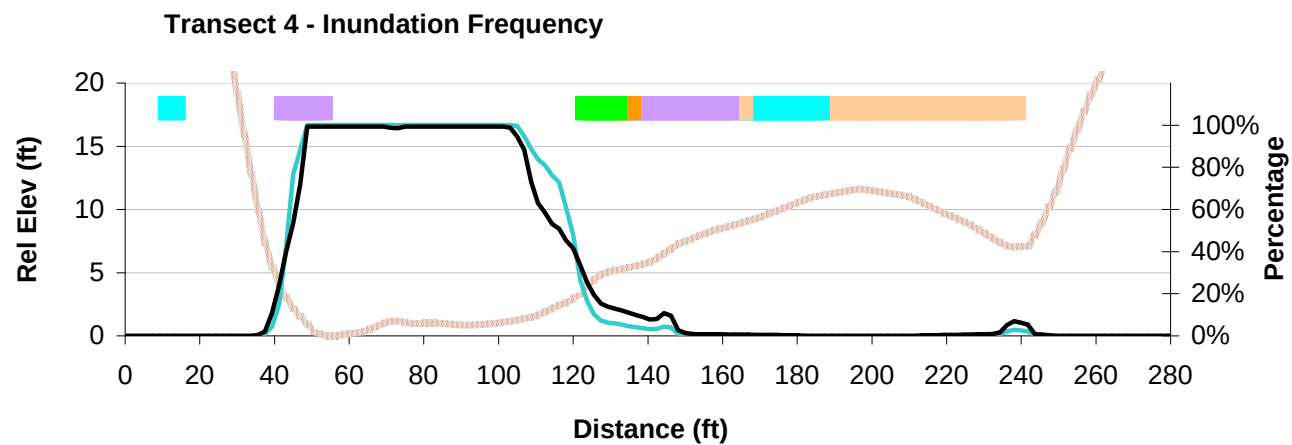
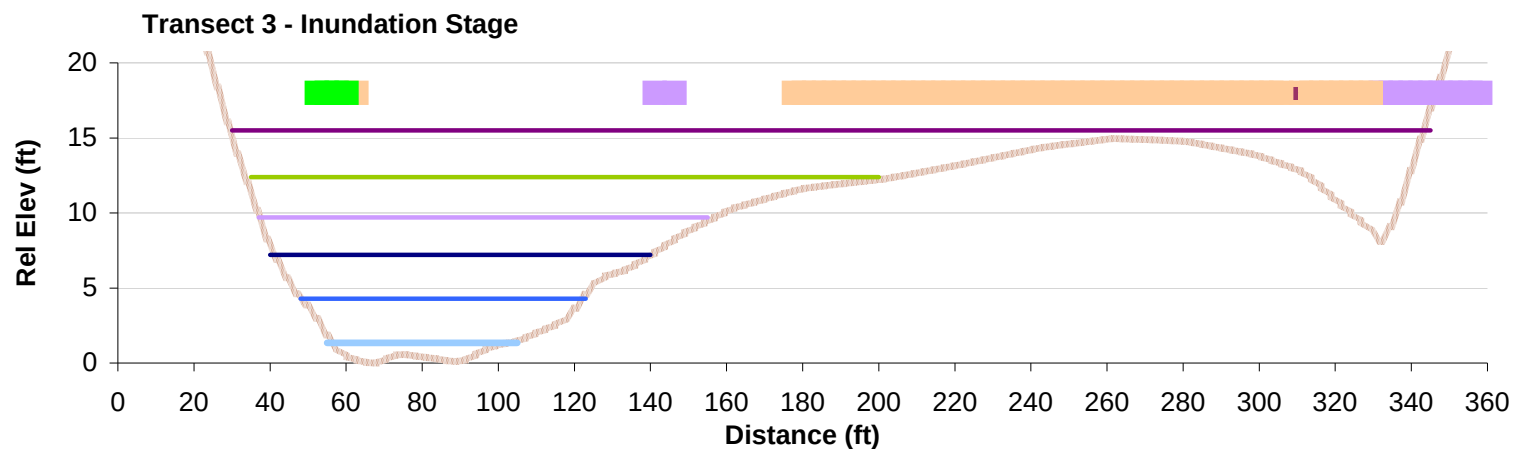


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF14.1

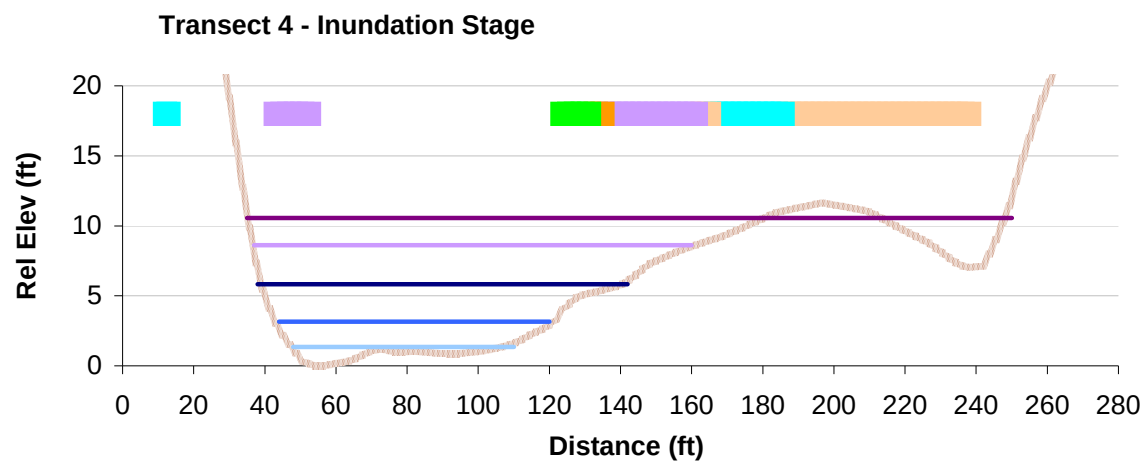
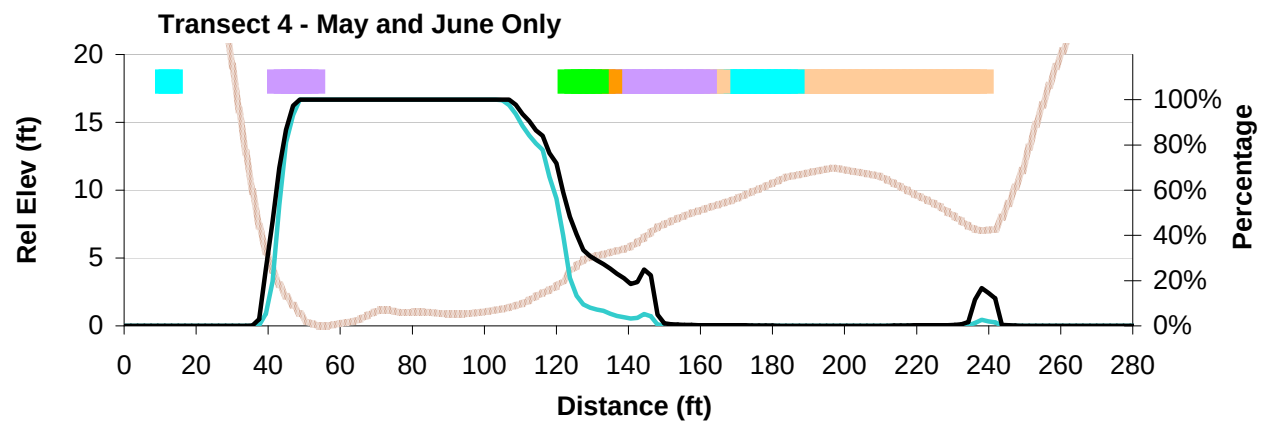
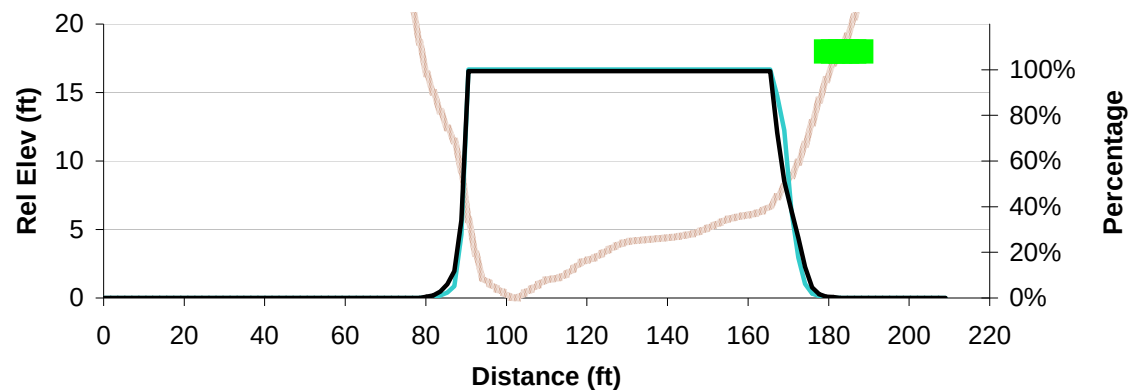


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF14.1

Transect 5 - Inundation Frequency



Transect 5 - May and June Only

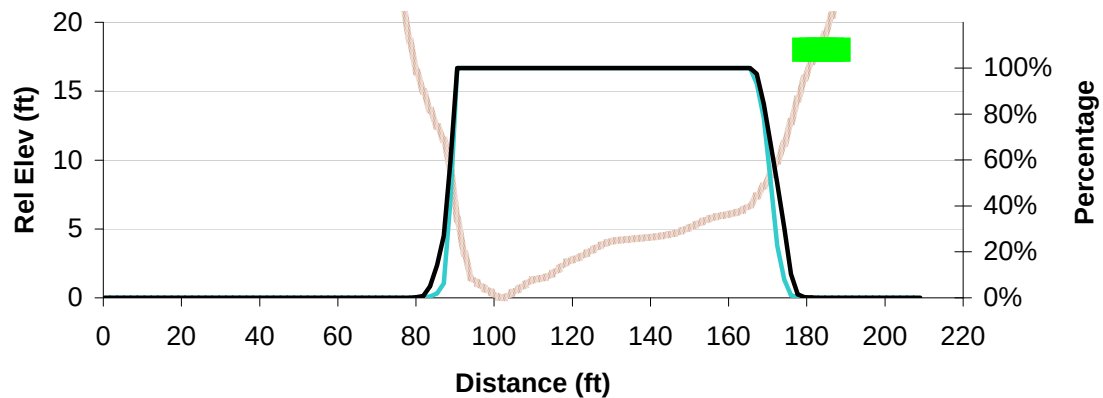
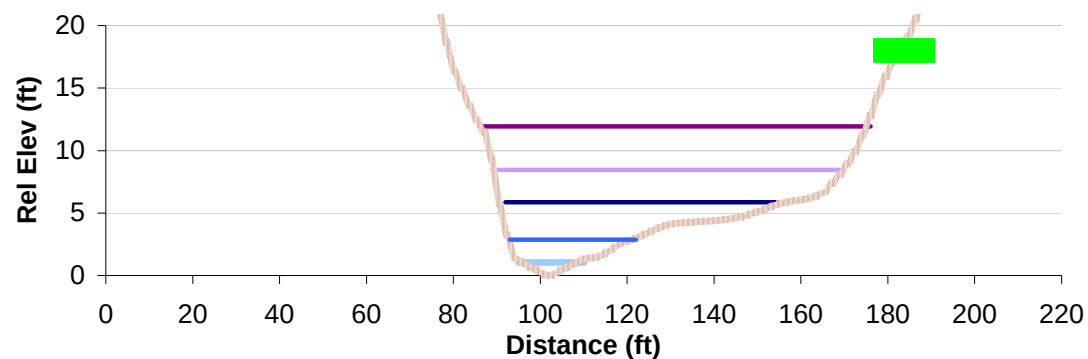


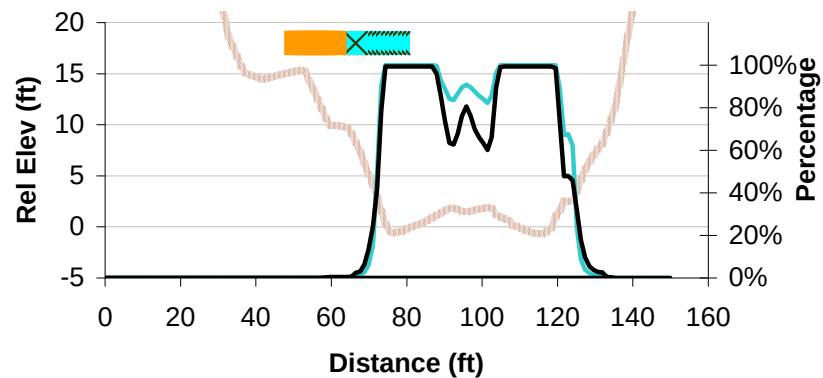
Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF14.1

Transect 5 - Inundation Stage



Transect 6 - Inundation Frequency



Transect 6 - May and June Only

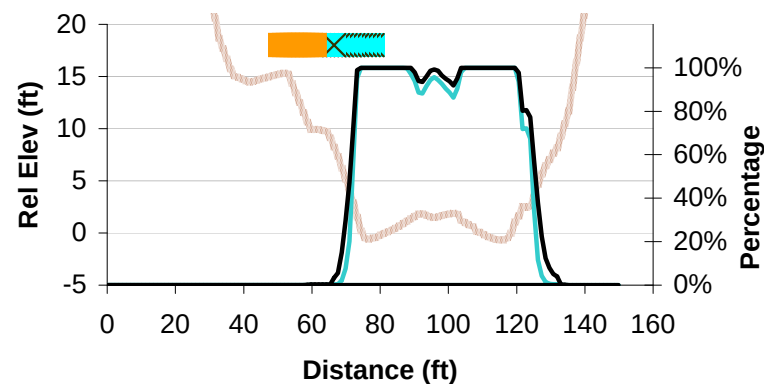


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF14.1

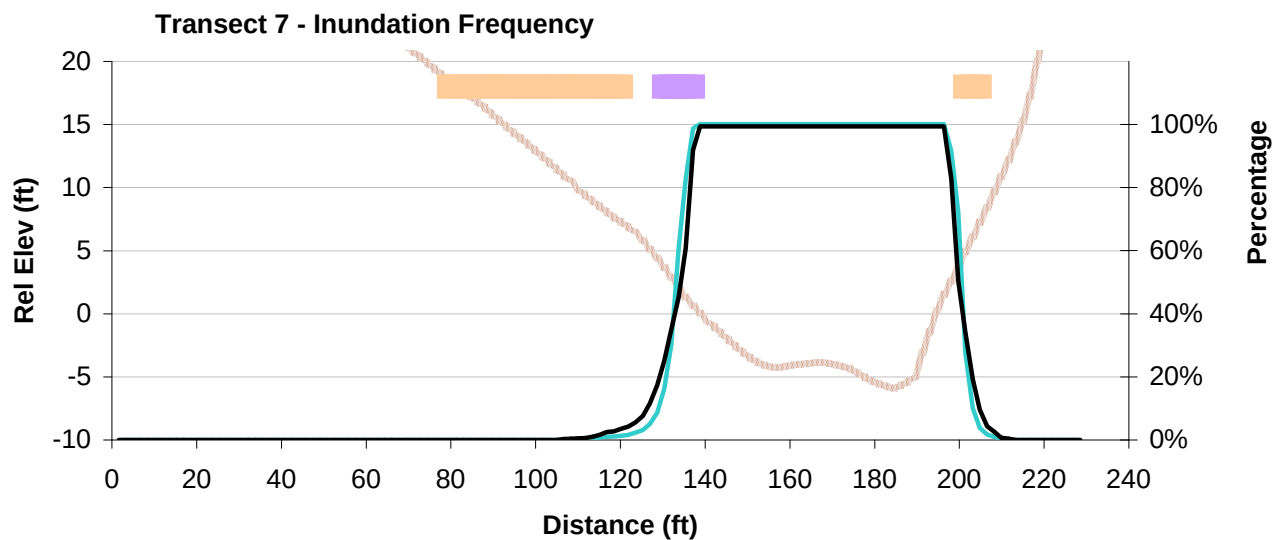
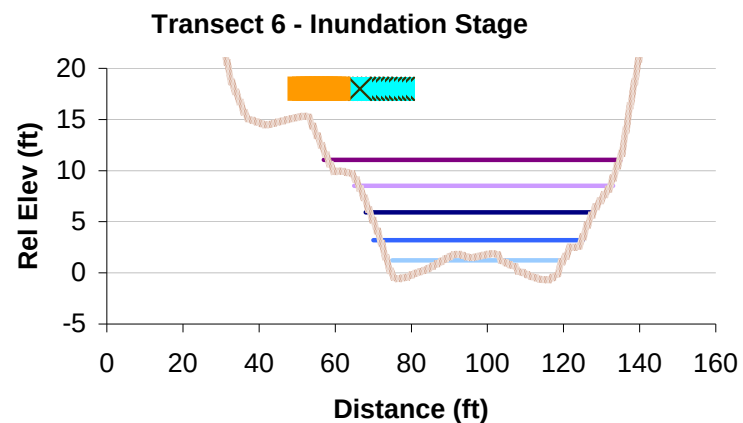


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF14.1

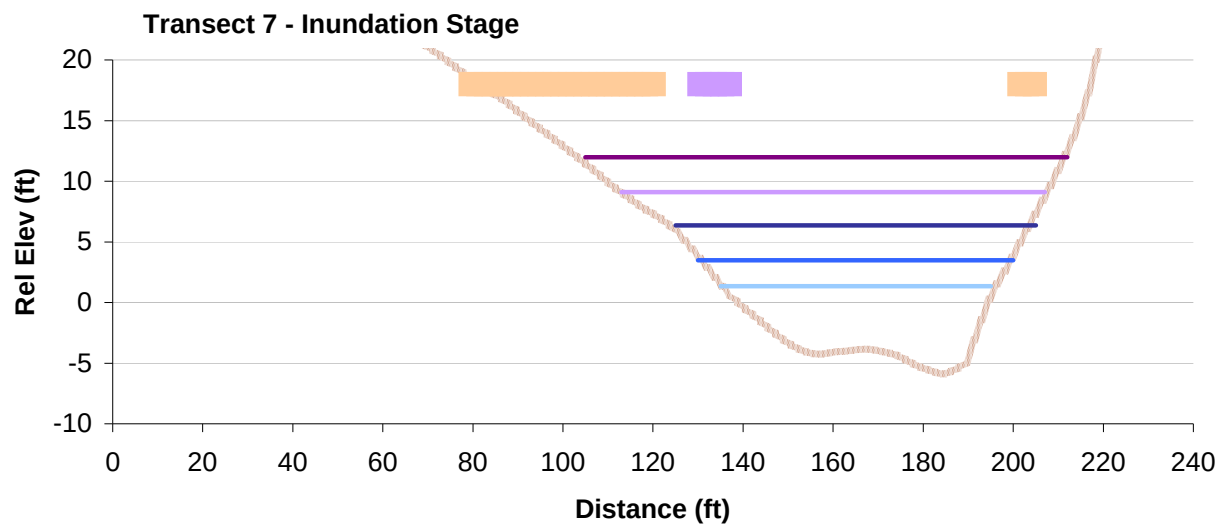
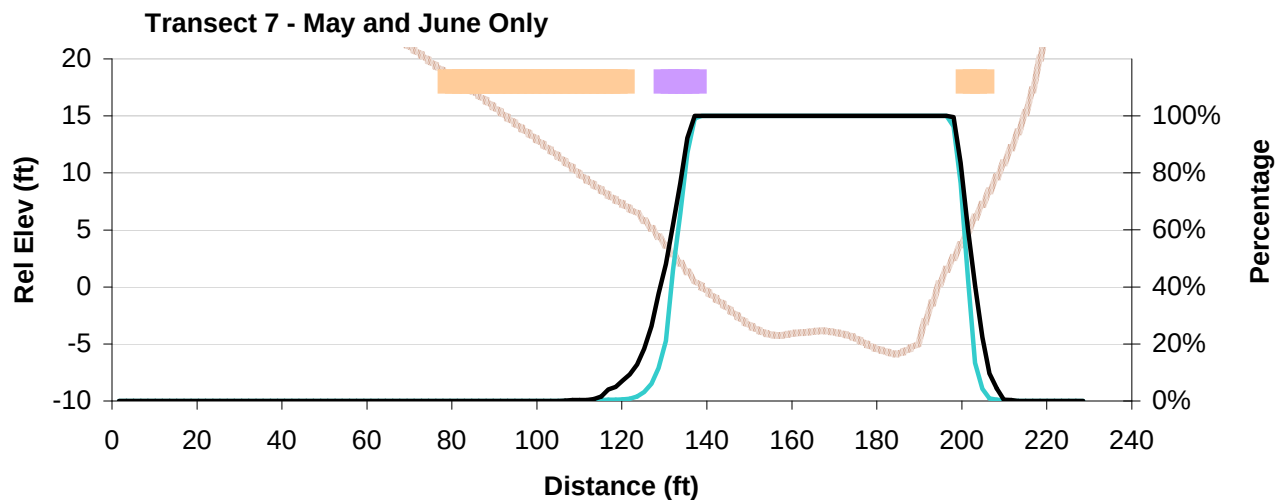


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF14.1

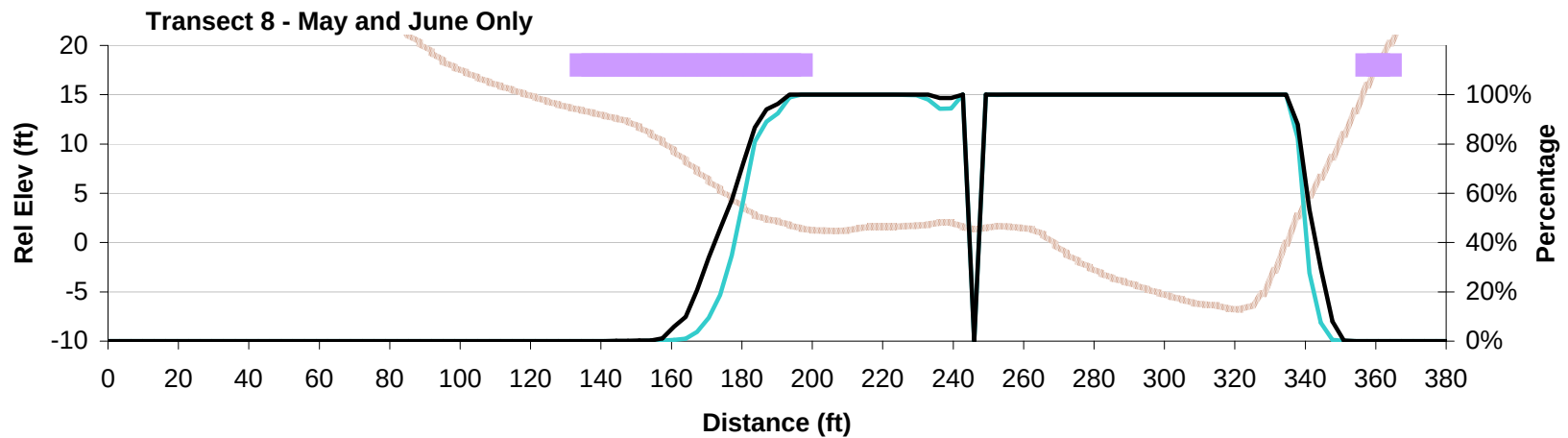
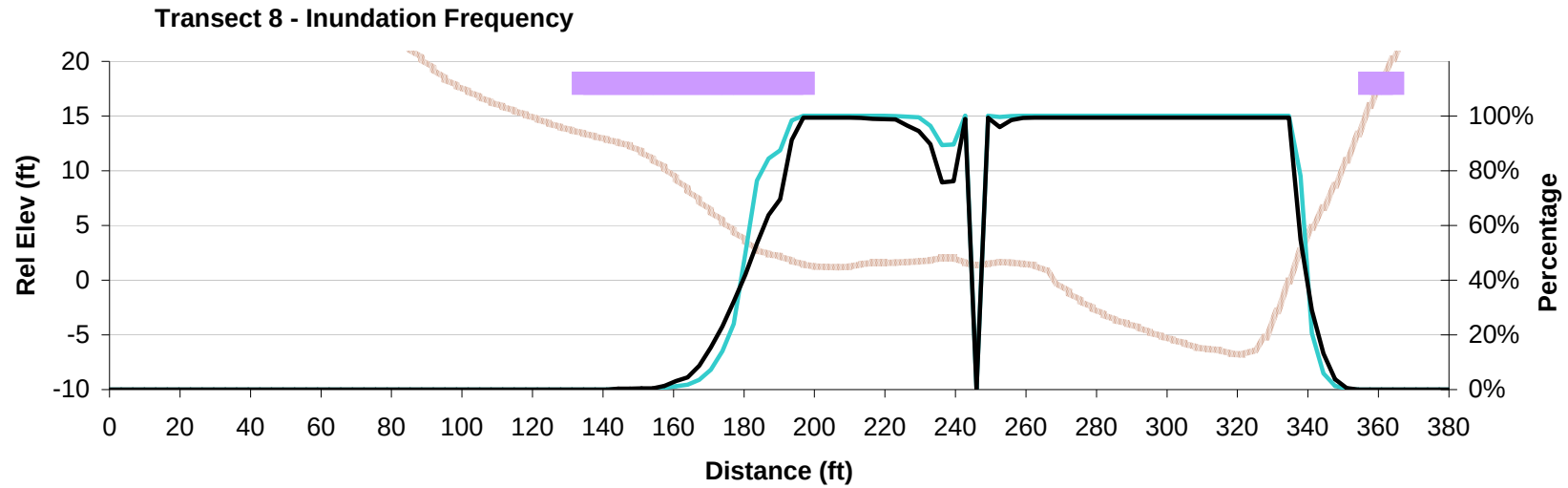


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF14.1

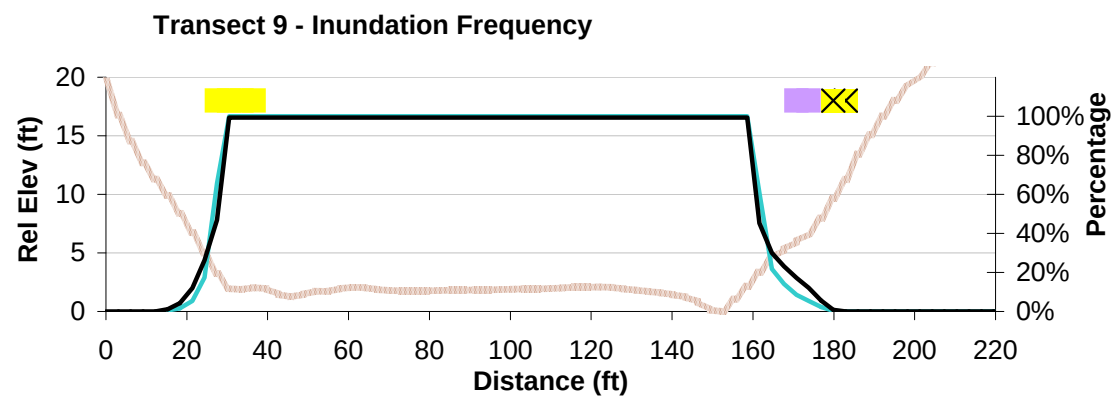
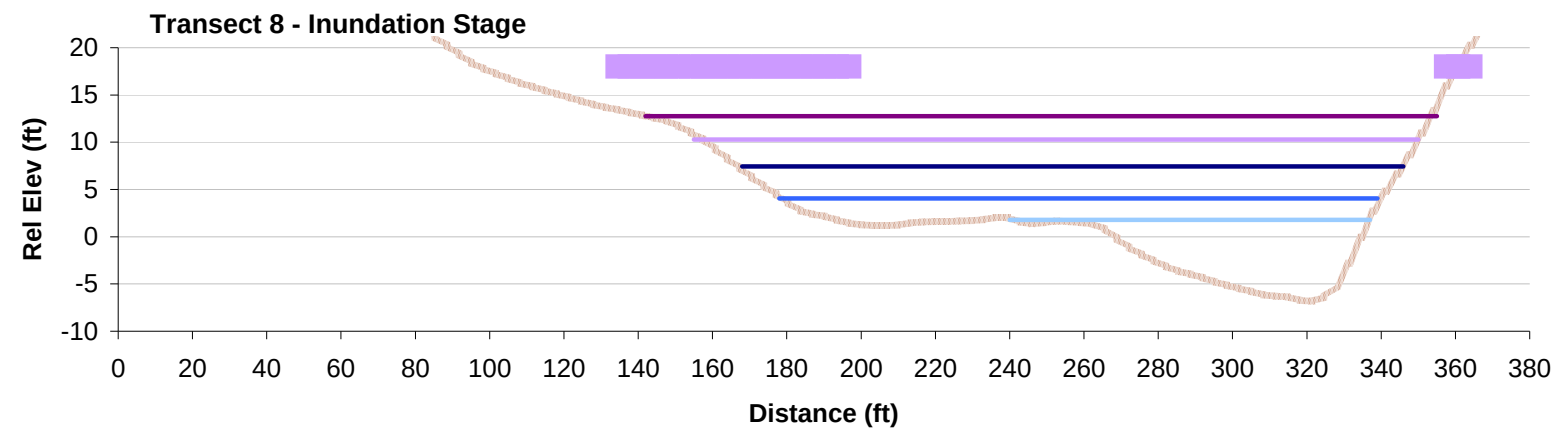
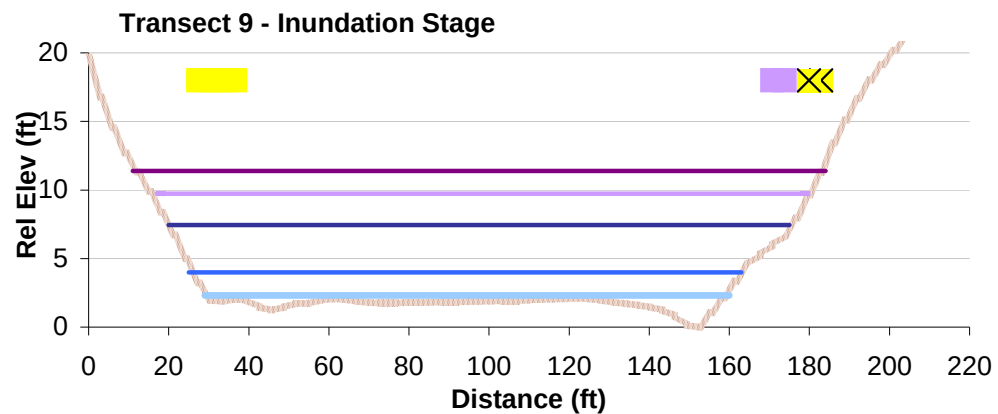
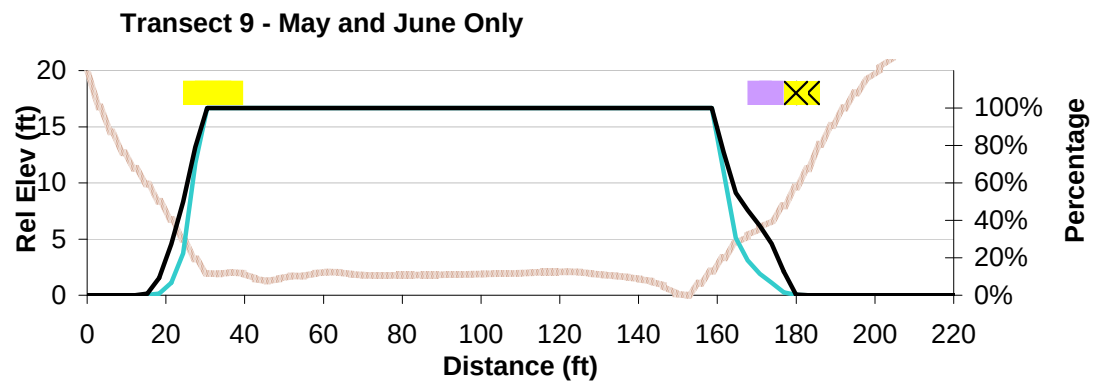


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF14.1



Note: Rel Elev = Relative Elevation

Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF14.1

Relationship of Stage and Inundation Frequency (a) and Wetted Width and Inundation Frequency (b) with Flow.

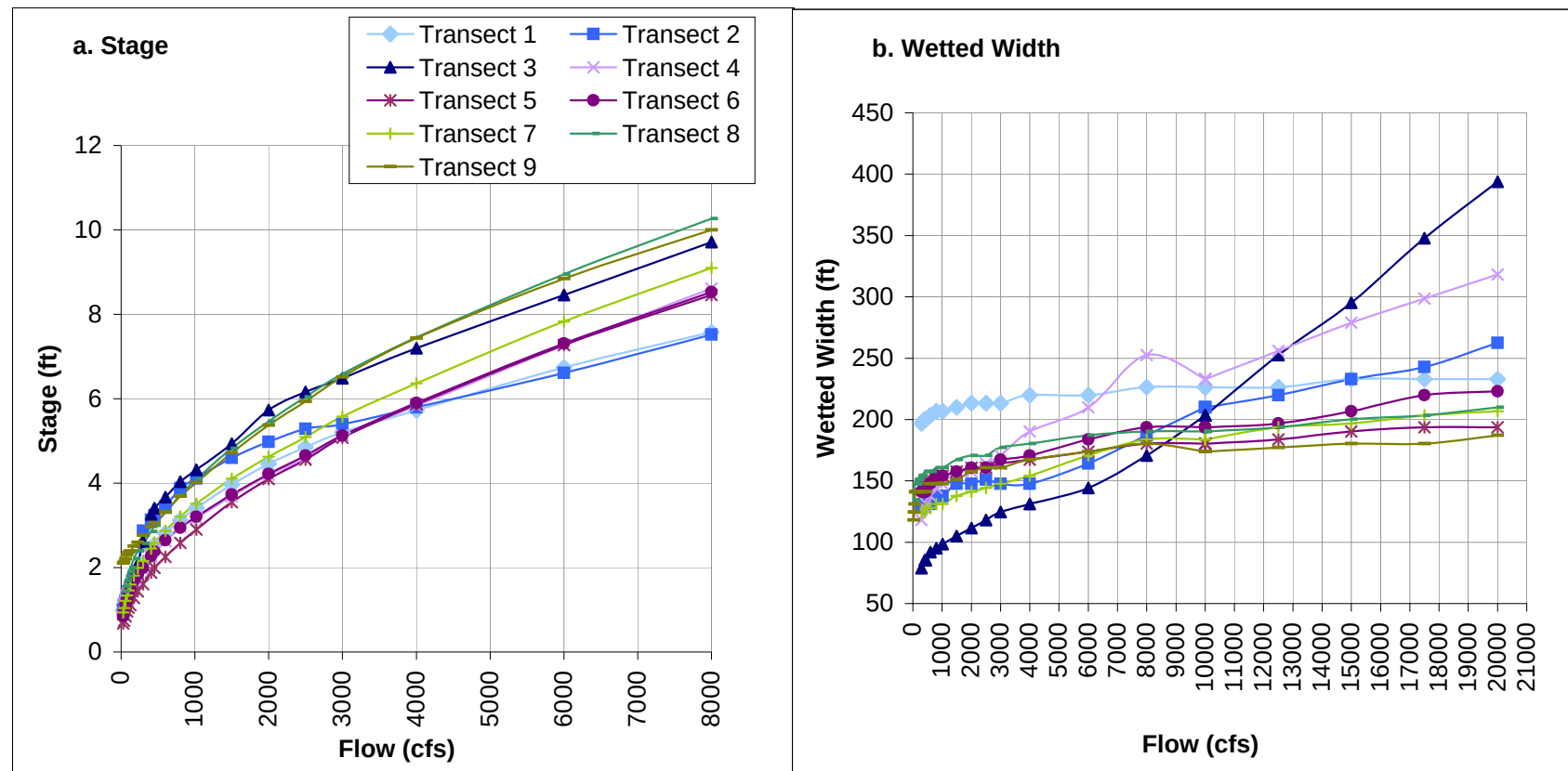


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF4.8

Note vertical exaggeration

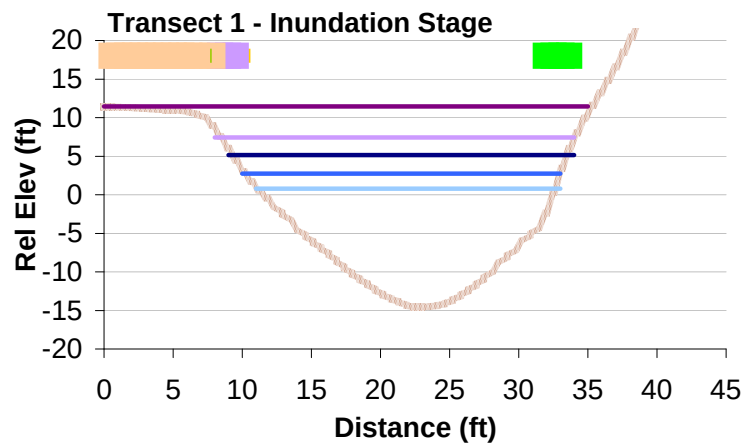
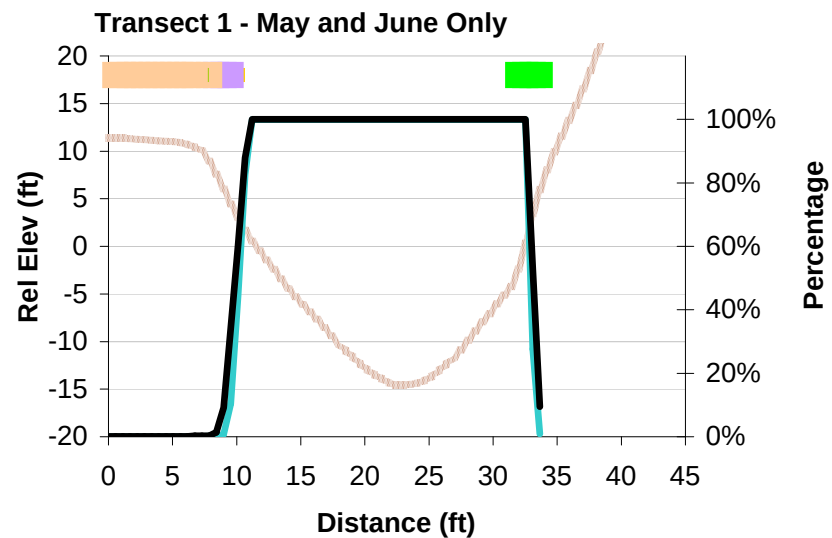
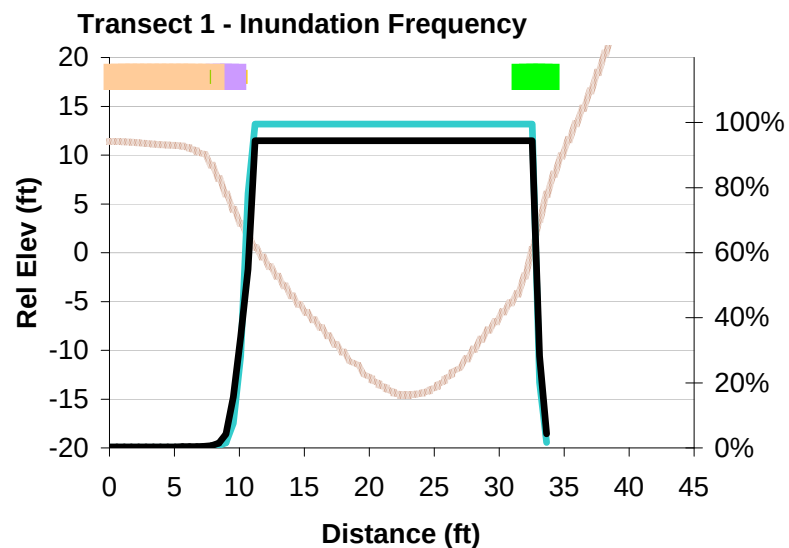


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF4.8

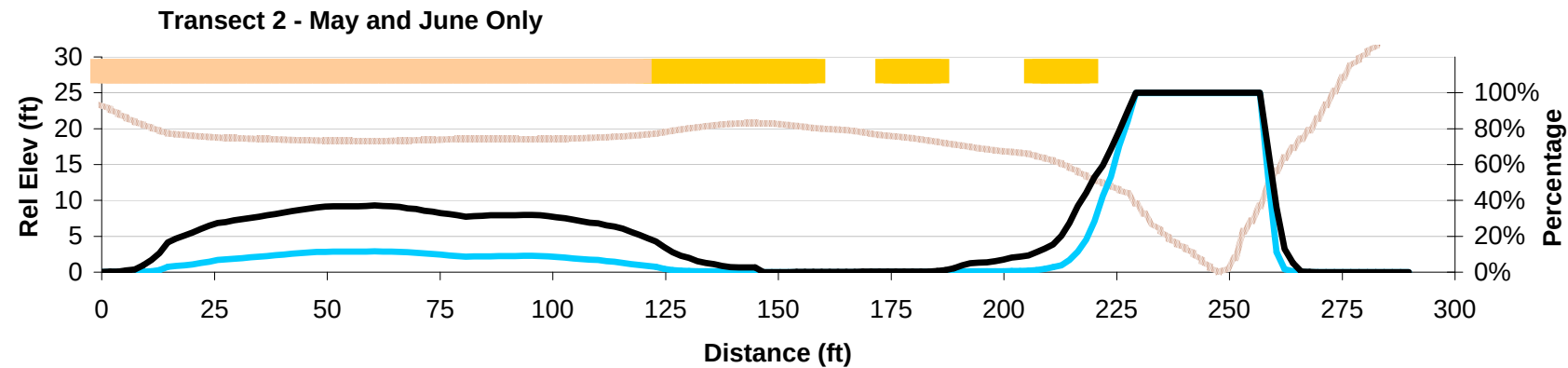
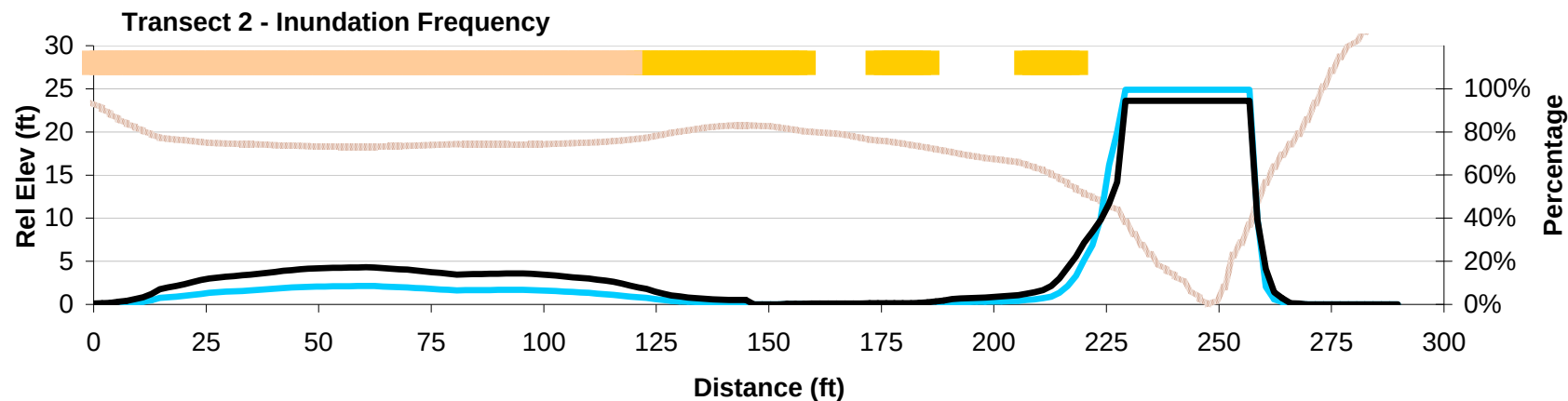


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF4.8

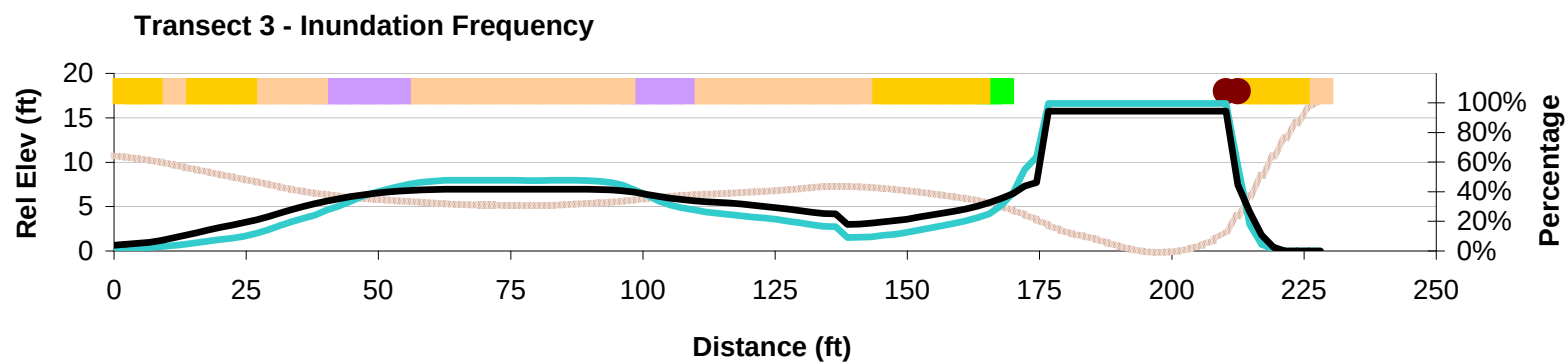
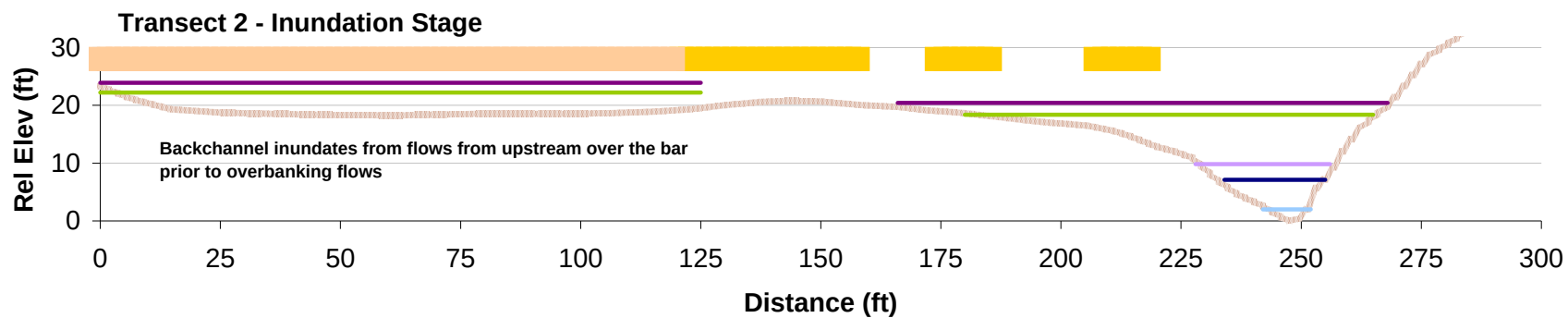


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF4.8

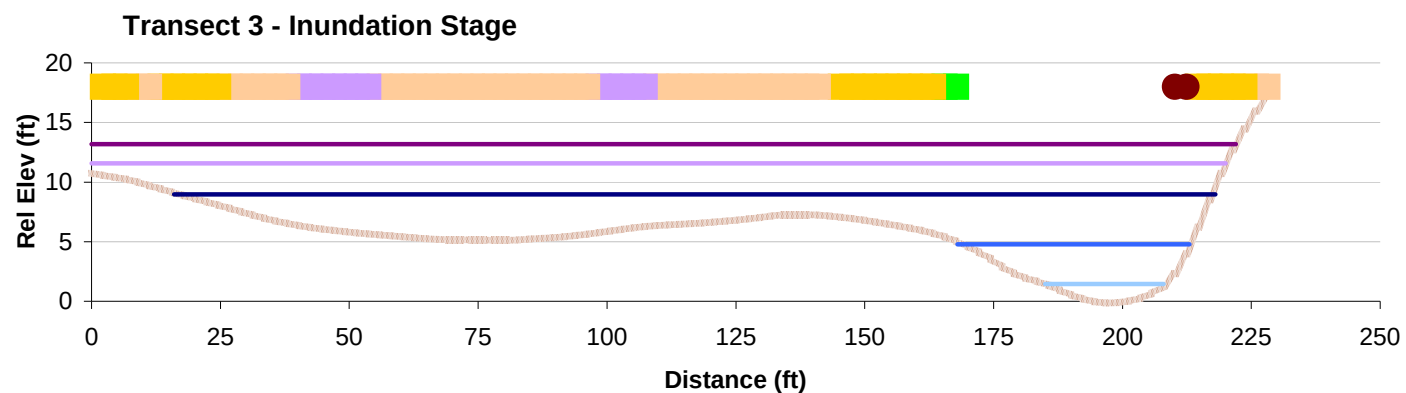
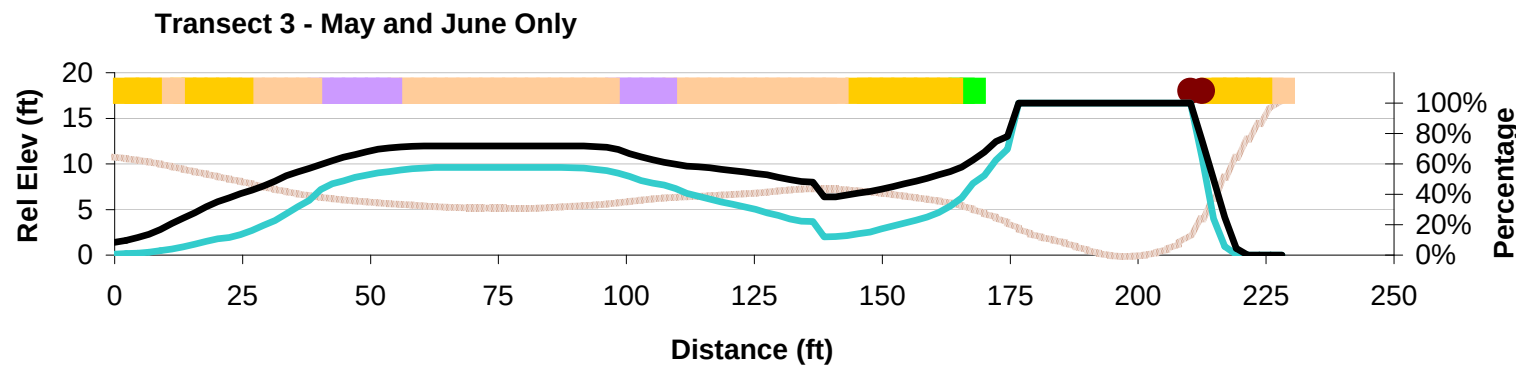


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF4.8

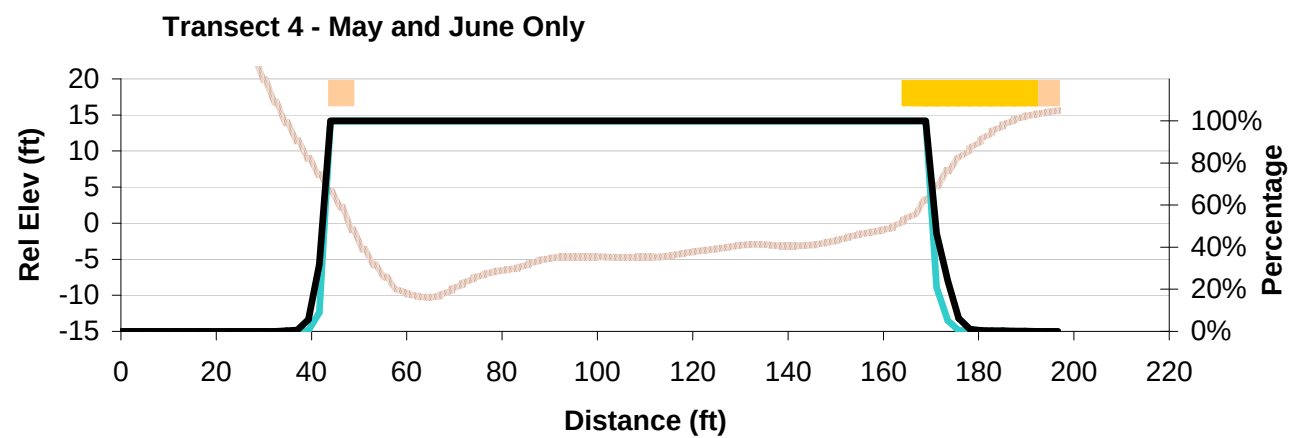
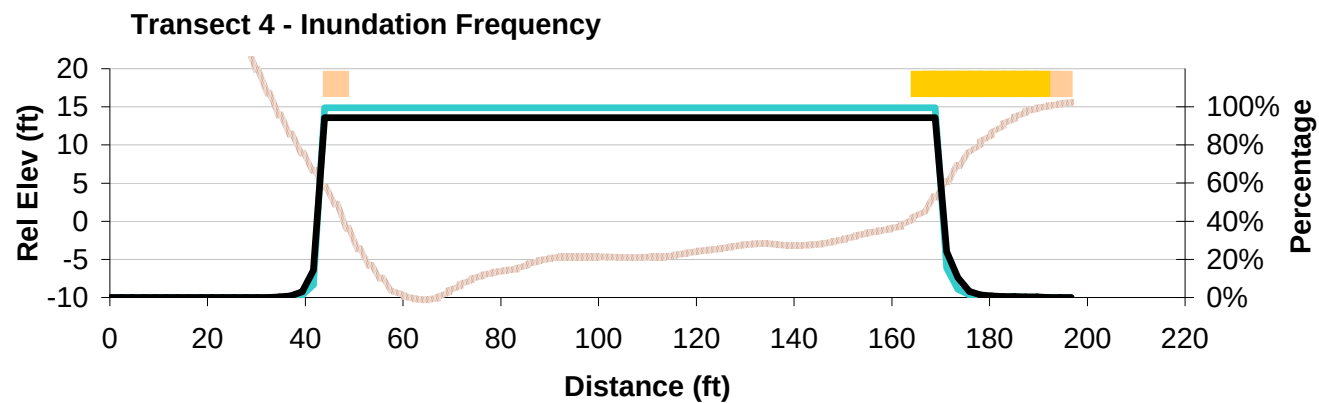
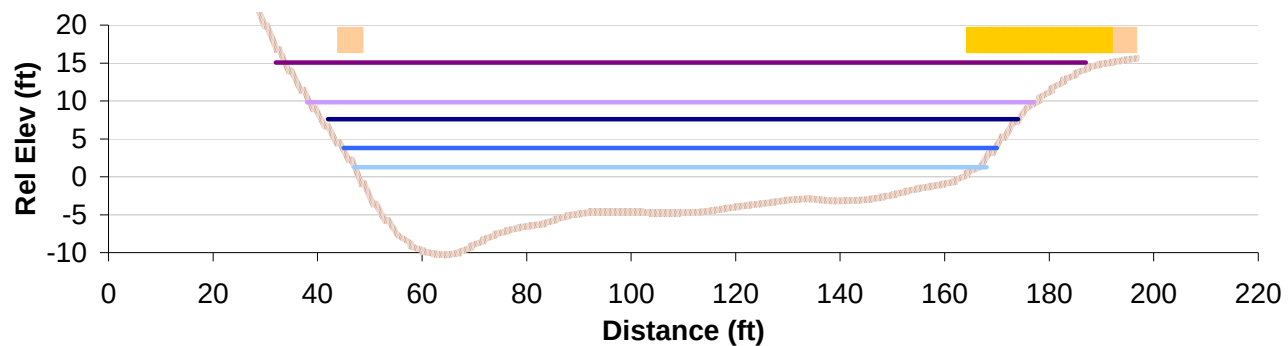


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF4.8

Transect 4 - Inundation Stage



Transect 5 - Inundation Frequency

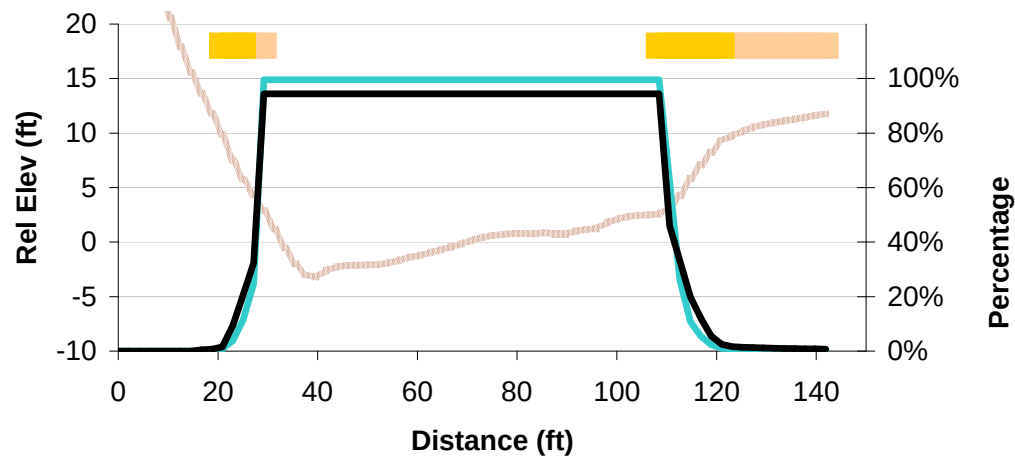


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF4.8

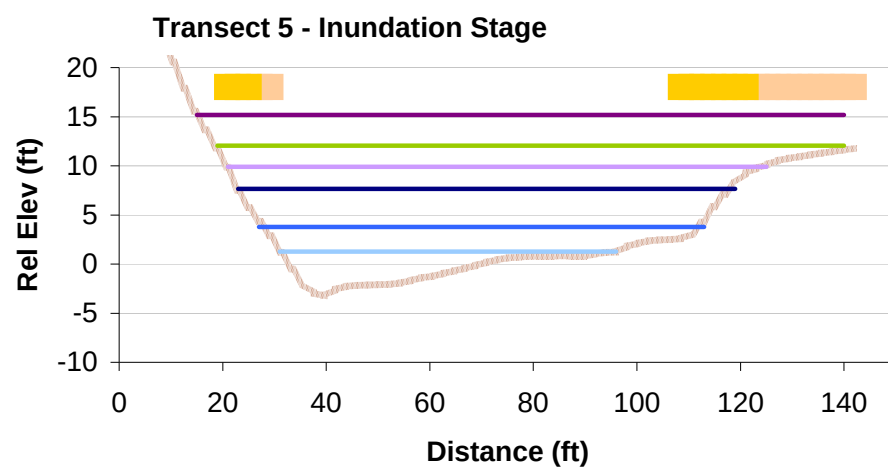
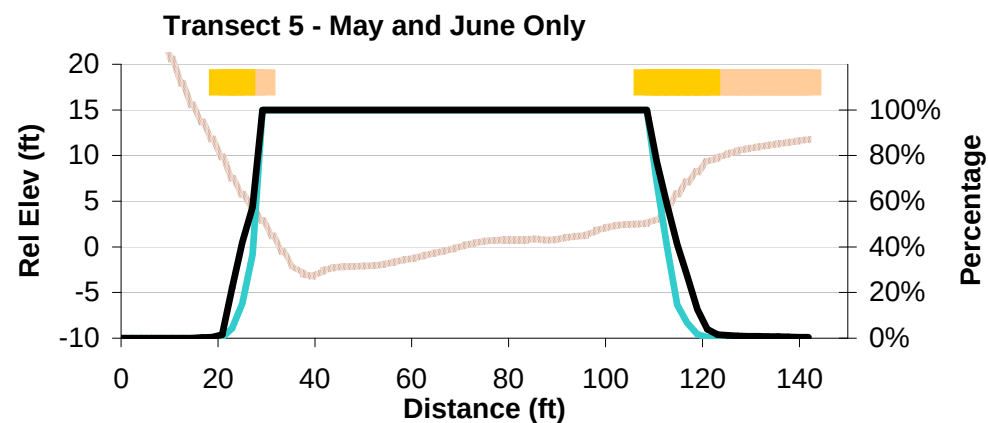


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF4.8

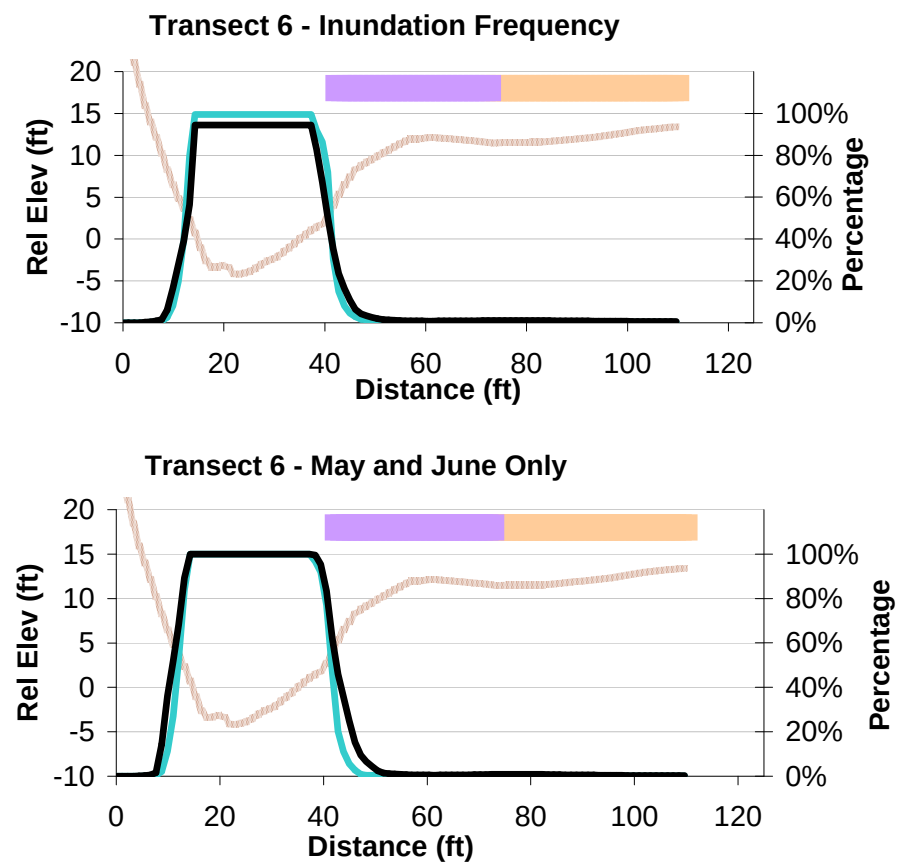


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF4.8

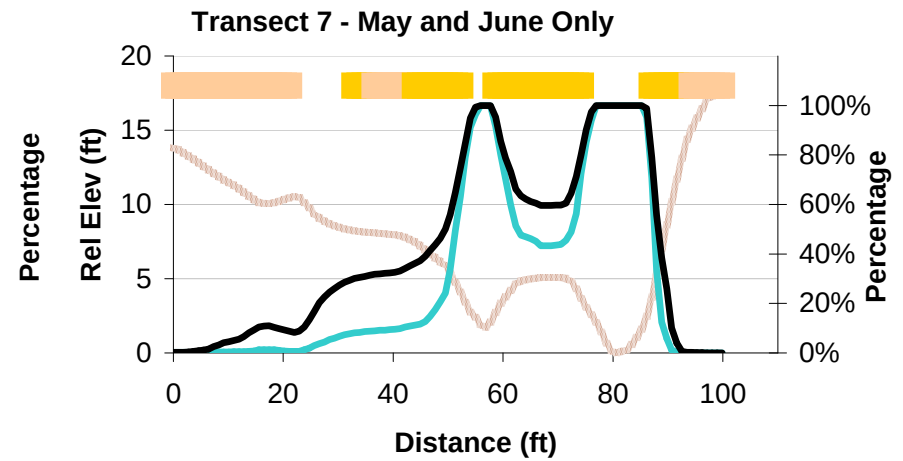
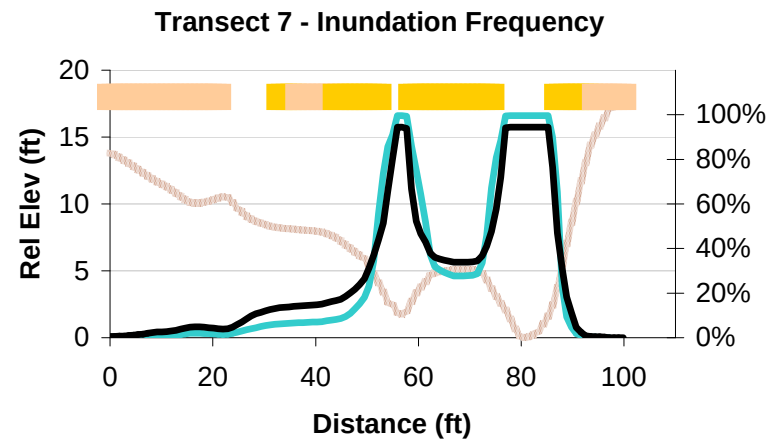
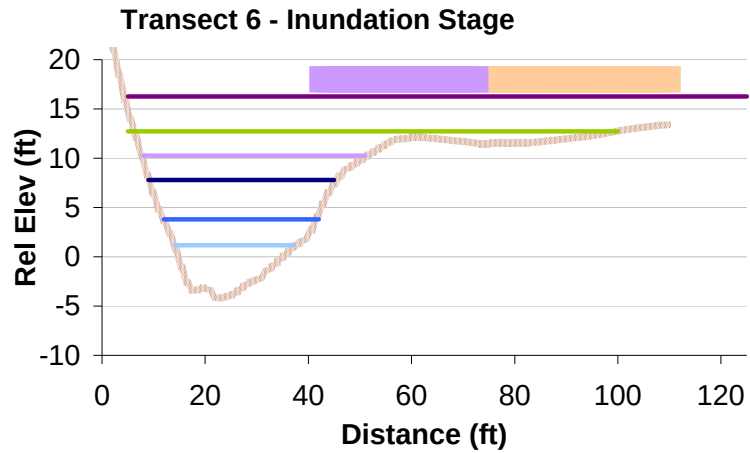


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF4.8

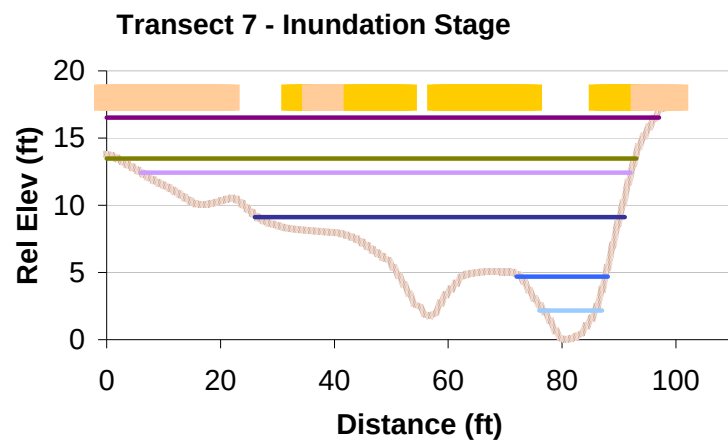


Figure F-1. Riparian Community Patterns and Inundation Frequencies and Stages Along Surveyed Transects on the Peaking Reach Study Sites (MF14.1 and MF4.8) (continued).

Middle Fork American River Peaking Reach - MF4.8

Relationship of Stage and Inundation Frequency (a) and Wetted Width and Inundation Frequency (b) with Flow.

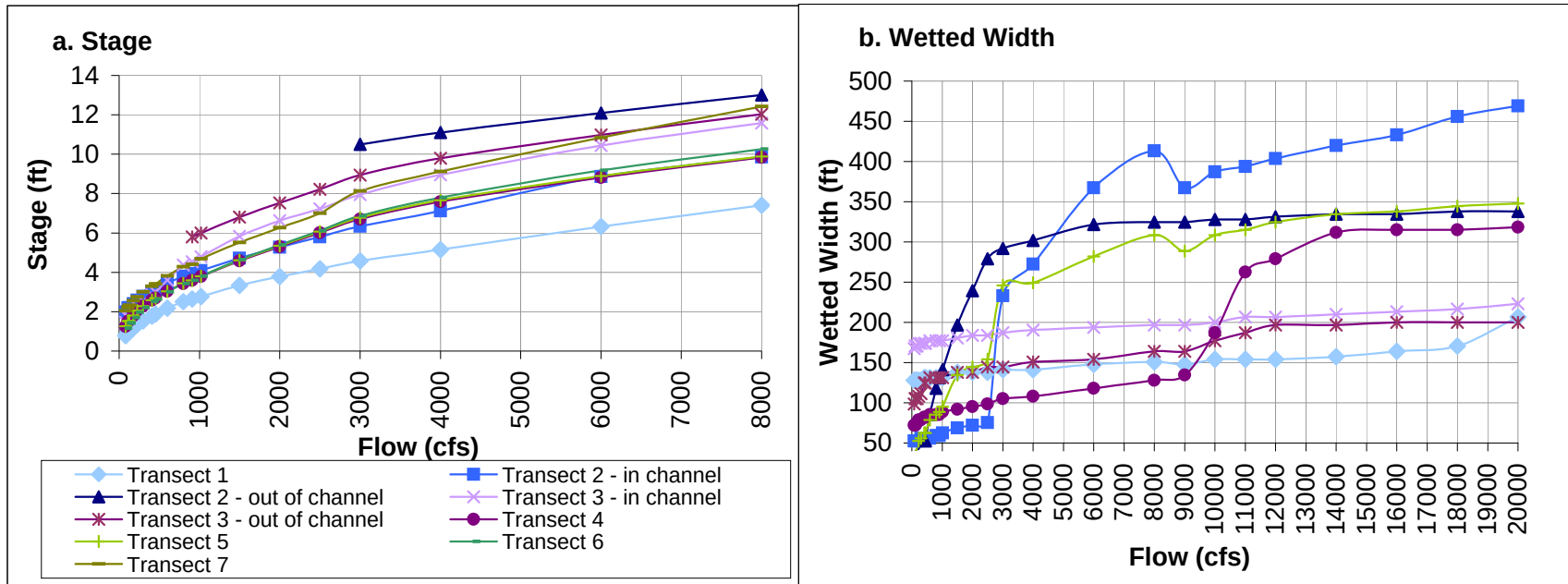
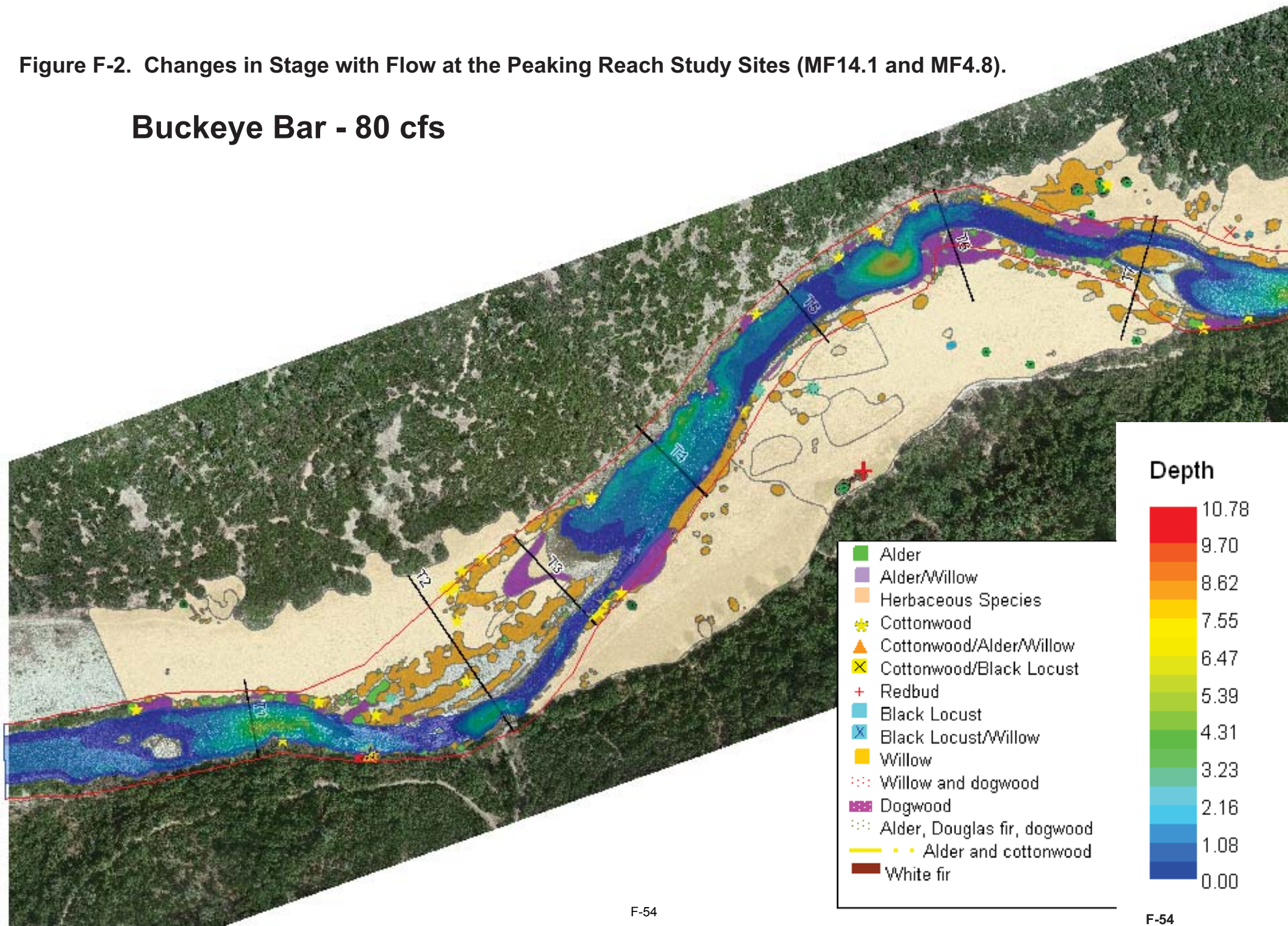
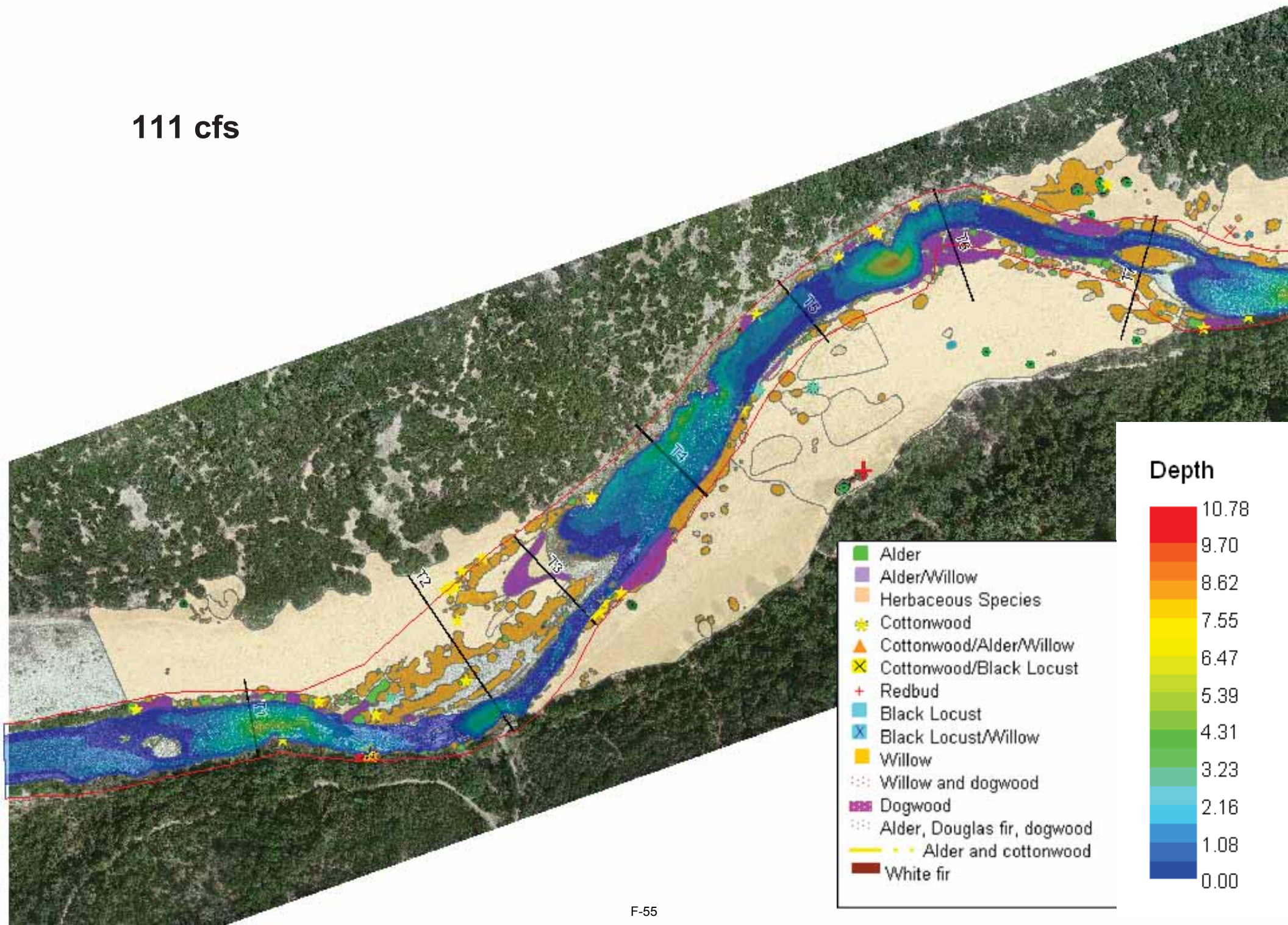


Figure F-2. Changes in Stage with Flow at the Peaking Reach Study Sites (MF14.1 and MF4.8).

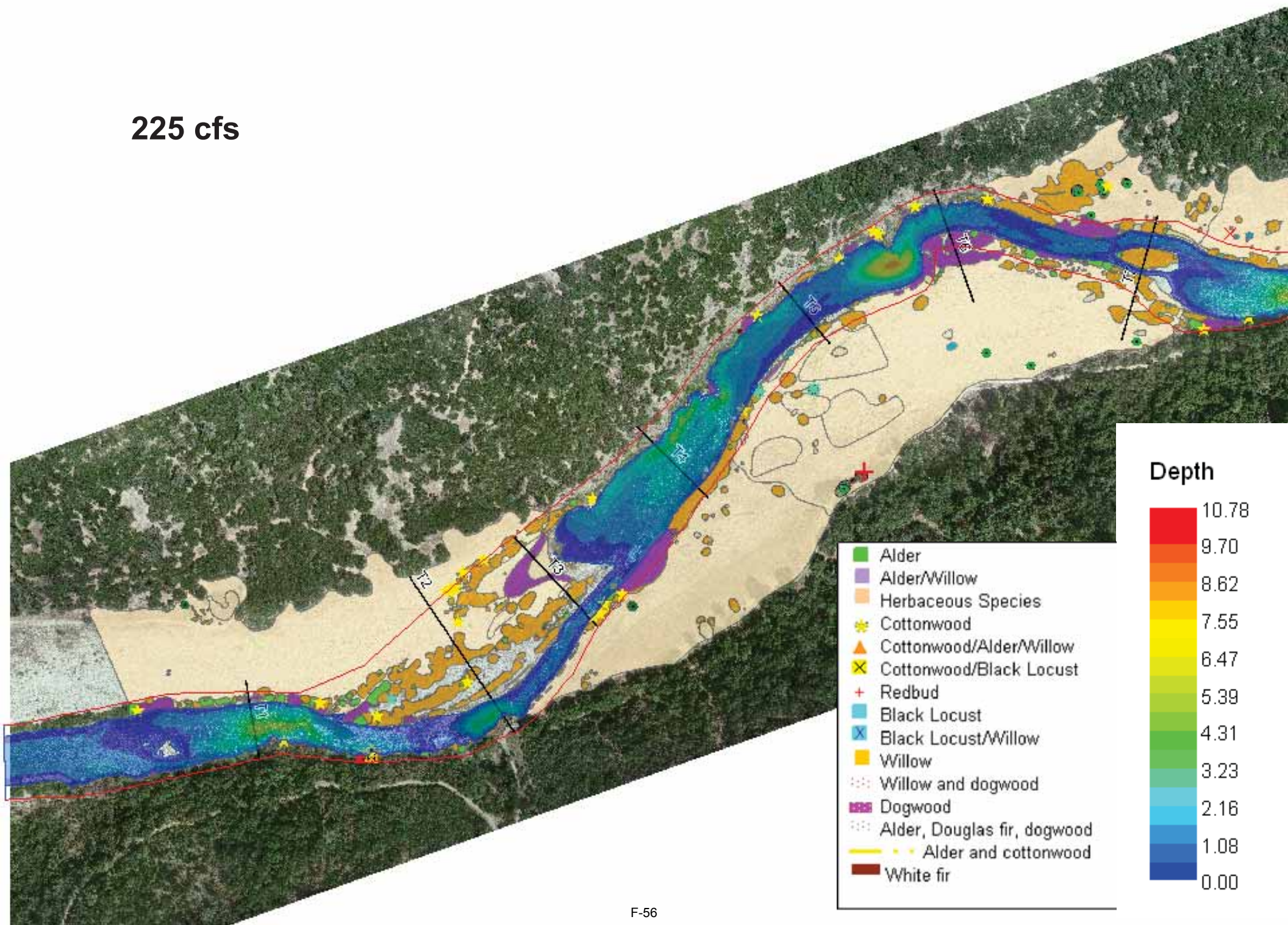
Buckeye Bar - 80 cfs



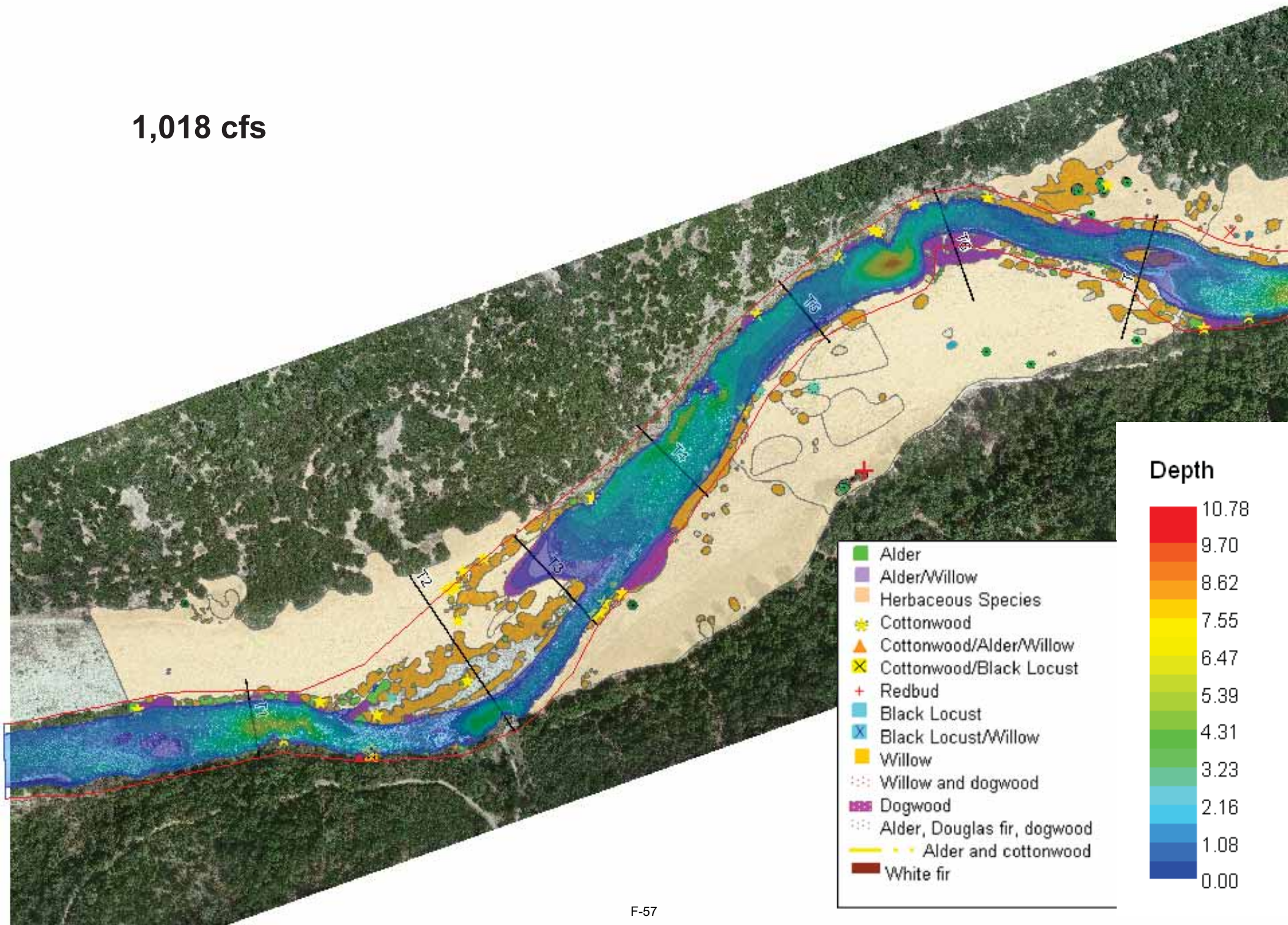
111 cfs



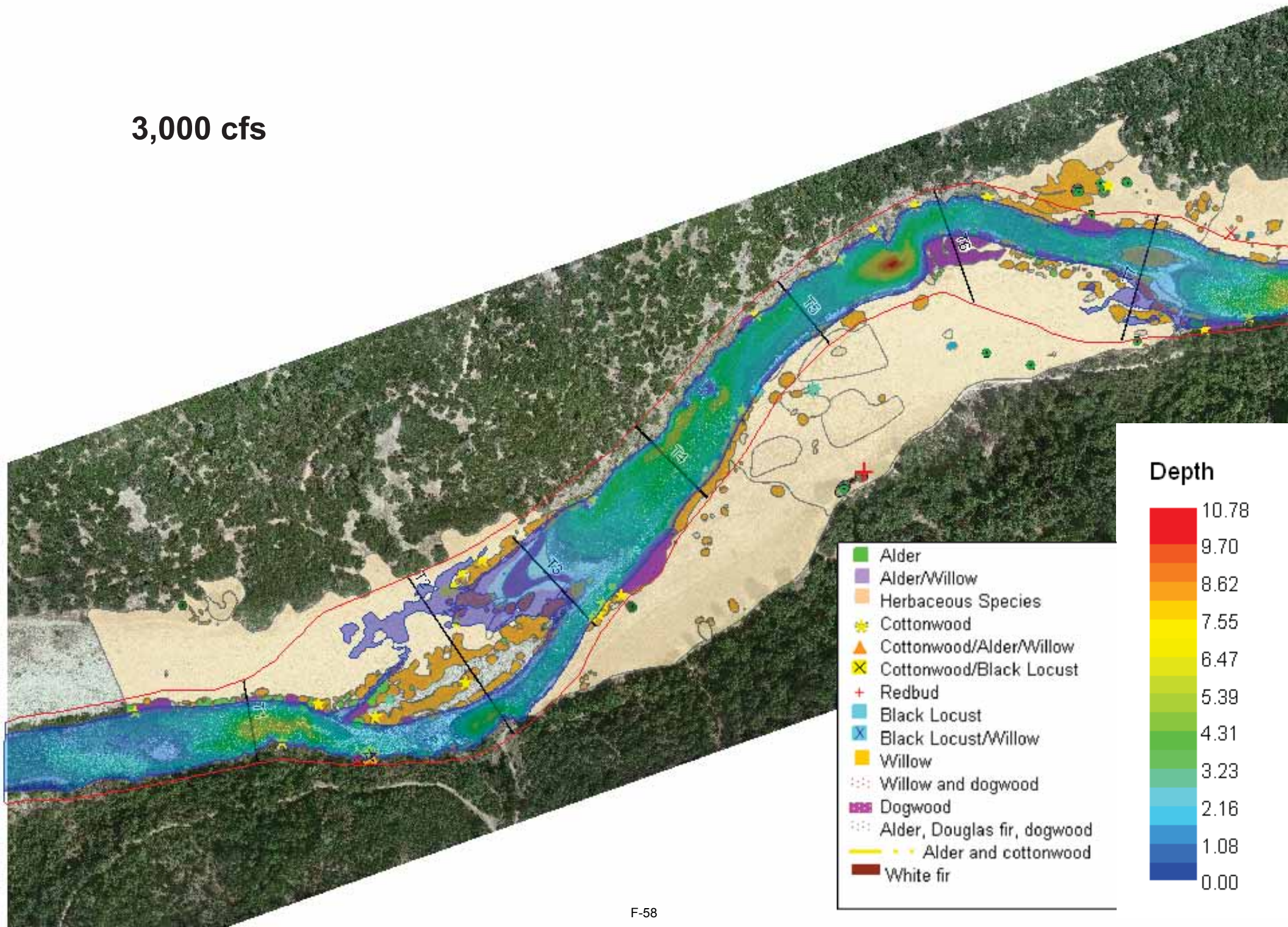
225 cfs



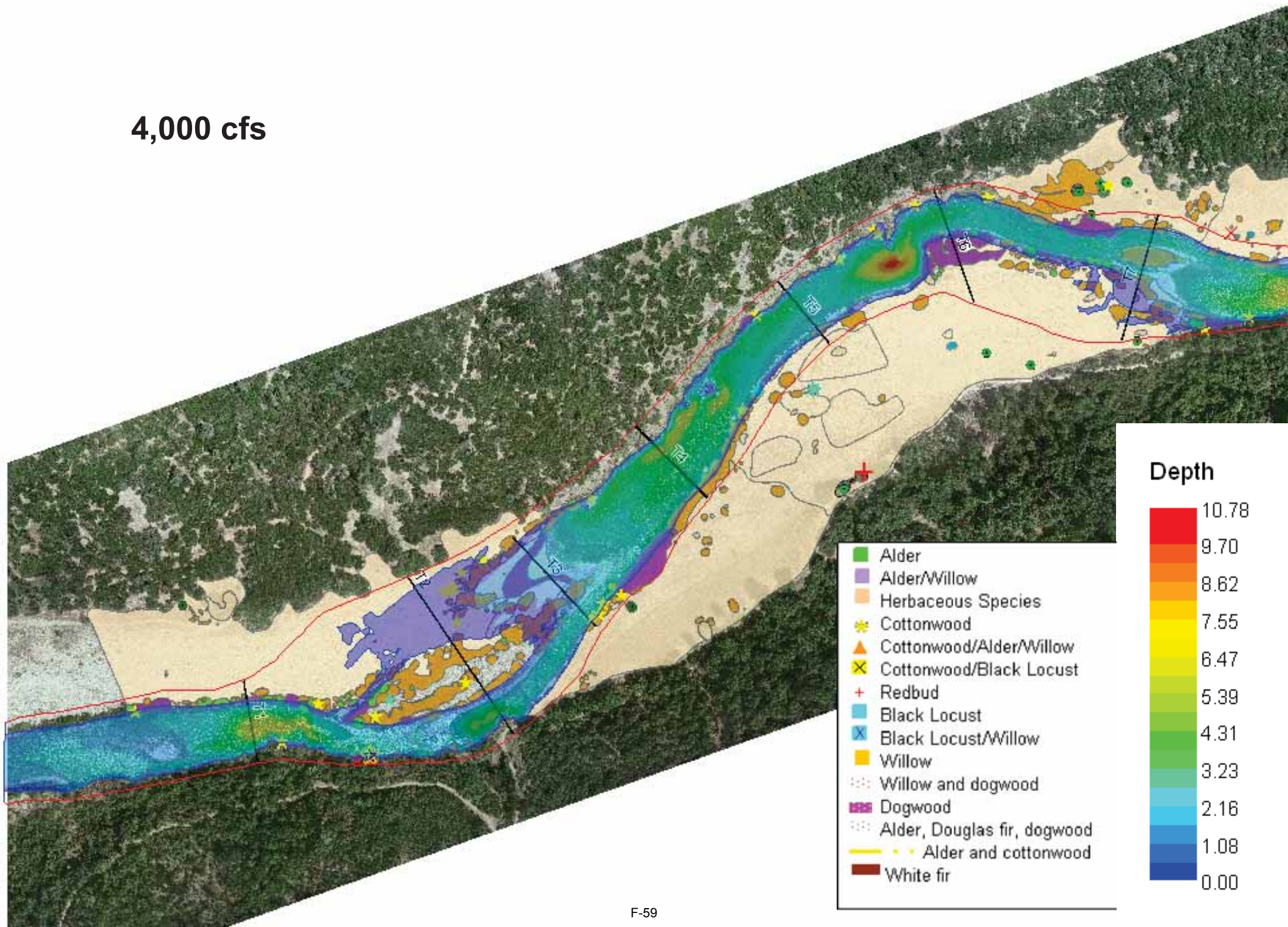
1,018 cfs



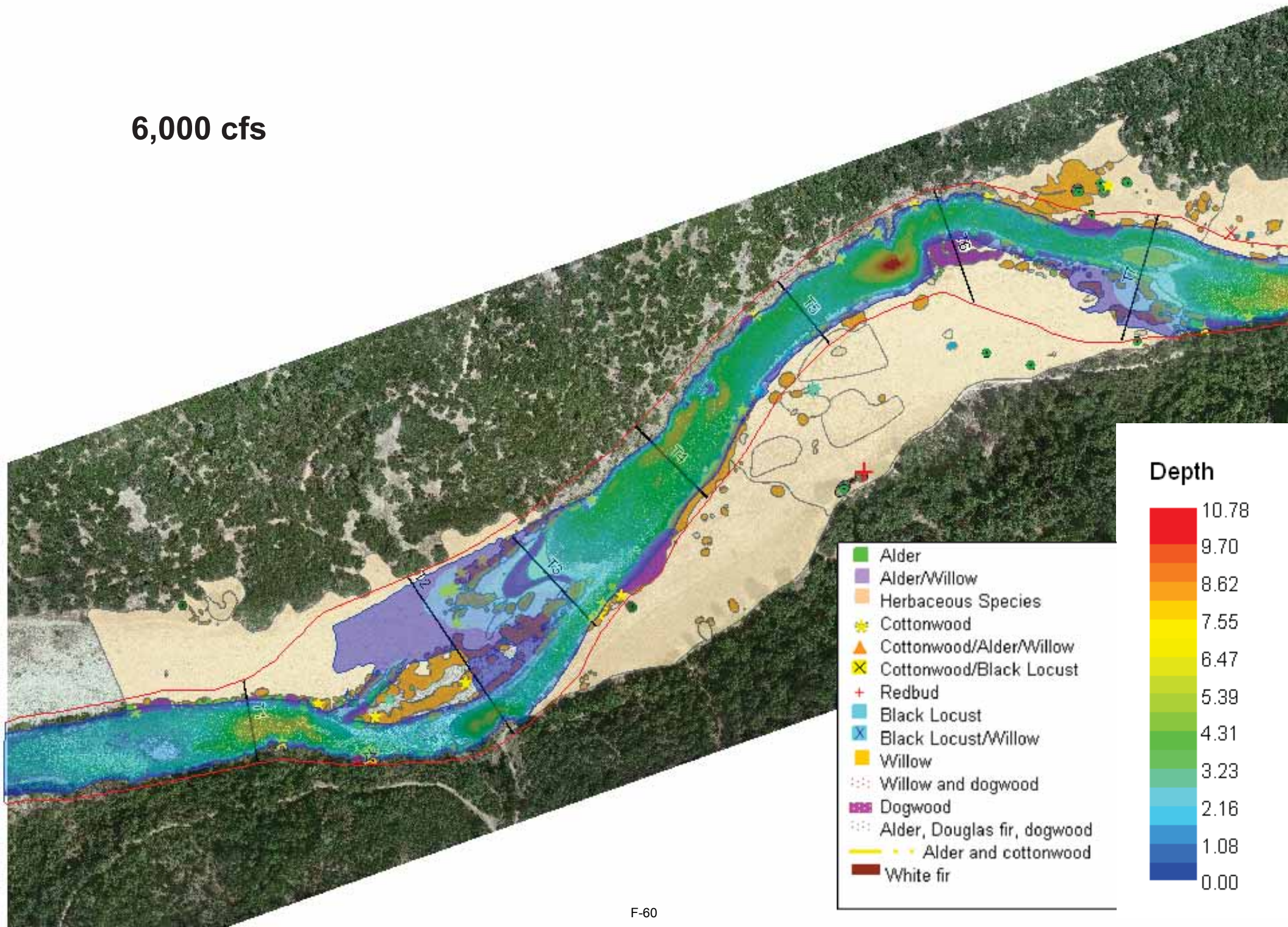
3,000 cfs



4,000 cfs



6,000 cfs



8,000 cfs

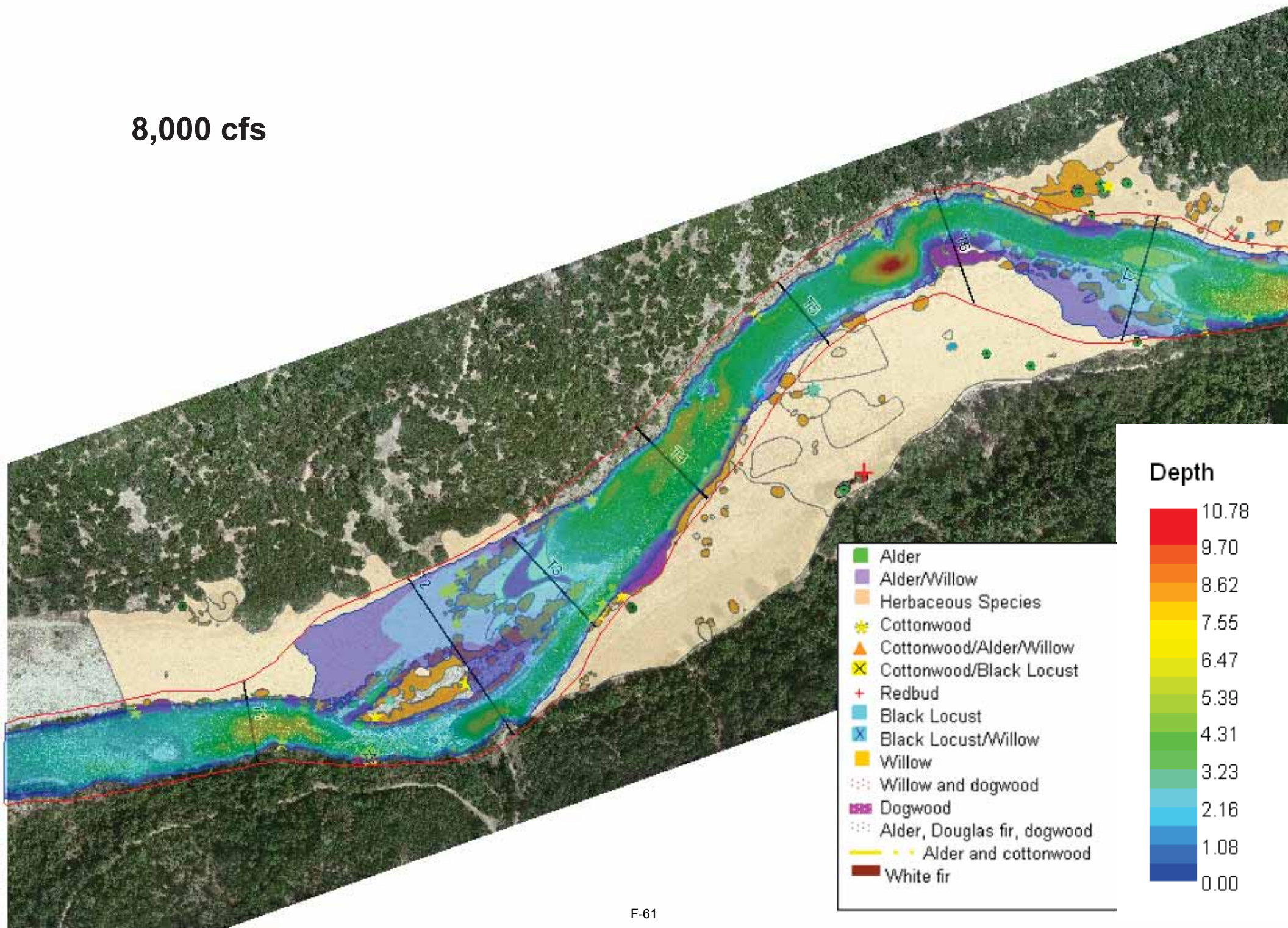
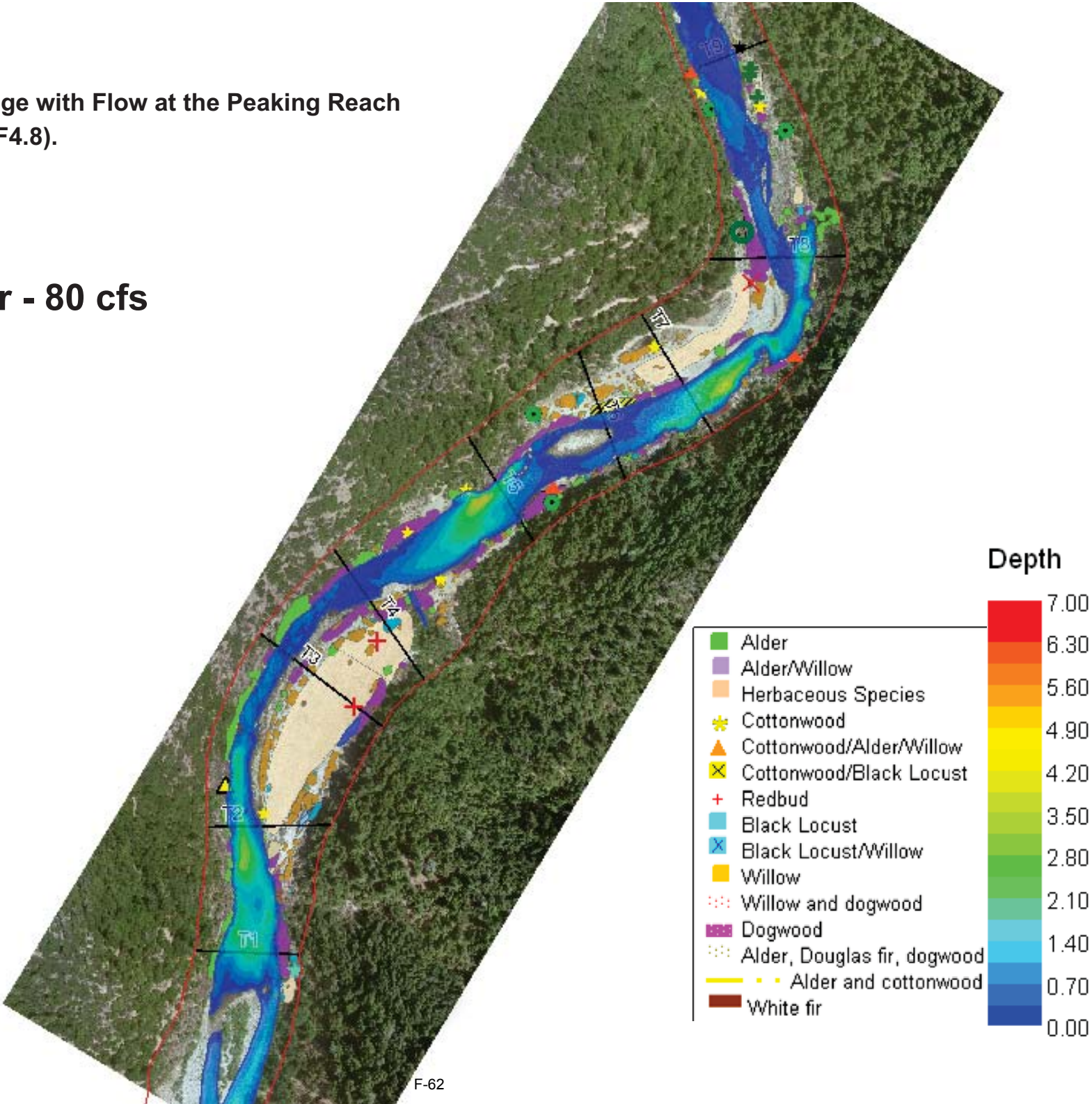
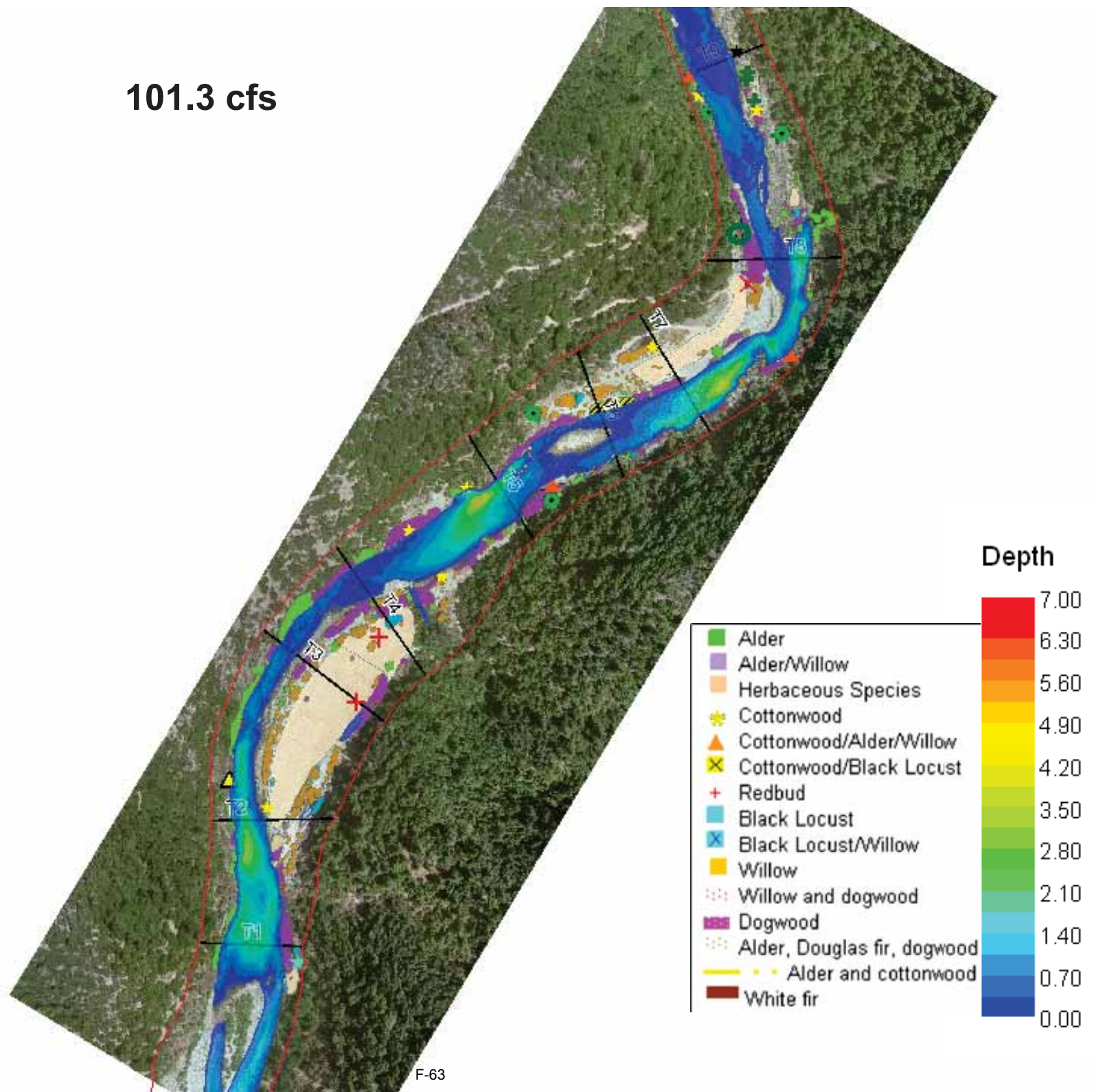


Figure F-2. Changes in Stage with Flow at the Peaking Reach Study Sites (MF14.1 and MF4.8).

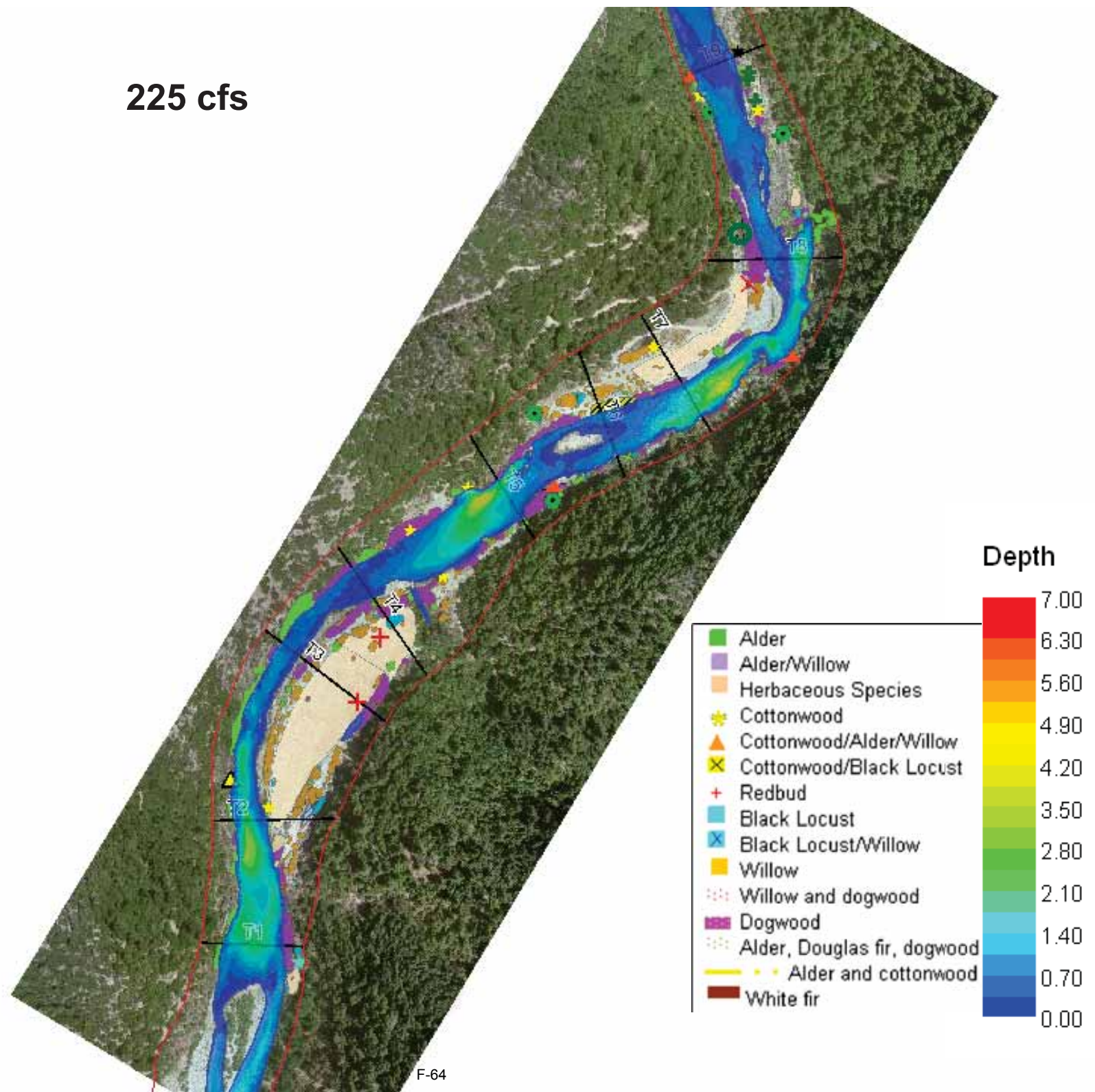
Fords Bar - 80 cfs



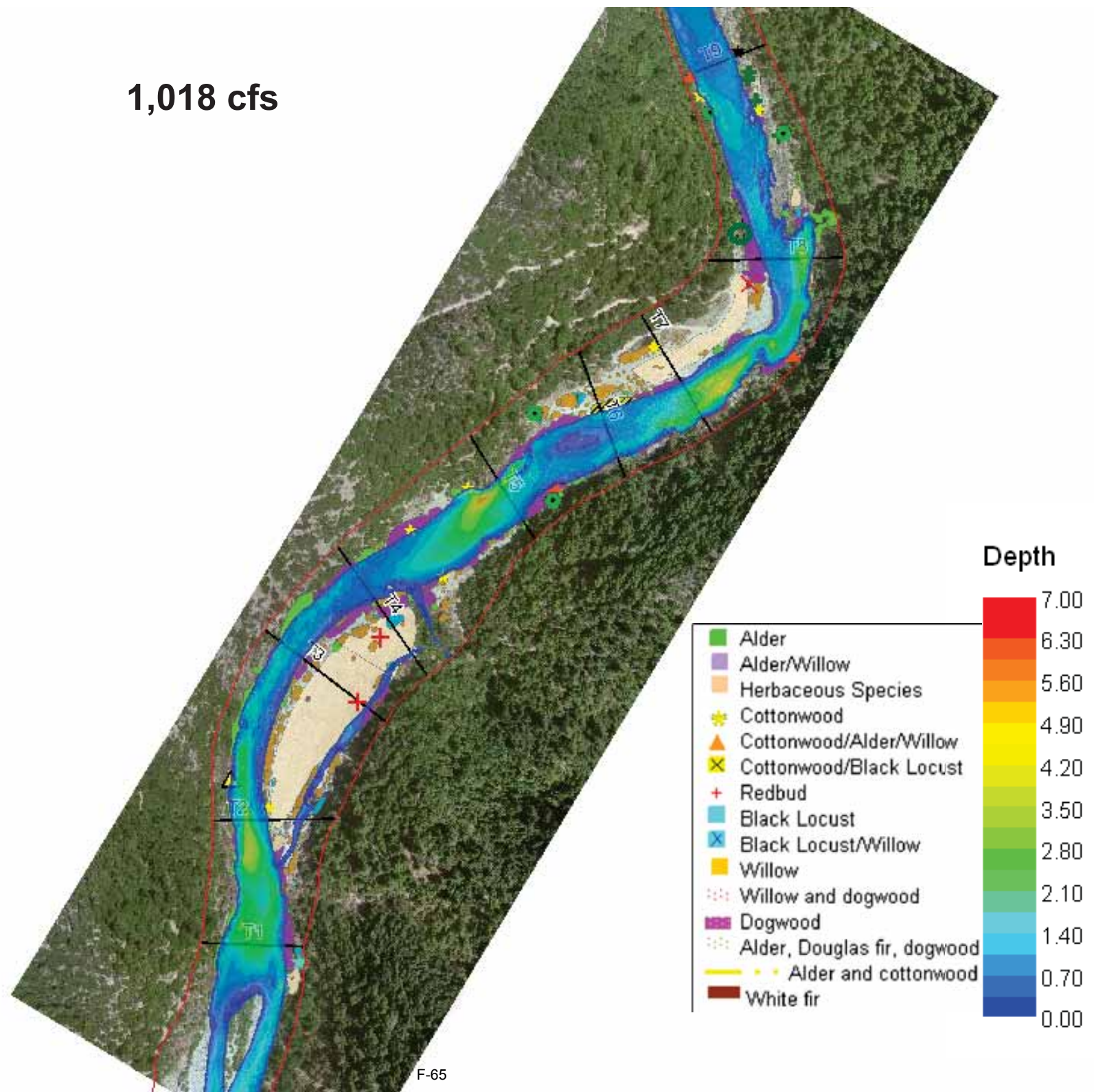
101.3 cfs



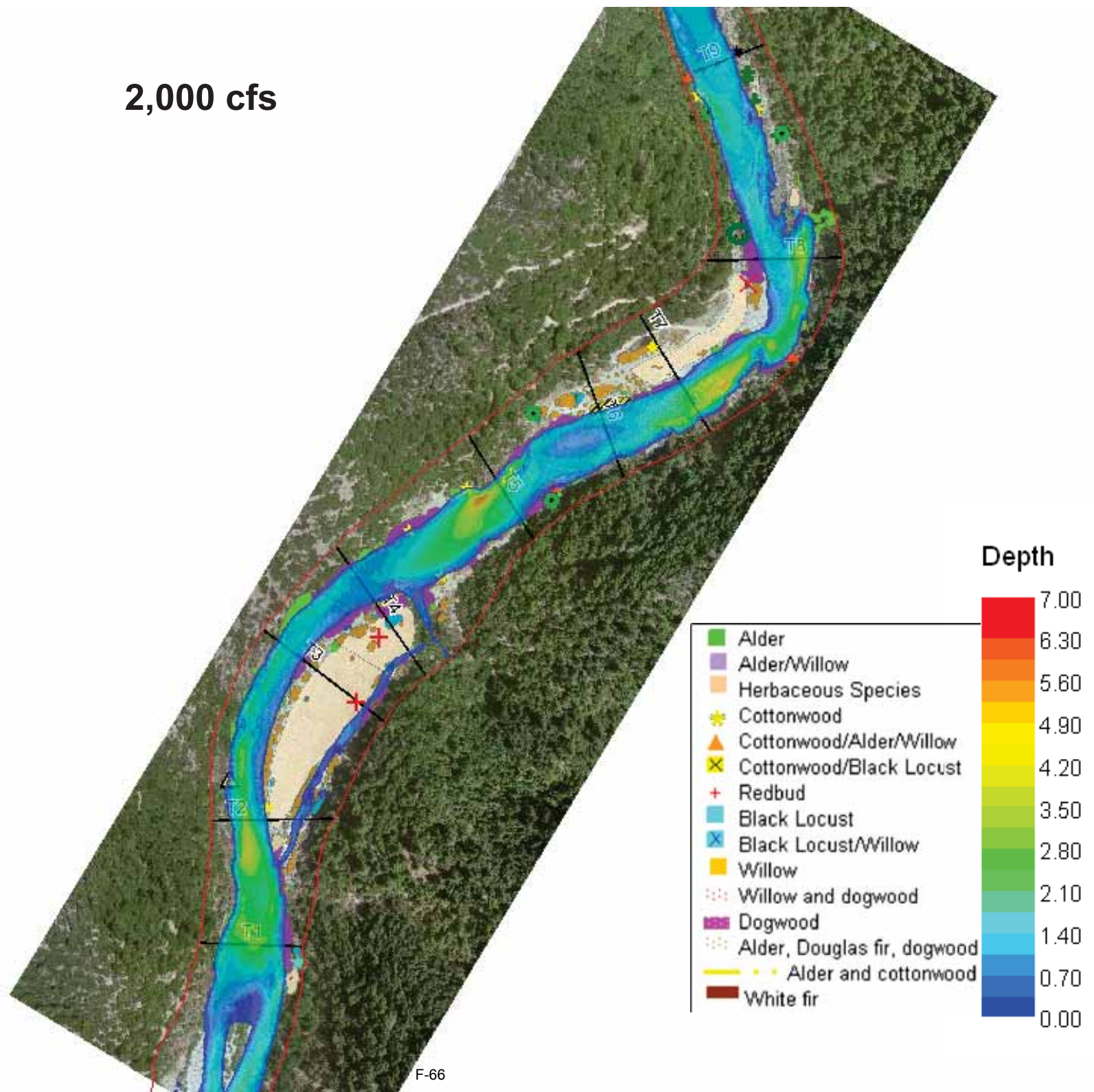
225 cfs



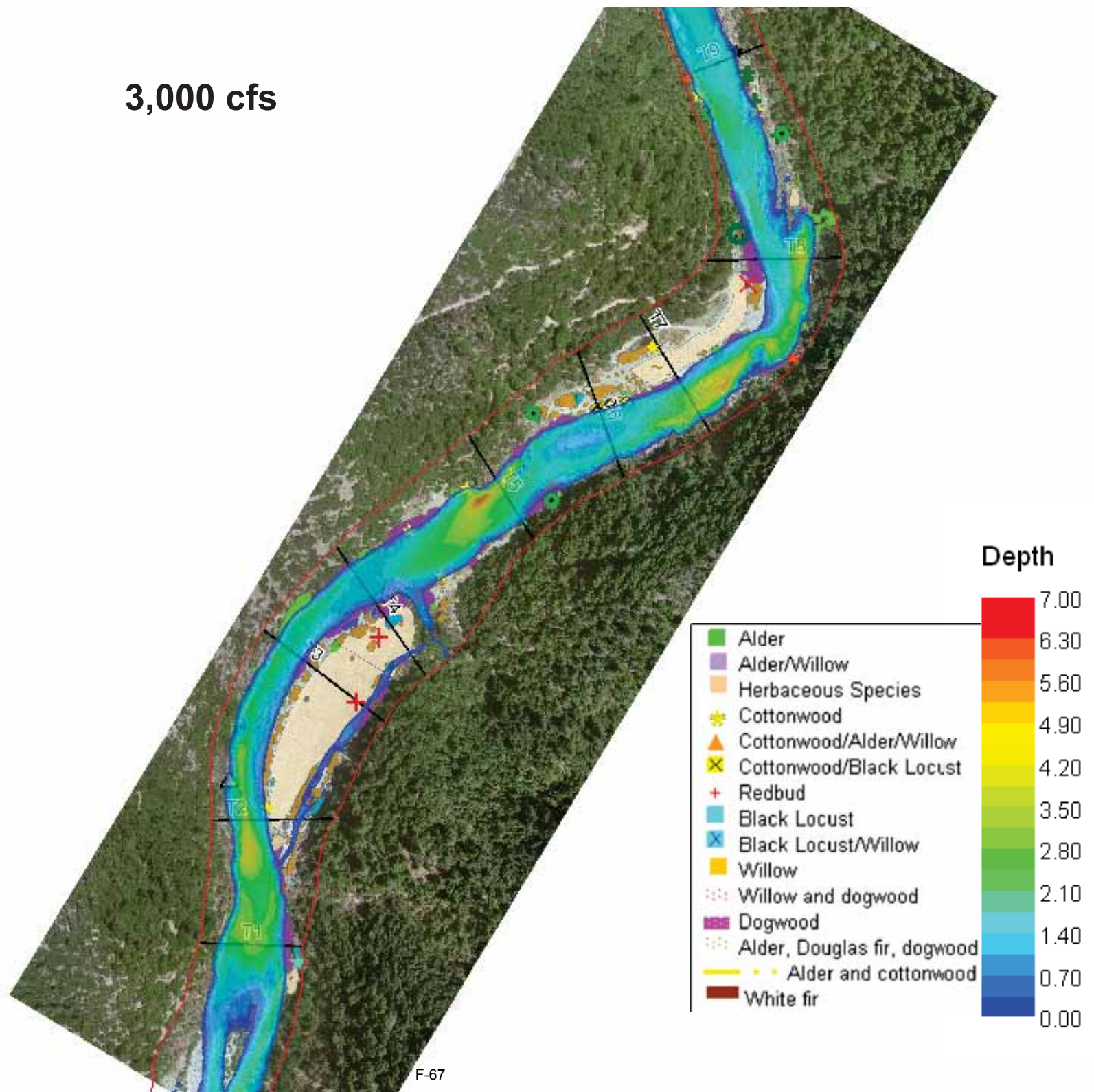
1,018 cfs



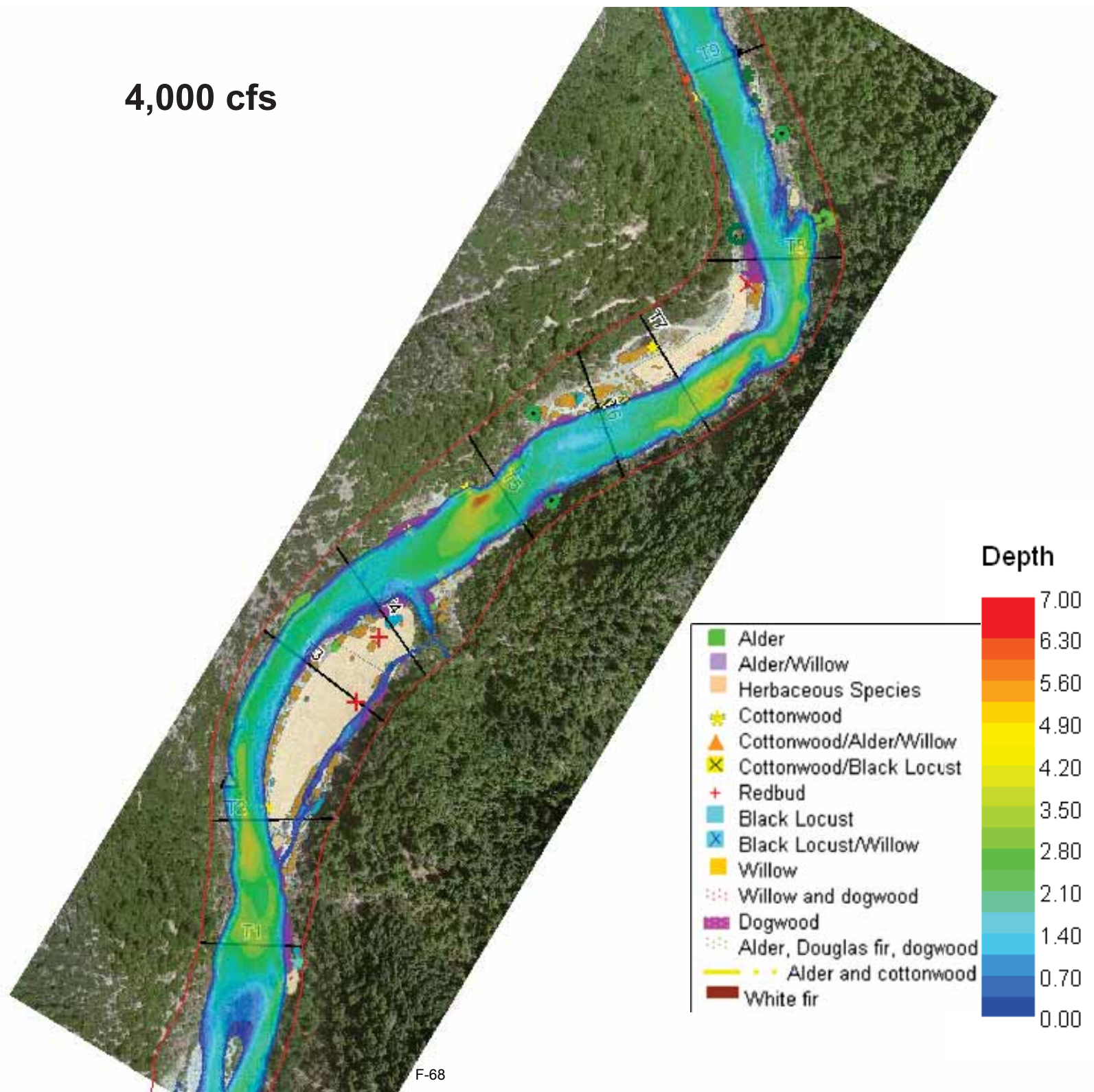
2,000 cfs



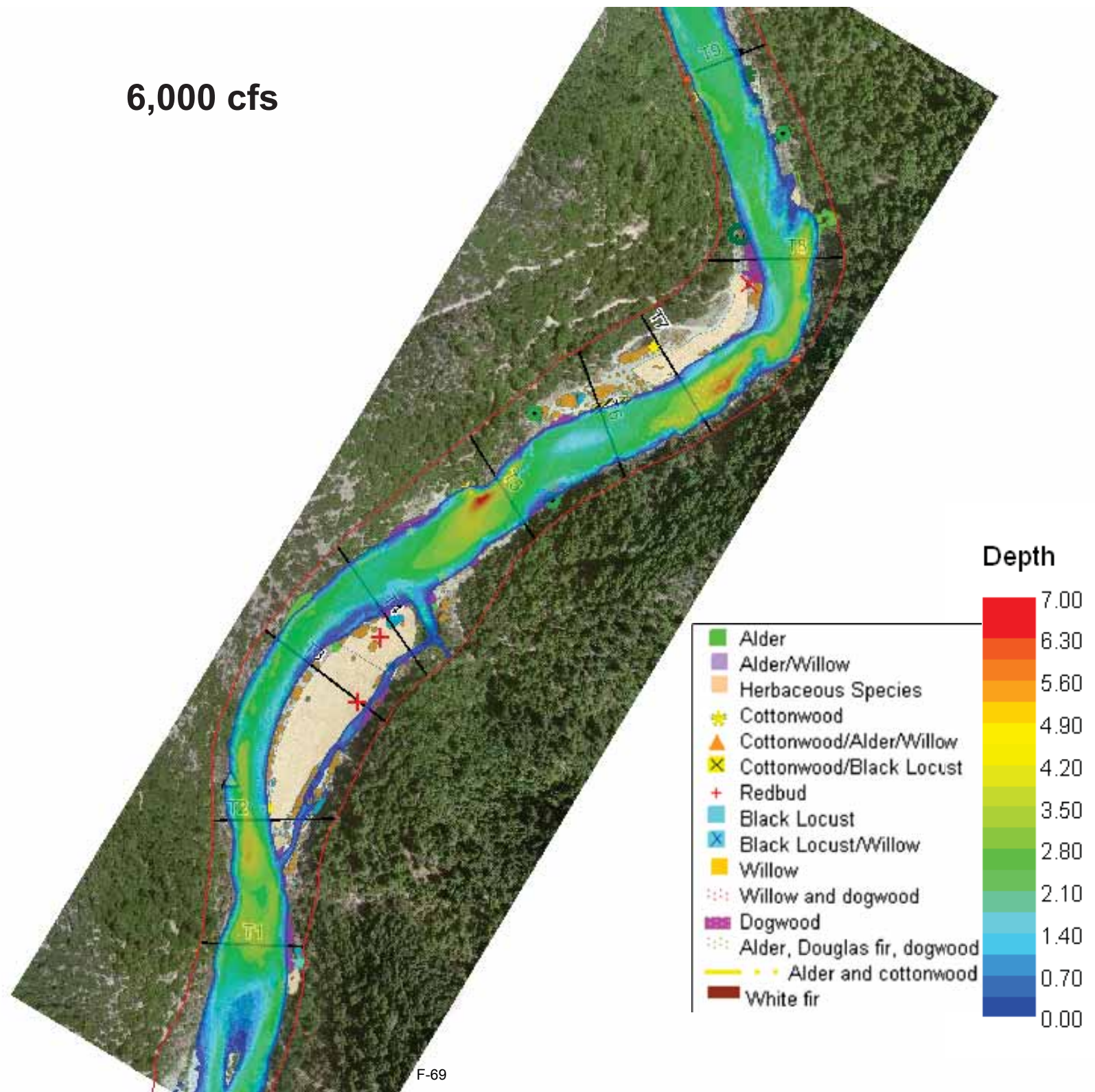
3,000 cfs



4,000 cfs



6,000 cfs



MAPS

APPENDIX G
Tree Cores – Results

Riparian Recruitment along the Middle Fork American River, Rubicon River, and Comparison Rivers

Tables

- Table G-1. Summary of Tree Core Data on the Comparison, Bypass, and Peaking Reaches.

Figures

- Figure G-1. Number of Trees Dated and Cumulative Distribution by Year along the Middle Fork American River and Comparison Rivers (top) and Rubicon River and Comparison Rivers (bottom).
- Figure G-2. Riparian Tree Successful Recruitment Events on the Middle Fork American River – Below Middle Fork Interbay (MF29.4 and MF28.6) (a); Upper Peaking Reach (MF17) (b); and Near Buckeye Bar (MF4.8) (c).
- Figure G-3. Riparian Tree Successful Recruitment Events on the Rubicon River – Below Hell Hole Dam (R25.7) (a); Below South Fork Rubicon River Confluence (R20.9) (b); and Below the Long Canyon Creek Confluence (R2.6/ 3.5) (c).
- Figure G-4. Riparian Tree Successful Recruitment Events on the North Fork American River (NF31.3) (A) and the North Fork of the Middle Fork American River (NFMF2.3) (B).
- Figure G-5. Relationship Between Rooted Elevation of Dated Trees Above Summer Baseflow and Inundation Frequency on the Rubicon River, Middle Fork American River, and Comparison Rivers for All Water Year Types (1975–2007).

Riparian Recruitment along the Middle Fork American River, Rubicon River, and Comparison Rivers

Recruitment along each of the reaches where tree cores analyses were completed is summarized below. Recession rates are discussed in Section 6.2.1.

Middle Fork American River Bypass Reach – On the Middle Fork American River downstream of Middle Fork Interbay, the majority of the trees established following large flows in 1986 and 1996–1997 when relatively low magnitude spring flow events occurred (approximately 700–1,400 cfs) (Figures G-1 and G-2). Approximately one-third of the sampled trees (10 trees) established prior to 1975. The younger trees (all species) that were dated (1996 and younger) were all established less than two feet above summer baseflow, near the water's edge (Figure G-5 and Table G-1). In comparison, the older trees (some established soon after construction of Middle Fork Interbay Dam) were rooted near the estimated bankfull elevation (four to six feet above summer baseflow).

Middle Fork American River Peaking Reach – Tree cores were collected from two sites (at RM 17.0 and RM 4.8) (Table G-1). Both sites have wide cobble and sand bars, similar to those at the NF31.3 study site. At the upper peaking reach site (RM 17.0), almost all the dated trees established following events that occurred between 1996 and 2001. The majority of these trees were established above elevations that would be inundated at approximately 1,000 cfs. At the lower site, the dated trees were rooted near the active channel and established following two successful recruitment events with recurrence intervals between 5 and 10 years, between 1996 and 2001 and in 1986 and 1987 (Figure G-1).

Rubicon River – The majority of the trees established between 1995 and 2000, with most trees establishing after the 1997 high flows (approximately 17,100 cfs downstream from the dam and greater than 27,500 cfs downstream from the South Fork Rubicon River) (see Figure AQ 10-4 and Figure G-2). An event of this magnitude would likely have scoured most vegetation that had previously been established along the channel (e.g. during events that occurred in the early to mid-1980s). Low magnitude spills (<< Q1.5 magnitude flow) occurred during the subsequent years. Most of the trees were established less than 6 feet above the base flow water elevation. A few trees that established during previous events were also dated, including in the early 1970s following a spill. These were typically rooted at higher elevations than the trees that established in the late 1990s (Figure G-5 and Table G-1).

Comparison Rivers – The majority of the cored trees established in the years following the large 1986 and 1997 events (recurrence intervals were greater than the ten year event on both rivers) (Figures G-1 and G-4). Both of these high flow winter events were followed by low to moderate magnitude spring flows, and subsequent years without high winter flows. Almost all the trees that were dated were established at elevations that would primarily be inundated only during wet and above normal water years (greater than 3 feet above summer baseflow) (Table G-1). At NF31.3, the white alders were established at lower elevations than the Fremont cottonwoods. In the narrower sections

in the unimpaired comparison NFMF2.3 study site, trees were established across a range of elevations, with some trees rooted at elevations that were infrequently inundated even during wet and above normal water years (Figure G-5). In these narrower reaches with coarse substrate, limited areas with suitable substrate, available water, and protection from scouring high flows for riparian vegetation to establish exist.

TABLES

Table G-1. Summary of Tree Core Data on the Bypass, Peaking, and Comparison Reaches and Inundation Frequency Under Current Operations.

Study Site ¹	Sampling Date	Transect Number	Location Description	Species ³	Elevation Above Water Surface (ft)	DBH ² (cm)	Years of Growth	Year Established	Inundation Frequency Per Year ⁵	Inundation Frequency Per Wet and Above Normal Water Years	Inundation Frequency Per Below Normal, Dry, and Critically Dry Water Year
Middle Fork American River											
MF29.4	9/25/2006	Transect 2	Right Bank near water edge - on island	SALA6	0.4	8.1	6	2000	Periodically	Periodically	Infrequently
			Left Bank near water edge	POFR2	0.89	3.2	8	1998	Infrequently	Infrequently	Rarely
			Right Bank near water edge	SALA3	1.02	6.7	9	1997	Infrequently	Infrequently	Rarely
			Left Bank near water edge	ALRH2	1.43	9.2	10	1996	Infrequently	Infrequently	Rarely
			Left Bank near water edge	ALRH2	1.72	7.5	7	1999	Rarely	Infrequently	Rarely
			Historic Bankfull - Right Bank	ALRH2	4.78	28.9	39	1967	Rarely	Rarely	Rarely
			Right Bank near water edge	ALRH2	1.06	7.3	5	2001	Infrequently	Infrequently	Rarely
			Historic Bankfull - Right Bank	ALRH2	4.84	24	20	1986	Rarely	Rarely	Rarely
			Right Bank near water edge	SALA6	0.97	4.5	5	2001	Infrequently	Infrequently	Rarely
			Historic Bankfull - Right Bank	ALRH2	4.52	27.5	44	1962	Rarely	Rarely	Rarely
			Left Bank near water edge	ALRH2	1.44	7.7	7	1999	Infrequently	Infrequently	Rarely
			Historic Bankfull - Right Bank	ALRH2	4.88	31.6	47	1959	Rarely	Rarely	Rarely
			Historic Bankfull - Left Bank	ALRH2	5.15	21	38	1968	Rarely	Rarely	Rarely
			Historic Bankfull - Left Bank	ALRH2	5.46	25.9	25	1981	Rarely	Rarely	Rarely
MF28.6	9/27/2006	Transect 1	Left Bank	ALRH2	0	7.7	7	1999	Periodically	Frequently	Periodically
			Right Bank	ALRH2	1.2	7.5	8	1998	Infrequently	Infrequently	Rarely
			Right Bank	ALRH2	1.2	10.3	8	1998	Infrequently	Infrequently	Rarely
			Right Bank	ALRH2	1.4	20.9	20	1986	Infrequently	Infrequently	Rarely
			Left Bank	ALRH2	1.4	9.1	7	1999	Infrequently	Infrequently	Rarely
			Right Bank	ALRH2	4	43.1	37	1969	Rarely	Rarely	Rarely
			Left Bank	ALRH2	2	32.2	8	1998	Rarely	Infrequently	Rarely
			Left Bank	ALRH2	1	8.4	8	1998	Infrequently	Infrequently	Rarely
			Right Bank	ALRH2	3.7	30	28	1978	Rarely	Rarely	Rarely
			Left Bank	ALRH2	2	46.2	20	1986	Rarely	Infrequently	Rarely
			Right Bank	ALRH2	0.4	9.6	8	1998	Periodically	Periodically	Infrequently
			Right Bank	ALRH2	3.9	40	39	1967	Rarely	Rarely	Rarely
			Right Bank	ALRH2	5.2	35.8	38	1968	Rarely	Rarely	Rarely
MF17 ⁴	9/25/2006	Downstream of Transect 2	Right Bank Bankfull	ALRH2	0.86	12.9	8	1998	Infrequently	Periodically	Rarely
			Right Bank Bankfull	ALRH2	1.22	8.9	10	1996	Infrequently	Periodically	Rarely
			Right Bank Bankfull	ALRH2	1.97	17.6	10	1996	Infrequently	Infrequently	Rarely
			Right Bank Bankfull	ALRH2	3.31	10.6	7	1999	Rarely	Rarely	Rarely
			Historic Bankfull - Right Bank	ALRH2	4.12	6.6	7	1999	Rarely	Rarely	Rarely
			Historic Bankfull - Right Bank	ALRH2	4.12	7.7	7	1999	Rarely	Rarely	Rarely
			Historic Bankfull - Right Bank	ALRH2	4.18	11.7	10	1996	Rarely	Rarely	Rarely
			Historic Bankfull - Right Bank	SALA3	4.21	11.2	10	1996	Rarely	Rarely	Rarely
			Historic Bankfull - Right Bank	FRLA	4.21	15.1	11	1995	Rarely	Rarely	Rarely
			Historic Bankfull - Right Bank	SALA3	6.06	9.4	8	1998	Rarely	Rarely	Rarely
			Historic Bankfull - Right Bank	CEOCC2	6.42	4.3	8	1998	Rarely	Rarely	Rarely
			Historic Bankfull - Right Bank	SALA3	6.51	11.6	20	1986	Rarely	Rarely	Rarely
MF4.8/ 6.0 ⁴	9/26/2006	Transect 1	Left Bank	ALRH2	0	20.4	20	1986	Periodically	Periodically	Infrequently
			Left Bank	ALRH2	0.2	14.5	8	1998	Periodically	Periodically	Infrequently
			Left Bank	ALRH2	0.5	34.5	11	1995	Periodically	Periodically	Infrequently
			Left Bank	ALRH2	1.1	19	11	1995	Infrequently	Periodically	Rarely
			Left Bank	ALRH2	1.1	39.4	8	1998	Infrequently	Periodically	Rarely
			Left Bank - lower bar	ALRH2	1.2	19.2	8	1998	Infrequently	Periodically	Rarely
			Left Bank - lower bar	ALRH2	1.6	9.3	10	1996	Infrequently	Periodically	Rarely
			Left Bank	ALRH2	2	8.8	8	1998	Infrequently	Infrequently	Rarely
			Left Bank	ALRH2	2	20.1	19	1987	Infrequently	Infrequently	Rarely
			Left Bank - lower bar	ALRH2	2	18	11	1995	Infrequently	Infrequently	Rarely
			Left Bank	ALRH2	3.5	46	20	1986	Rarely	Infrequently	Rarely
			Left Bank	ALRH2	4.8	19.1	25	1981	Rarely	Rarely	Rarely

Table G-1. Summary of Tree Core Data on the Bypass, Peaking, and Comparison Reaches (continued).

Study Site ¹	Sampling Date	Transect Number	Location Description	Species ³	Elevation Above Water Surface (ft)	DBH ² (cm)	Years of Growth	Year Established	Inundation Frequency Per Year	Inundation Frequency Per Wet and Above Normal Water Years	Inundation Frequency Per Below Normal, Dry, and Critically Dry Water Year			
Rubicon River														
R25.7	7/24/2008	Downstream of Transect 2	Right bank	ALRH2	0.28	3.5	10	1998	Rarely	Infrequently	Rarely			
			Right bank	ALRH2	0.81	4.7	11	1997	Rarely	Infrequently	Rarely			
			Right bank	ALRH2	0.81	5.5	10	1998	Rarely	Infrequently	Rarely			
			Right bank	ALRH2	1.07	6	10	1998	Rarely	Infrequently	Rarely			
			Right bank	ALRH2	1.15	5.3	11	1997	Rarely	Infrequently	Rarely			
	8/22/2008		Right bank	ALRH2	1.51	4.8	10	1998	Rarely	Rarely	Rarely			
			Left bank	ALRH2	0.42	4.1	13	1995	Rarely	Infrequently	Rarely			
			Left bank	ALRH2	0.9	4.4	13	1995	Rarely	Rarely	Rarely			
			Left bank	ALRH2	1.02	6.1	10	1998	Rarely	Rarely	Rarely			
			Left bank	ALRH2	1.08	5.1	10	1998	Rarely	Rarely	Rarely			
			Right bank	ALRH2	1.87	10.1	36	1972	Rarely	Rarely	Rarely			
			Right bank	ALRH2	1.88	9.9	38	1970	Rarely	Rarely	Rarely			
			Left bank	ALRH2	2.32	4	13	1995	Rarely	Rarely	Rarely			
			Right bank	ALRH2	2.62	8.8	34	1974	Rarely	Rarely	Rarely			
			Right bank	ALRH2	2.82	14.5	38	1970	Rarely	Rarely	Rarely			
			Right bank	ALRH2	2.96	6.2	33	1975	Rarely	Rarely	Rarely			
			Right bank	ALRH2	3.88	15	38	1970	Rarely	Rarely	Rarely			
			Right bank	ALRH2	3.9	7.1	38	1970	Rarely	Rarely	Rarely			
			Right bank	ALRH2	5.19	9.8	38	1970	Rarely	Rarely	Rarely			
			R20.9	9/26/2006	Transects 1 and 2	Left Bank	ALRH2	0.6	19	8	1998	Infrequently	Periodically	Infrequently
Left Bank	ALRH2	0.78				19.3	8	1998	Infrequently	Periodically	Rarely			
Left Bank	ALRH2	0.84				6	8	1998	Infrequently	Periodically	Rarely			
Left Bank	ALRH2	0.9				21.8	8	1998	Infrequently	Periodically	Rarely			
Left Bank	ALRH2	1.59				15	8	1998	Rarely	Infrequently	Rarely			
Left edge of water	ALRH2	1.87				13.9	8	1998	Rarely	Infrequently	Rarely			
Left Bank	ALRH2	2.6				21.4	8	1998	Rarely	Rarely	Rarely			
Left Bank	ALRH2	2.74				13.5	8	1998	Rarely	Rarely	Rarely			
Left Bank	ALRH2	3.16				12.9	8	1998	Rarely	Rarely	Rarely			
Left Bank	ALRH2	7.58				16.7	29	1978	Rarely	Rarely	Rarely			
Left Bank	ALRH2	4.4				19.9	45	1961	Rarely	Rarely	Rarely			
Left Bank	ALRH2	12.23				31	24	1982	Rarely	Rarely	Rarely			
Left Bank	ALRH2	4.25				4	10	1996	Rarely	Rarely	Rarely			
Left Bank	ALRH2	0				7	7	1999	Periodically	Periodically	Periodically			
On top of left bank undercut	ALRH2	3.6				37	36	1970	Rarely	Rarely	Rarely			
R2.6/ 3.5	9/25/2006	Downstream of Transect 3				Left Bank	ALRH2	0.8	14.7	8	1998	Periodically	Periodically	Infrequently
						Left Bank	ALRH2	0.9	20.2	8	1998	Infrequently	Periodically	Infrequently
			Left Bank	SALA3	0.9	10.2	8	1998	Infrequently	Periodically	Infrequently			
			Left Bank	SALA6	1.4	8.9	6	2000	Infrequently	Periodically	Rarely			
			Left Bank	ALRH2	1.5	16.8	8	1998	Infrequently	Periodically	Rarely			
			Left Bank	ALRH2	1.5	13.3	8	1998	Infrequently	Periodically	Rarely			
			Left Bank	ALRH2	1.6	11.7	7	1999	Infrequently	Infrequently	Rarely			
			Left Bank	SALA3	1.7	6.7	11	1995	Infrequently	Infrequently	Rarely			
			Left Bank	SALA3	1.8	6.7	6	2000	Infrequently	Infrequently	Rarely			
			Left Bank	POFR2	1.5	5.4	11	1995	Infrequently	Periodically	Rarely			
			Left Bank	ALRH2	1.4	13.5	10	1996	Infrequently	Periodically	Rarely			
			Left Bank	ALRH2	1.1	8.5	8	1998	Infrequently	Periodically	Infrequently			
			Left Bank	ALRH2	1.3	5	8	1998	Infrequently	Periodically	Rarely			
			Left Bank	ALRH2	1.3	9.7	8	1998	Infrequently	Periodically	Rarely			
			Left Bank	SALA6	1.4	8.9	6	2000	Infrequently	Periodically	Rarely			
			Left Bank	ALRH2	0.8	14.7	8	1998	Periodically	Periodically	Infrequently			
			Left Bank	SALA3	0.9	10.2	8	1998	Infrequently	Periodically	Infrequently			
			Left Bank	ALRH2	1.5	13.3	8	1998	Infrequently	Periodically	Rarely			
			Left Bank	ALRH2	1.6	23.4	7	1999	Infrequently	Infrequently	Rarely			

Table G-1. Summary of Tree Core Data on the Bypass, Peaking, and Comparison Reaches (continued).

Study Site ¹	Sampling Date	Transect Number	Location Description	Species ³	Elevation Above Water Surface (ft)	DBH ² (cm)	Years of Growth	Year Established	Inundation Frequency Per Year	Inundation Frequency Per Wet and Above Normal Water Years	Inundation Frequency Per Below Normal, Dry, and Critically Dry Water Year
North Fork of the Middle Fork American River											
NFMF2.3	8/27/2007	Transect 1	Right bank	ALRH2	1.42	4.7	20	1987	Periodically	Periodically	Infrequently
			Right bank	ALRH2	2.9	7	12	1995	Rarely	Infrequently	Rarely
			Right bank	ALRH2	3.01	6	16	1991	Rarely	Infrequently	Rarely
			Right bank	ALRH2	3.06	6.15	20	1987	Rarely	Infrequently	Rarely
			Right bank	ALRH2	3.33	7.6	14	1993	Rarely	Rarely	Rarely
			Right bank	ALRH2	3.73	8.4	20	1987	Rarely	Rarely	Rarely
		Transect 2	Right bank	ALRH2	1.28	5.3	30	1977	Periodically	Periodically	Infrequently
			Right bank	ALRH2	3.38	6.7	20	1987	Rarely	Rarely	Rarely
			Right bank	ALRH2	3.45	4.5	24	1983	Rarely	Rarely	Rarely
		Transect 3	Right bank	ALRH2	2.25	3.1	14	1993	Periodically	Periodically	Infrequently
			Right bank	ALRH2	3.17	8.2	25	1982	Infrequently	Periodically	Infrequently
			Right bank	ALRH2	3.32	6.6	12	1995	Infrequently	Periodically	Rarely
			Right bank	ALRH2	3.63	6.1	10	1997	Infrequently	Infrequently	Rarely
			Right bank	ALRH2	3.63	7.4	10	1997	Infrequently	Infrequently	Rarely
			Right bank	ALRH2	3.8	12.9	32	1975	Infrequently	Infrequently	Rarely
			Right bank	ALRH2	5.39	11.5	37	1970	Rarely	Rarely	Rarely
			Right bank	ALRH2	7.24	13.7	32	1975	Rarely	Rarely	Rarely
North Fork American River											
NF31.3	9/14/2007	Transect 4	Left bank	POFR2	2.72	3.7	7	2000	Infrequently	Infrequently	Rarely
		Transect 3	Left bank	POFR2	3.01	3.9	7	2000	Infrequently	Periodically	Rarely
			Right bank	ALRH2	6.29	6	10	1997	Rarely	Rarely	Rarely
		Right bank	ALRH2	6.35	6.5	20	1987	Rarely	Rarely	Rarely	
		Transect 1	Right bank	POFR2	5.94	3.3	14	1993	Rarely	Rarely	Rarely
		Transect 2	Left bank	ALRH2	1.68	3.3	7	2000	Periodically	Periodically	Infrequently
			Left bank	ALRH2	2.45	4	7	2000	Infrequently	Periodically	Infrequently
			Left bank	ALRH2	2.47	3.6	7	2000	Infrequently	Periodically	Infrequently
			Left bank	ALRH2	3.2	4	7	2000	Infrequently	Infrequently	Rarely
			Left bank	POFR2	3.43	6.4	10	1997	Infrequently	Infrequently	Rarely
			Left bank	POFR2	3.86	5.1	10	1997	Rarely	Infrequently	Rarely
			Left bank	POFR2	4.1	4.4	16	1991	Rarely	Rarely	Rarely
			Left bank	POFR2	6.57	3.6	10	1997	Rarely	Rarely	Rarely
			Left bank	POFR2	6.82	5	10	1997	Rarely	Rarely	Rarely
			Left bank	POFR2	8.21	6.6	12	1995	Rarely	Rarely	Rarely

¹ Refer to Table AQ.10-1 for corresponding 2006 quantitative study site numbers.

² DBH: Diameter at breast height.

³ ALRH2 - white alder; CEOCC2 - California button willow; POFR2 - Fremont cottonwood; SALA6 - arroyo willow; SALA3 - red willow

⁴ Inundation frequencies were based on average daily flows in the peaking reach.

⁵ Inundation Frequency: Rarely (<5% of year); Infrequently (5-25% of year); Periodically (25-75% of year); Frequently (>75% of year).

FIGURES

Figure G-1. Number of Trees Dated and Cumulative Distribution by Year along the Middle Fork American River and Comparison Rivers (top) and Rubicon River and Comparison Rivers (bottom).

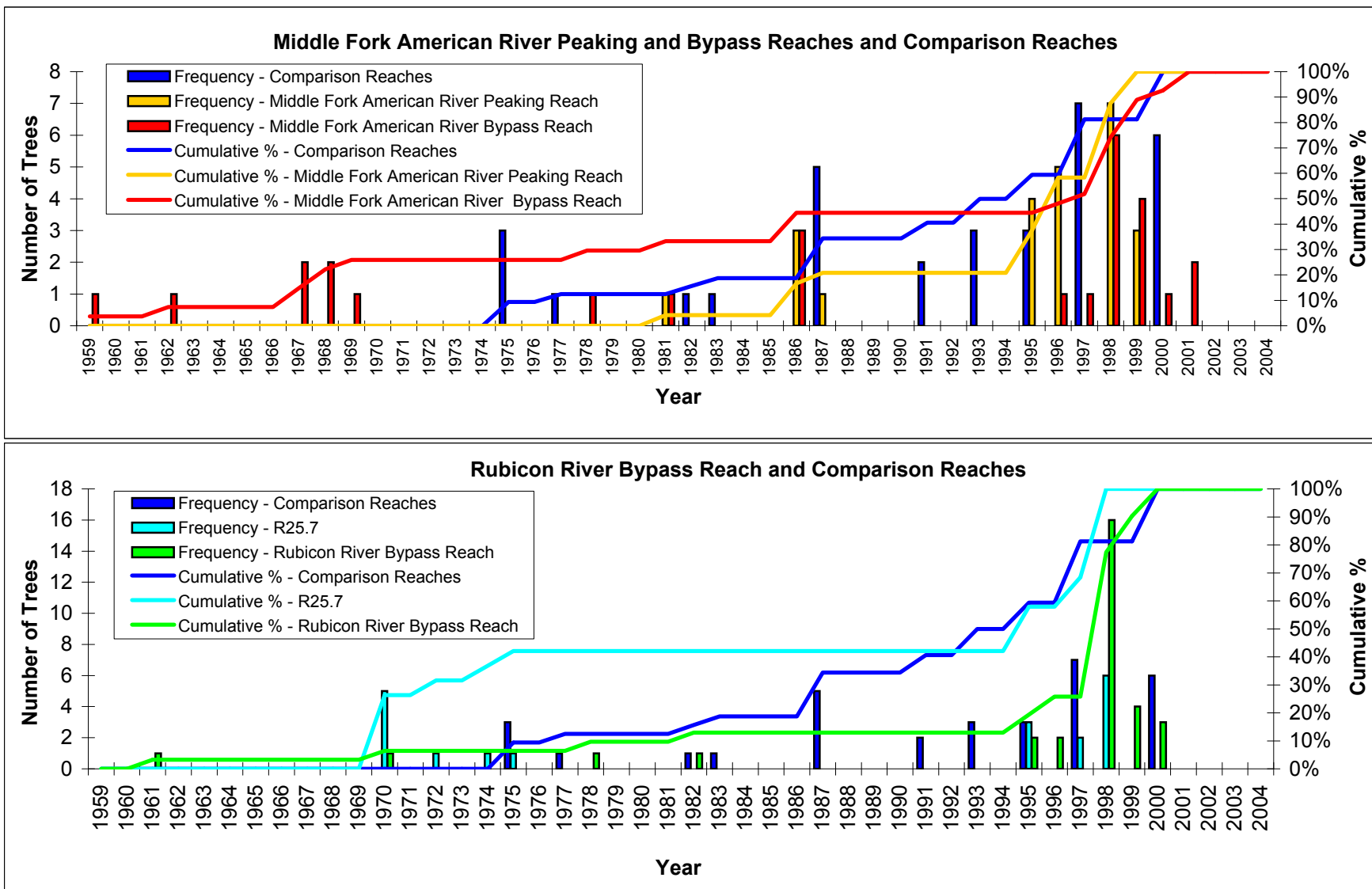


Figure G-2. Riparian Tree Successful Recruitment Events on the Middle Fork American River - Below Middle Fork Interbay (MF29.4 and MF28.6) (a); Upper Peaking Reach (MF17.0) (b); and near Buckeye Bar (MF4.8) (c)^{1,2}.

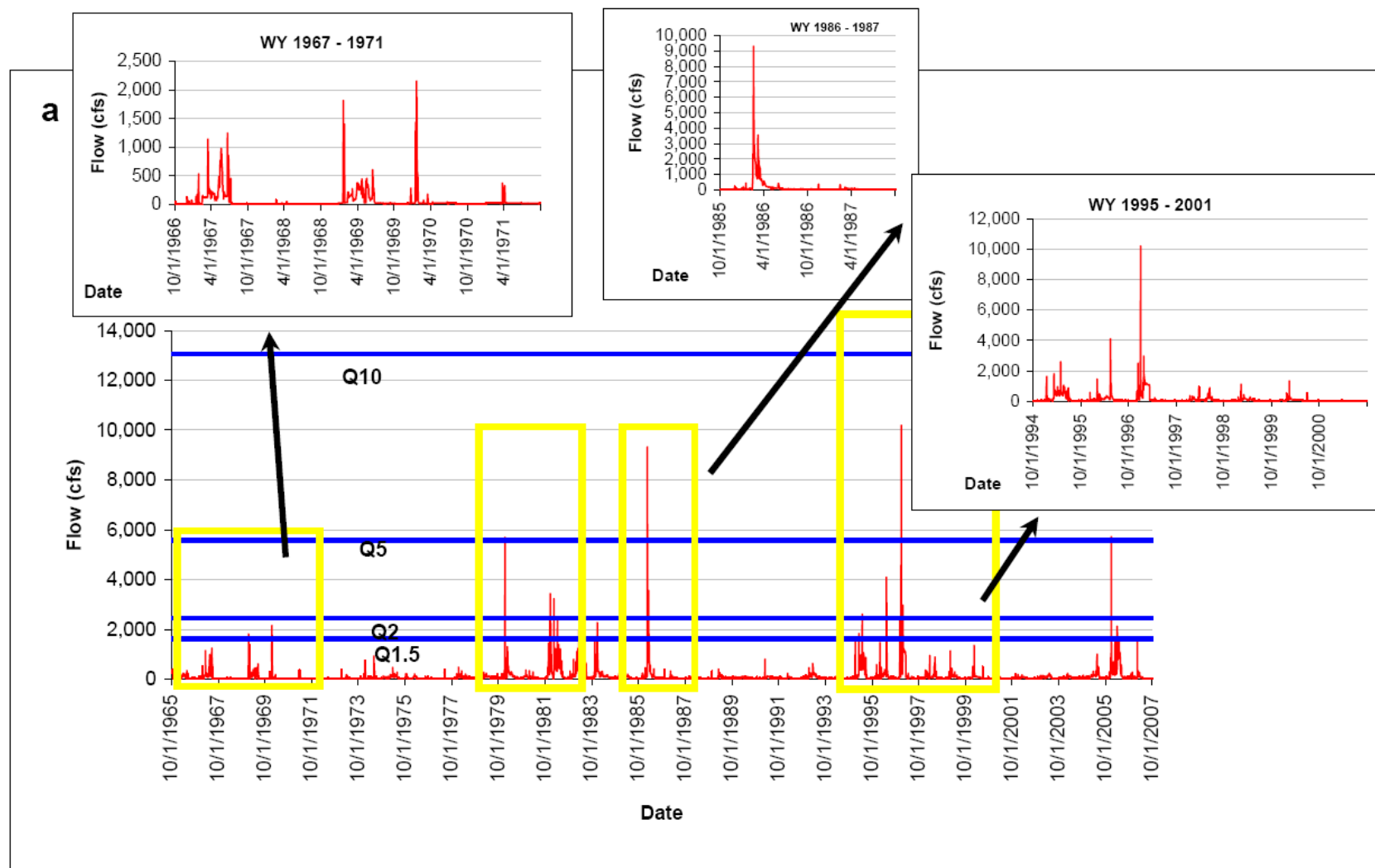


Figure G-2. Riparian Tree Successful Recruitment Events on the Middle Fork American River - Below Middle Fork Interbay (MF29.4 and MF28.6) (a); Upper Peaking Reach (MF17.0) (b); and near Buckeye Bar (MF4.8) (c)^{1,2} (continued).

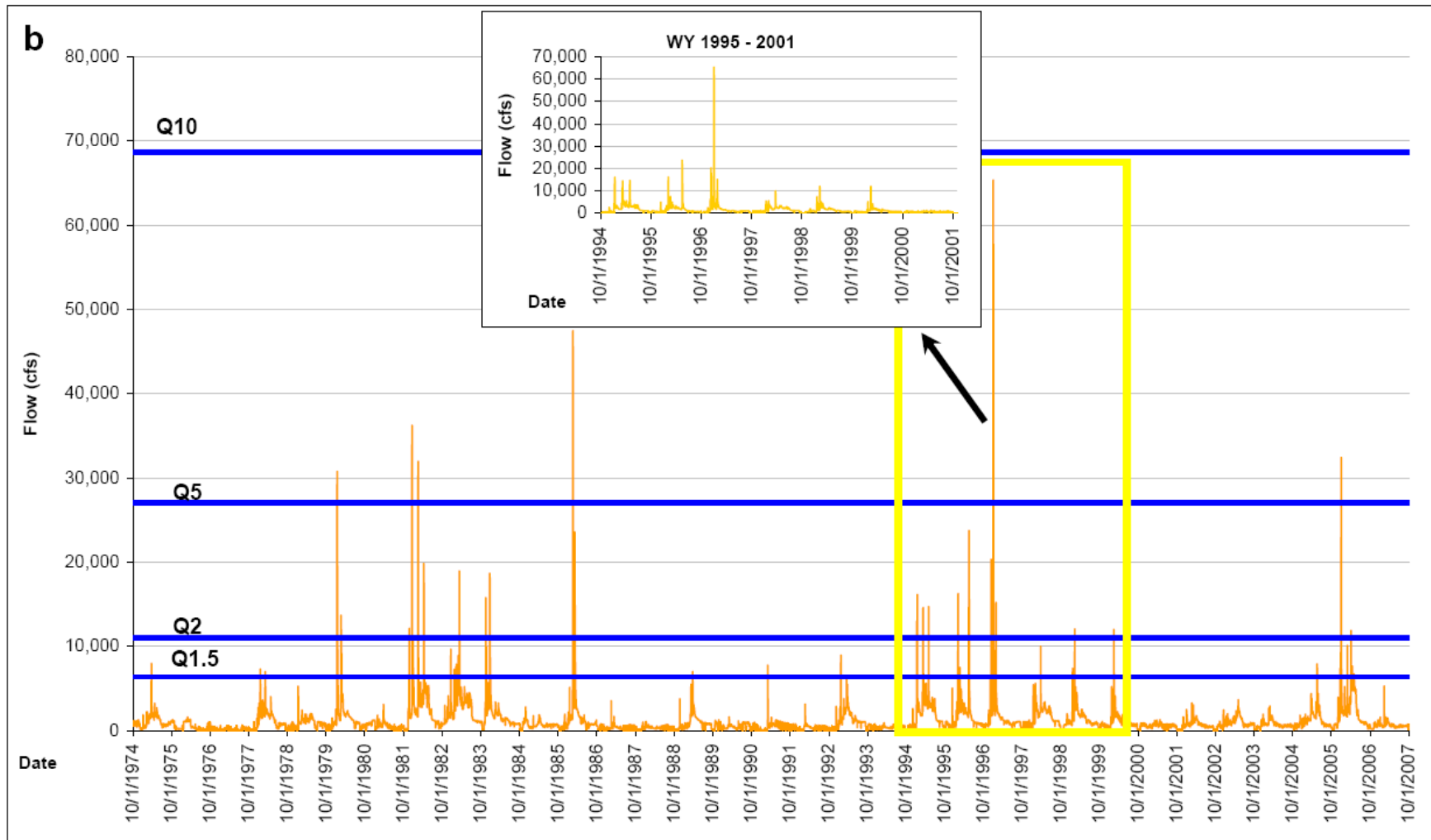
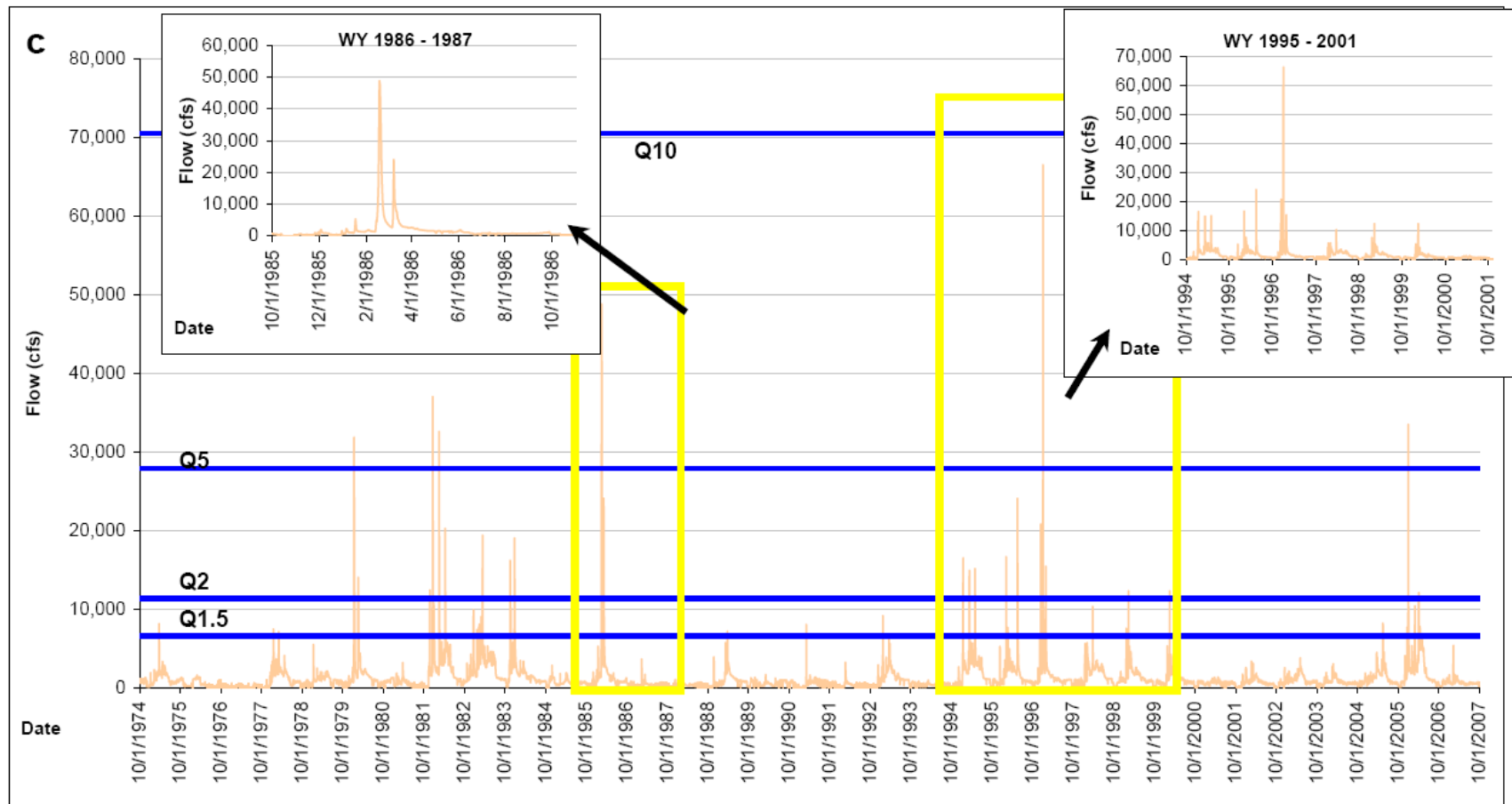


Figure G-2. Riparian Tree Successful Recruitment Events on the Middle Fork American River - Below Middle Fork Interbay (MF29.4 and MF28.6) (a); Upper Peaking Reach (MF17.0) (b); and near Buckeye Bar (MF4.8) (c)^{1,2}(continued).



¹Data Source: USGS gaging station 11427770 for 10/1/1965 to 10/1/1974; and Operations Model for the reach in which the riparian study sites are located for 10/1/1974 to 10/1/2007.

²Recurrence intervals calculated from unimpaired flow data are shown on the plots.

Figure G-3. Riparian Tree Successful Recruitment Events on the Rubicon River - Below Hell Hole Dam (R25.7) (a); Below South Fork Rubicon River Confluence (R20.9) (b); and Below the Long Canyon Creek Confluence (R2.6/ 3.5) (c)^{1,2}.

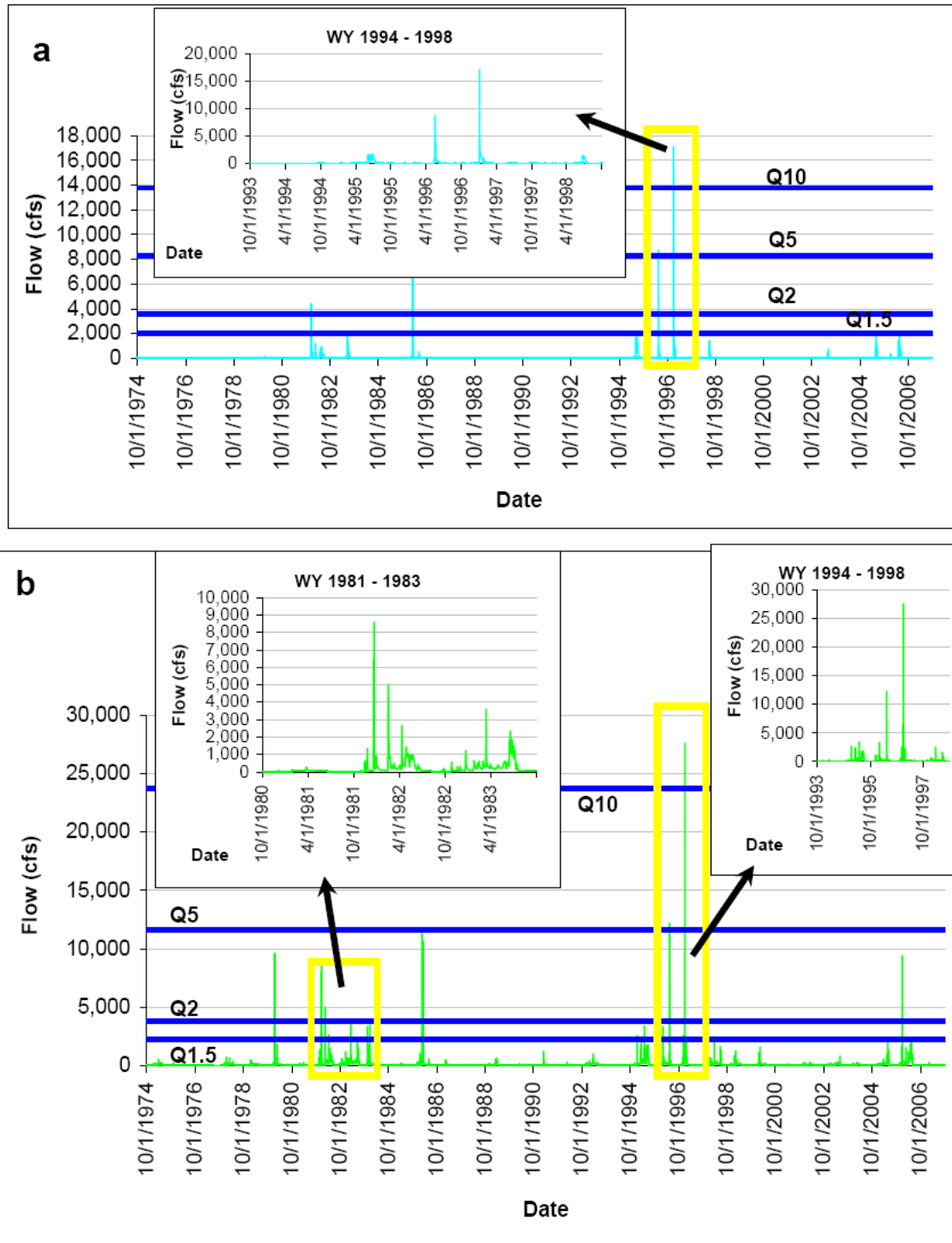
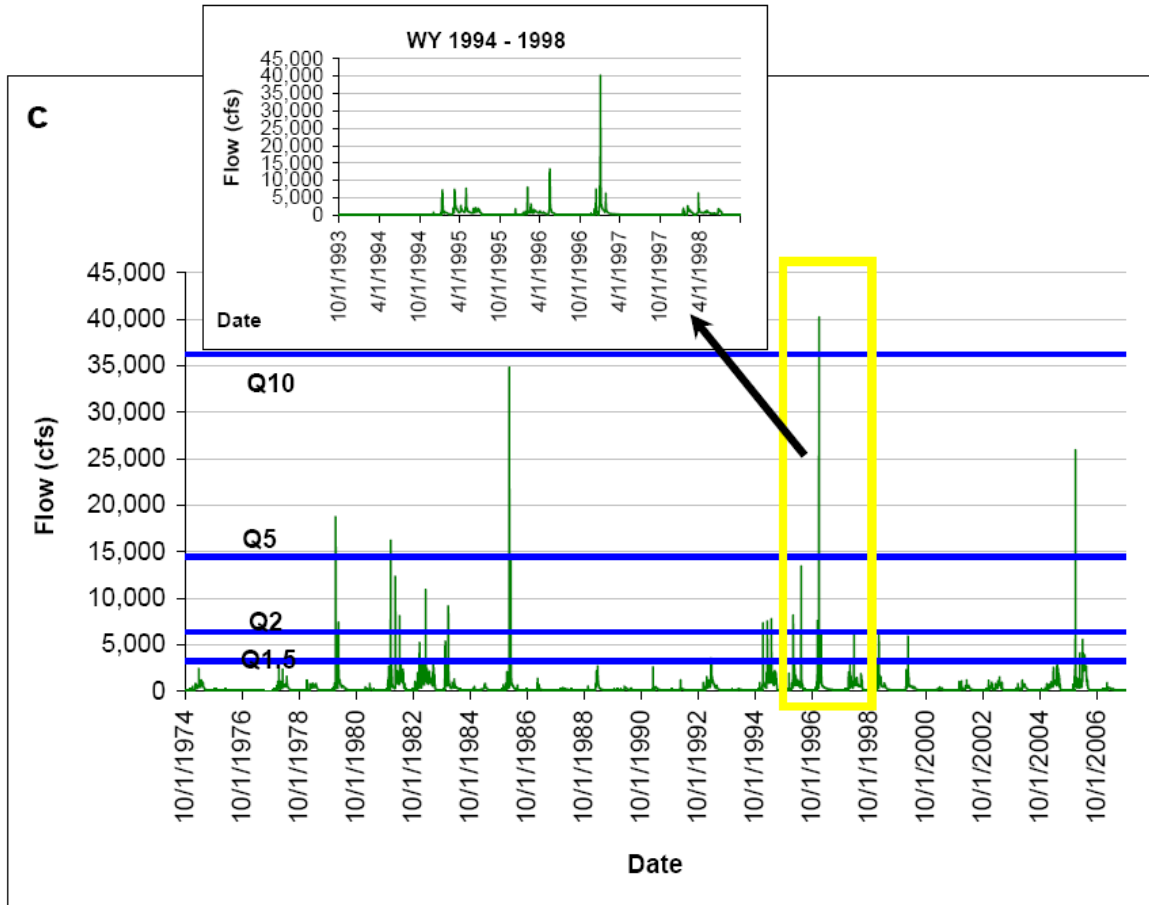


Figure G-3. Riparian Tree Successful Recruitment Events on the Rubicon River - Below Hell Hole Dam (R25.7) (a); Below South Fork Rubicon River Confluence (R20.9) (b); and Below the Long Canyon Creek Confluence (R2.6/ 3.5) (c)^{1,2} (continued).



¹ Data Source: Impaired daily hydrology: Operations Model.

² Recurrence intervals calculated from unimpaired flow data are shown on the plots.

Figure G-4. Riparian Tree Successful Recruitment Events on the North Fork American River (NF31.3) (a) and North Fork of the Middle Fork American River (NFMF2.3) (b)¹.

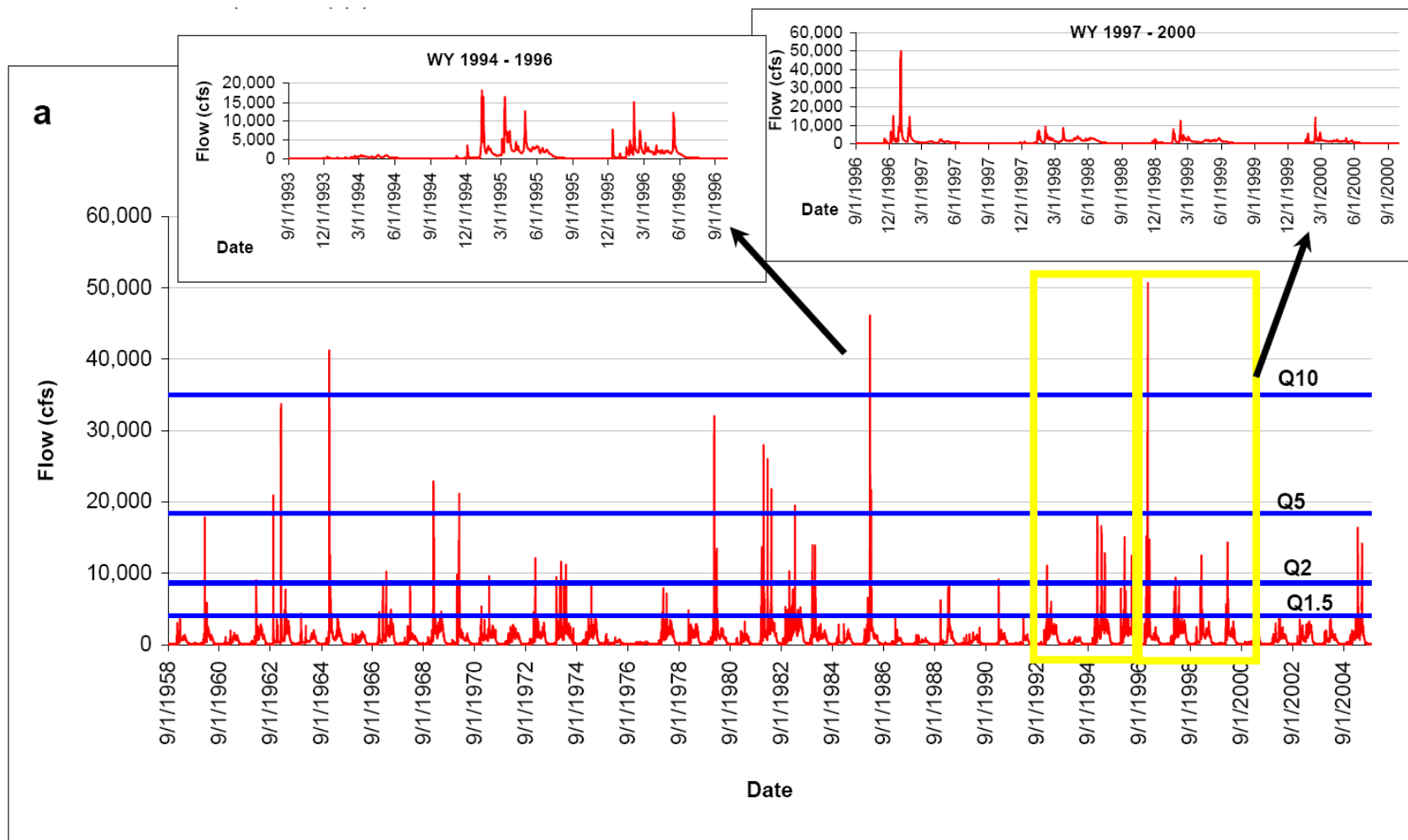
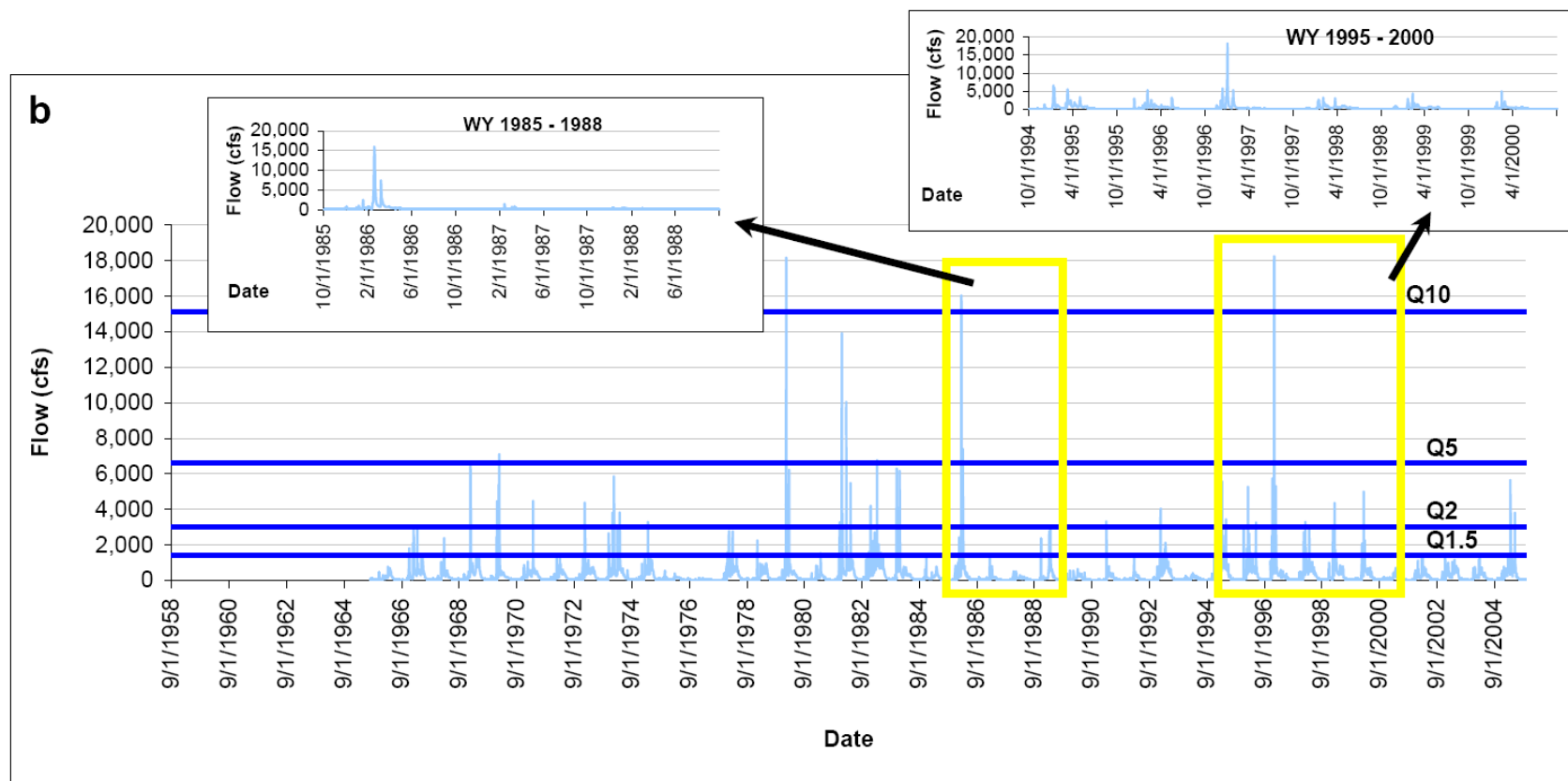


Figure G-4. Riparian Tree Successful Recruitment Events on the North Fork American River (NF31.3) (a) and North Fork of the Middle Fork American River (NFMF2.3) (b)¹ (continued).



¹ Data Source: North Fork American River Flows: USGS gaging station 11427000 (North Fork American River at North Fork Dam). North Fork of the Middle Fork American River Flows: USGS gaging station 11433260 (near Foresthill) and Operations Model for the period of record.

Figure G-5. Relationship Between Rooted Elevation of Dated Trees Above Summer Baseflow and Inundation Frequency on the Middle Fork American River, Rubicon River, and Comparison Rivers for All Water Year Types (1975-2007)¹.

Middle Fork American River - Bypass Reach

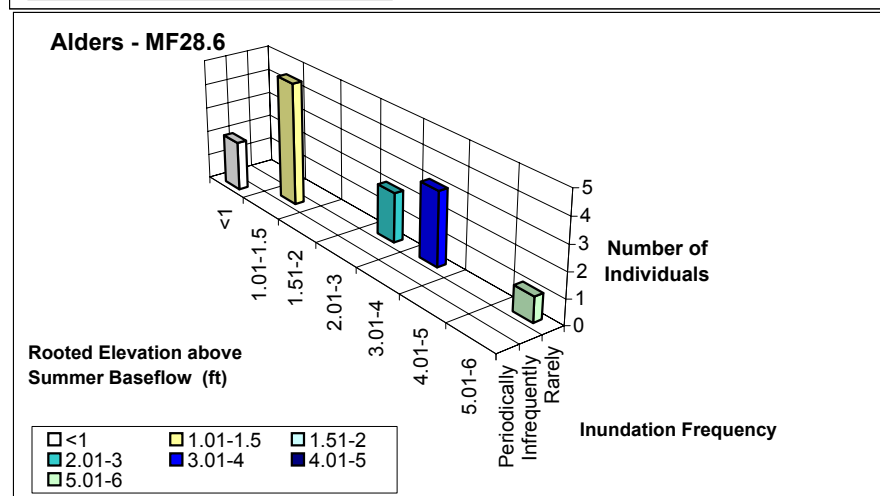
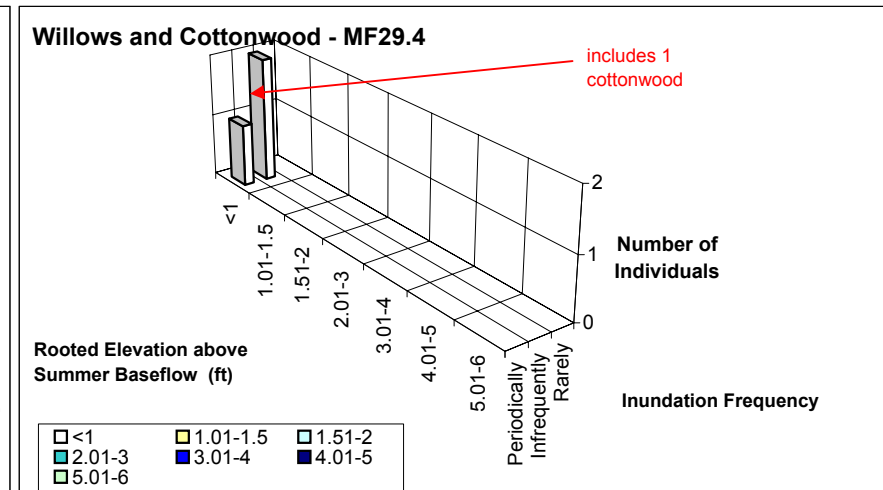
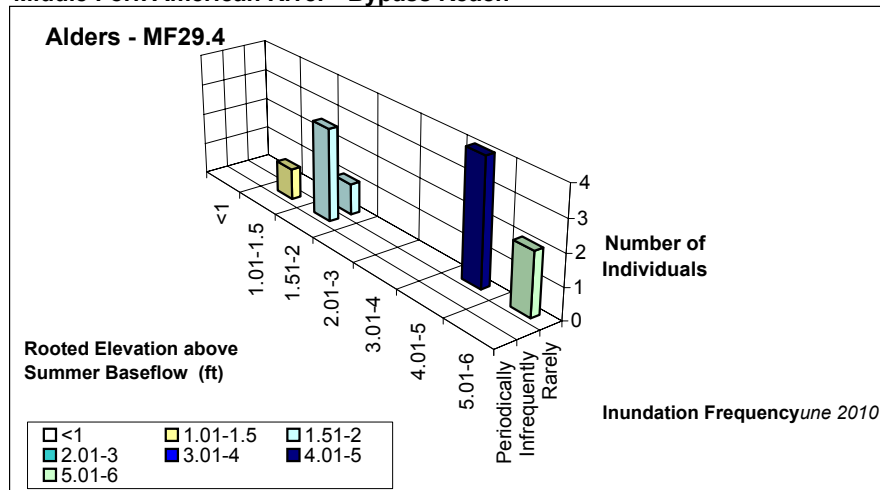


Figure G-5. Relationship Between Rooted Elevation of Dated Trees Above Summer Baseflow and Inundation Frequency on the Middle Fork American River, Rubicon River, and Comparison Rivers for All Water Year Types (1975-2007) (continued).

Middle Fork American River Peaking Reach

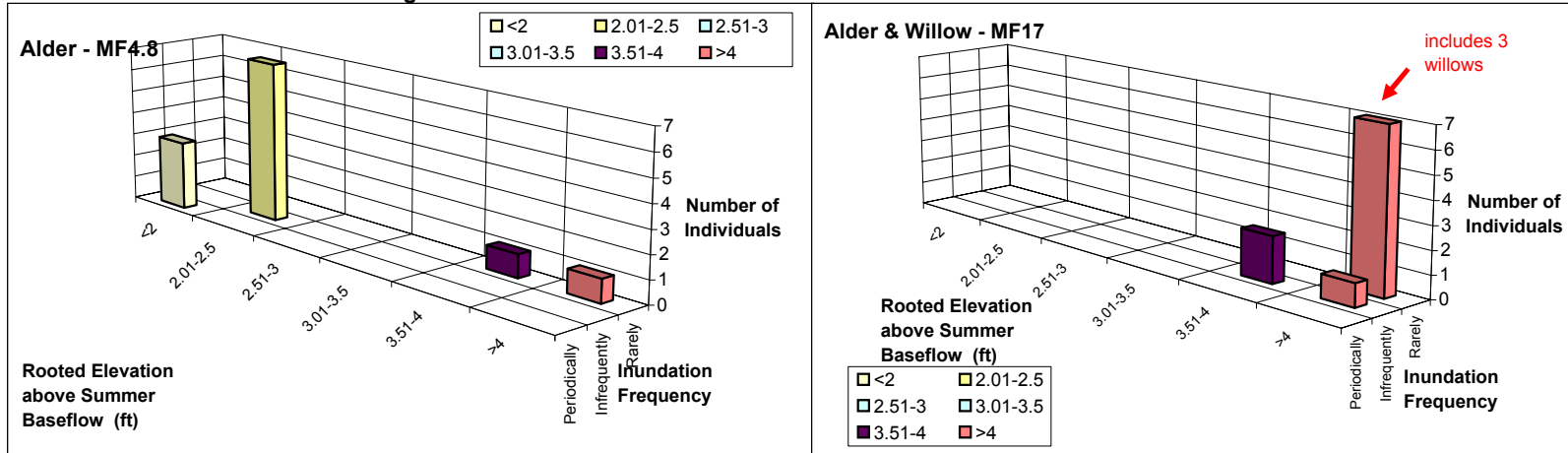


Figure G-5. Relationship Between Rooted Elevation of Dated Trees Above Summer Baseflow and Inundation Frequency on the Middle Fork American River, Rubicon River, and Comparison Rivers for All Water Year Types (1975-2007) (continued).

Rubicon River

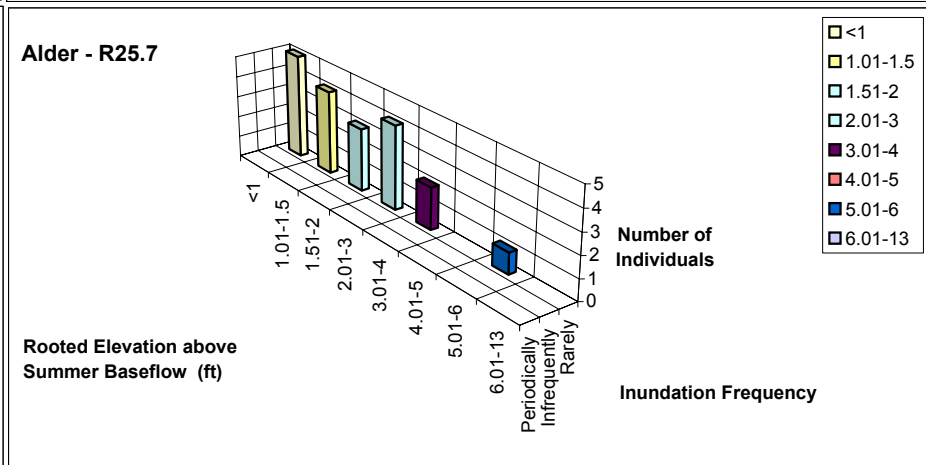
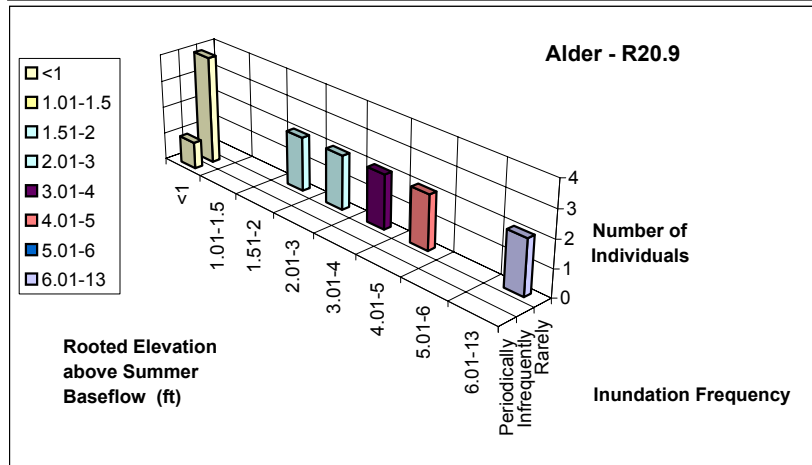
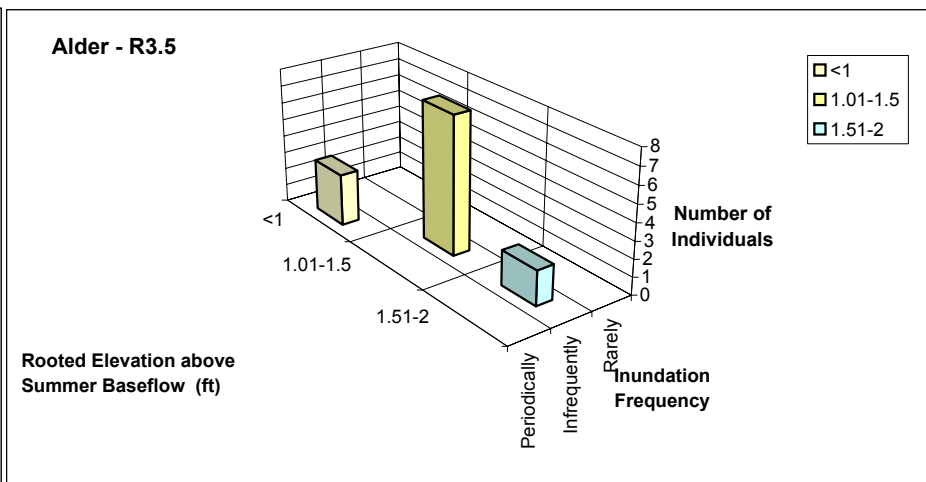
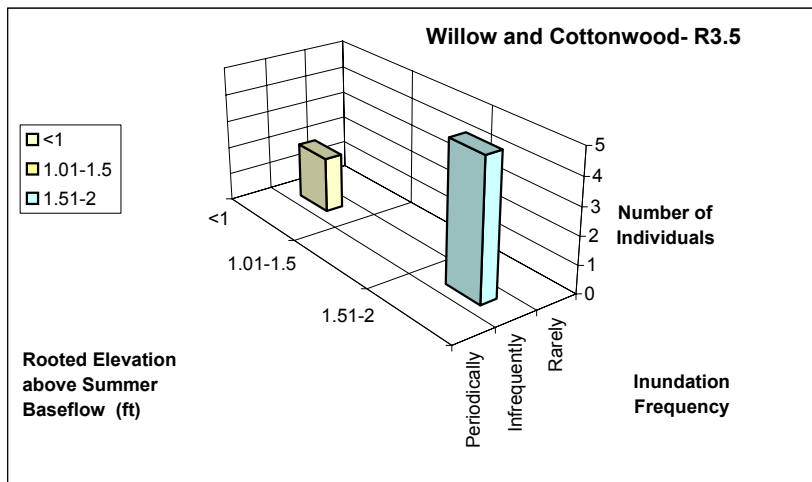
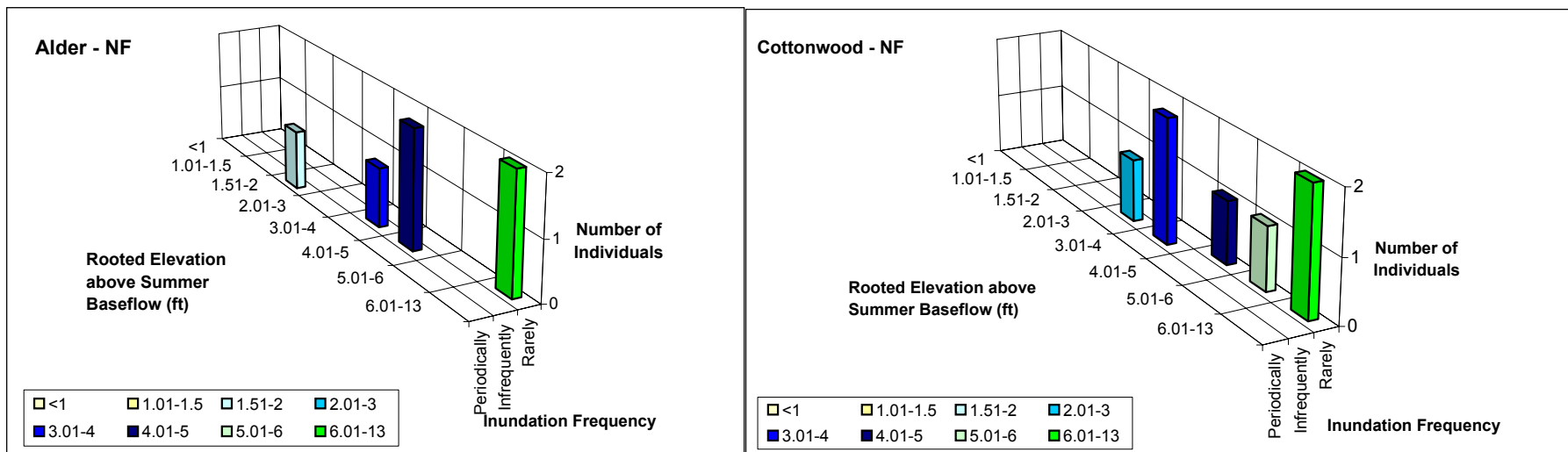
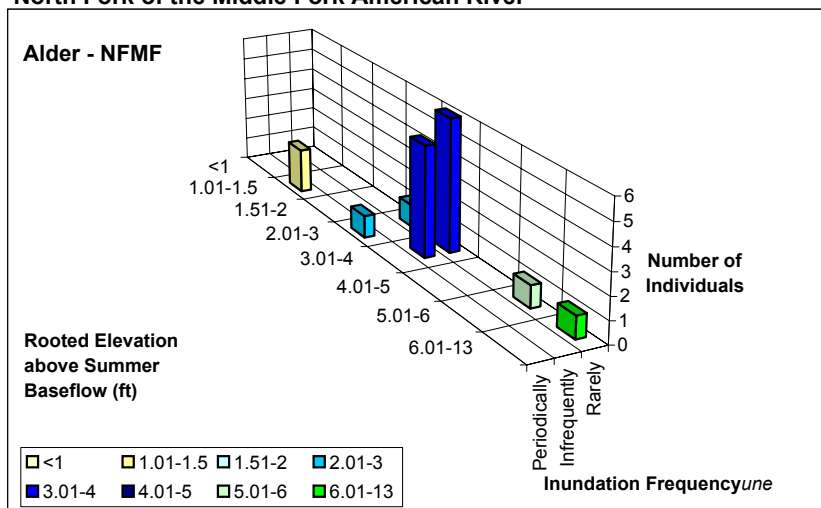


Figure G-5. Relationship Between Rooted Elevation of Dated Trees Above Summer Baseflow and Inundation Frequency on the Middle Fork American River, Rubicon River, and Comparison Rivers for All Water Year Types (1975-2007) (continued).

North Fork American River



North Fork of the Middle Fork American River



¹ Inundation Frequency: Rarely (<5% of year); Infrequently (5-25% of year); Periodically (25-75% of year); Frequently (>75% of year)

APPENDIX H

Project Reservoirs (French Meadows Reservoir, Ralston Afterbay, and Middle Fork Interbay) – Vegetation Summary Tables, Plots of Vegetation along Surveyed Transects, and Water Surface Elevation Summary Plots

Tables

- Table H-1. Attribute Summary of Riparian Vegetation and Substrate along Hell Hole Reservoir Inflows and Shoreline.
- Table H-2. Riparian Vegetation in the Study Area around Hell Hole Reservoir for the Existing Project.

Figures

- Figure H-1. Plant Community Zones and Substrate Characteristics along Surveyed Transects around French Meadows Reservoir.
- Figure H-2. Middle Fork American River Flows above French Meadows Reservoir (December 2006 to October 2007).
- Figure H-3. French Meadows Reservoir Water Surface Elevations During Water Year 2007.
- Figure H-4. French Meadows Reservoir Annual and Inter-annual Fluctuations in Water Surface Elevations (1975–2007).
- Figure H-5. Median, Quartile (25% and 75%), Minimum, and Maximum Reservoir Water Surface Elevations by Month for French Meadows Reservoir and Hell Hole Reservoir (1975–2007).
- Figure H-6. Hell Hole Reservoir Annual and Inter-annual Fluctuations in Water Surface Elevations (1975–2007).
- Figure H-7. Rooted Elevation of Riparian Individuals at Three Locations Along Ralston Afterbay.
- Figure H-8. General Pattern of Riparian Vegetation Along Middle Fork Interbay in Relation to Elevation Above the Water Surface Elevation.

Maps

- Map H-1a. French Meadows Reservoir: Locations of Surveyed Transects.
- Map H-1b. Upper French Meadows Reservoir: Locations of Surveyed Transects.
- Map H-2. French Meadows Reservoir: Average Wet and Critical Dry Water Year Water Surface Elevations.
- Map H-3. Riparian Vegetation Composition at Hell Hole Reservoir (4 sheets).
- Map H-4. Hell Hole Reservoir: Average Wet and Critical Dry Water Year Water Surface Elevations.

TABLES

Table H-1. Attribute Summary of Riparian Vegetation and Substrate along Hell Hole Reservoir Inflows and Shoreline.

Corresponding Map Polygon Number ¹	Bank	Attribute				Notes	Area (acres)	Area (square feet)
		Dominant Species						
		Dominant Species Present ²	Structure ³	Sub-Dominant Species	Dominant Substrate			
Rubicon River Upstream from Hell Hole Reservoir								
UH41	Left	None	Not applicable	None	cobble-gravel	On top of bedrock overlooking pool	0.29	12,541
UH42	Right	None	Not applicable	None	cobble	5% drift/flat area	0.17	7,350
UH43	Left	None	Not applicable	None	bedrock	75-100 ft before reaching PICO line	0.20	8,774
UH44	Right	None	Not applicable	None	bedrock	75-100 ft before reaching PICO line	0.17	7,520
UH45	Left	None	Not applicable	None	bedrock	Deep (20 ft) dry falls	0.16	6,959
UH46	Right	None	Not applicable	None	bedrock	Deep (20 ft) dry falls	0.18	7,928
UH47	Left	SALIX, ALRH2	S, O	DAPE, DRAR3	bedrock-cobble		0.00	159
UH48	Left	None	Not applicable	None	bedrock	Sparse <5% upland vegetation (PIPO, CADE27, EPCA3)	0.18	7,881
UH49	Right	None	Not applicable	None	bedrock	Sparse <5% upland vegetation (PIPO, CADE27, EPCA3)	0.14	5,909
UH50	Left	SALA6	O	SPDE, moss	bedrock-boulder	Directly across from gaging station	0.00	207
UH51	Right	ALRH2	M	DAPE <1%, JUNCUS sp.	bedrock-cobble	Directly across from gaging station.	0.00	144
UH52	Left	ALRH2	Y	DAPE 10%	bedrock-boulder		0.00	179
UH53	Right	ALRH2	Y	BRCA3, MICA3	cobble	Near cobble bar	0.00	187
UH54	Left	SALA6	O	DAPE, upland sp. < 5%	bedrock-boulder		0.02	1,012
UH55	Right	ALRH2	Y	DAPE, MIAU (20%)	cobble		0.01	576

Table H-1. Attribute Summary of Riparian Vegetation and Substrate along Hell Hole Reservoir Inflows and Shoreline (continued).

Corresponding Map Polygon Number ¹	Bank	Attribute				Notes	Area (acres)	Area (square feet)
		Dominant Species						
		Dominant Species Present ²	Structure ³	Sub-Dominant Species	Dominant Substrate			
Five Lakes Creek								
UH01	-	SALIX	S	PSME, CADE27	bedrock-boulder		0.00	172
UH02	-	ALRH2, POBAT	S, Y, M, O	DAPE, WOFI, LEOR	boulder-bedrock	Woody debris 10%; after turn in river	0.07	3,258
				ANMA, MICA3, CADE27, CILA2		Before broad cobble floodplain		0
				PSME, CADE27		Woody debris 25%		0
UH03	-	ALRH2	S, Y	DAPE, MICA3, HEMI7, ANMA	bedrock	In narrow bedrock canyon	0.00	0
UH04	-	ALRH2, SALIX	S, Y	GNRA, ROCU2	bedrock-boulder-cobble		0.01	274
UH05	-	ALRH2, SALIX	S	EPCA3, DAPE, ROCU2	bedrock	Within narrow bedrock slot	0.04	1,801
UH06	-	ALRH2, SALIX	S, Y	JUPHP, MIAU, CILA2, EPCI	bedrock	Sloped bedrock canyon	0.01	586
UH07	-	ALRH2, SALIX	S, Y, M, O	DAPE, EPCI	bedrock-boulder-gravel-sand		0.11	4,627
UH08	-	ALRH2, SALIX,	S, Y, M,O	DAPE, EPCA3	boulder-bedrock		0.05	2,374
				DRAR3, POKR				
UH09	-	None	Not applicable	DAPE, QUCH2, EPCA3	bedrock-boulder	Gaging station location	0.02	1,028
UH10	-	None	Not applicable	DAPE, QUCH2, EPCA3	bedrock-boulder		0.03	1,174
UH11	-	SALIX, POBAT	S, Y	DAPE	bedrock-boulder	Seedlings in boulders in sandy patches	0.03	1,179
UH12	-	ALRH2, POBAT	S	EPCI	bedrock-boulder		0.02	736

Table H-1. Attribute Summary of Riparian Vegetation and Substrate along Hell Hole Reservoir Inflows and Shoreline (continued).

Corresponding Map Polygon Number ¹	Bank	Attribute				Notes	Area (acres)	Area (square feet)
		Dominant Species						
		Dominant Species Present ²	Structure ³	Sub-Dominant Species	Dominant Substrate			
UH13	-	POBAT	NA	Aster sp., various grasses, MEST	boulder		0.03	1,153
UH14	-	None	Not applicable	Aster sp., various grasses, MEST	boulder		0.01	461
UH15	-	SALIX, POBAT	S, Y, M, O	VICA5 20%	boulder		0.39	16,787
				PTAQP2, various grasses, EPCI, JUNCUS sp.				
UH16	-	ALRH2, SALIX, POBAT	S, Y, M	CILA2, EQLA, DIAC2, EPCI, JUNE, JUCH, JUPHP	cobble-gravel	Seedlings line water's edge	0.10	4,419
UH17	-	SALIX	S	EPCI, JUNCUS sp., CAAT3, MICA3, DIAC2, CILA2	bedrock-boulder		0.11	4,707
UH18	-	ALRH2	S	EPCI, JUNCUS sp., CAAT3, MICA3, DIAC2, CILA2	bedrock-boulder		0.06	2,728
UH19	-	ALRH2, SALIX	S, Y, M, O	EPCI, MICA3, DIAC2, CILA2, JUNCUS sp.	cobble-gravel-sand		0.15	6,636
UH20	-	SALIX	S, Y, M, O	LOOB2, various grasses	sand		0.08	3,343
UH21	-	POBAT	Y	JUPHP, MICA3, CIVU	boulder		0.01	554
UH22	-	SALIX	S, Y	JUPHP, MICA3, CIVU	boulder		0.00	0
UH23	-	ALRH2, SALIX	S, Y, M, O	JUPHP, MICA3, GNCA2, VETH, EPCI	cobble		0.05	2,210
UH24	-	POBAT	S, Y, M, O	JUPHP, CIVU, CAAT3, MICA3, various grasses	sand		0.06	2,619

Table H-1. Attribute Summary of Riparian Vegetation and Substrate along Hell Hole Reservoir Inflows and Shoreline (continued).

Corresponding Map Polygon Number ¹	Bank	Attribute				Notes	Area (acres)	Area (square feet)
		Dominant Species						
		Dominant Species Present ²	Structure ³	Sub-Dominant Species	Dominant Substrate			
UH25	-	ALRH2, SALIX	S, Y, M, O	JUPHP, CIVU, CAAT3, MICA3, various grasses	bedrock-cobble		0.06	2,503
UH26	-			None	boulder		0.06	2,634
UH27	-	ALRH2, SALIX, POBAT	S, Y, M, O	JUPHP, various grasses, CAREX sp.	sand		0.09	3,911
UH28	-	ALRH2, SALIX	S, Y, M, O	JUPHP, EPCI, MIMO3, COCA5	boulder-cobble-gravel		0.08	3,669
UH29	-	ALRH2, SALIX	S, Y	ROCR3, MIMO3, MILE2, EPCI	cobble		0.21	8,944
UH30	-	ALRH2, SALIX	S	CHBO2, EPCI, ROCR3, HYPE	sand		0.06	2,528
Un-named Tributary								
UH31	-	PIPO	Y, M, O	QUCH2, CADE27, QUKE	bedrock	Thin layer of duff; upland species only	0.03	1,408
UH32	-	VICA5	Not applicable	GNCA2, QUKE, QUCH2, PIPO	boulder-cobble-gravel	Entire streambed covered by VICA5	0.19	8,373
UH33	-	SALU	O	None	bedrock-gravel-fines	Drift cover 50 - 65% of ground	0.09	3,794
UH34	-	VICA5	Not applicable	one overhanging QUCH2, POGL9	bedrock-boulder		0.09	3,989
UH35	-	None	-	COCA5, GNCA2, VUMI, DIAC2, MEOF	bedrock-boulder		0.09	4,067
UH36	-	ALRH2	Y, M	CAVEV2 (1%)	boulder-gravel	Small individuals (2 ft. tall)	0.03	1,232
UH37	-	None	Not applicable	VETH, various grasses, GNCA2 in channel (all <5% cover)	fines-bedrock-boulder		0.06	2,617
UH38	-	SALU, VICA5	O	COCA5, GADI2, MEST, AGOR	boulder-bedrock-fines	1 large SALU in stream channel	0.07	3,175
UH39	-	None	Not applicable	COCA5, GADI2, MEST, AGOR	boulder-bedrock-fines	Drift cover 25%	0.16	6,854
UH40	-	SALU	Y, O	None	fines	3 large shrubs, 8 young	0.55	23,903

Table H-1. Attribute Summary of Riparian Vegetation and Substrate along Hell Hole Reservoir Inflows and Shoreline (continued).

Corresponding Map Polygon Number ¹	Bank	Attribute				Notes	Area (acres)	Area (square feet)
		Dominant Species						
		Dominant Species Present ²	Structure ³	Sub-Dominant Species	Dominant Substrate			
Hell Hole Reservoir Shoreline ⁴								
H02	-	POBAT, SALIX	S, Y, M, O	-	bedrock-sand		0.10	4,514
H01	-	SALIX	S, Y	-	-		0.00	189
H03	-	POBAT, SALIX	S, Y	-	boulder-sand		0.42	18,186
H04	-	SALIX	M, O	-	boulder-sand		0.25	10,722
H06	-	SALIX	O	-	-		0.01	361
H05	-	SALIX	O	-	-		0.01	361
H11	-	VICA5	Not applicable	-	-		0.02	1,042
H10	-	SALIX	M	-	sand		0.02	804
H09	-	SALIX	M, O	-	boulder-cobble-sand		0.01	552
H07	-	SALIX	M, O	-	cobble-sand		0.01	493
H08	-	SALIX	Y, O	-	sand		0.01	302
H12	-	POBAT, SALIX	S, Y, M, O	-	cobble-gravel-sand		0.10	4,438
H13	-	SALIX	S, Y, O	-	cobble-gravel-sand		0.10	4,378
H14	-	SALIX	O	-	-		0.06	2,806
H15	-	SALIX	-	-	-		0.00	179
H16	-	SALIX	O	-	-		0.05	2,326
H17	-	SALIX	-	-	-		0.08	3,513
H18	-	SALIX	-	-	-		0.02	922
H19	-	SALIX	-	-	-		0.01	414
H20	-	SALIX	-	-	-		0.01	407
H21	-	SALIX	-	-	-		0.01	340
H26	-	SALIX	-	-	-		0.04	1,751
H27	-	SALIX	S, Y, M, O	-	bedrock-boulder-sand		0.34	14,676
H22	-	SALIX	-	-	-		0.03	1,477
H24	-	SALIX	-	-	-		0.01	384
H25	-	SALIX	-	-	-		0.01	283
H23	-	SALIX	-	-	-		0.01	288
H28	-	SALIX	O	-	bedrock		0.02	669

Table H-1. Attribute Summary of Riparian Vegetation and Substrate along Hell Hole Reservoir Inflows and Shoreline (continued).

Corresponding Map Polygon Number ¹	Bank	Attribute				Notes	Area (acres)	Area (square feet)
		Dominant Species						
		Dominant Species Present ²	Structure ³	Sub-Dominant Species	Dominant Substrate			
H29	-	VICA5	Not applicable	-	-		0.01	554
H32	-	POBAT, SALIX	S, Y, M, O	-	boulder-cobble-gravel-sand		0.18	8,009
H33	-	SALIX	O	-	boulder-cobble-gravel-sand		0.03	1,100
H30	-	VICA5	Not applicable	-	-		0.05	2,389
H34	-	POBAT, SALIX	Y	-	boulder-cobble-gravel		0.01	341
H38	-	POBAT	O	-	boulder-sand		0.04	1,696
H39	-	VICA5	Not applicable	-	-		0.03	1,193
H41	-	SALIX	-	-	-		0.01	316
H42	-	ALRH2, SALIX	S, Y, M, O	-	-		0.44	19,213
H44	-	SALIX	S, Y	-	sand		0.25	10,963
H47	-	SALIX	-	-	-		0.26	11,268
H48	-	SALIX	Y	-	-		0.02	662
H49	-	SALIX	O	-	-		0.04	1,942
H50	-	POBAT	M	-	-		0.01	641
H51	-	SALIX	-	-	-		0.02	824
H45	-	SALIX	S, Y	-	sand		0.12	5,105
H52	-	ALRH2, POBAT, SALIX	S, Y	-	boulder-cobble-gravel		0.13	5,479
H53	-	SALIX	-	-	-		0.00	215
H54	-	SALIX	-	-	-		0.01	242
H55	-	SALIX	-	-	-		0.01	514
H56	-	SALIX	-	-	-		0.01	290
H59	-	SALIX	-	-	-		0.01	653
H57	-	SALIX	-	-	-		0.04	1,541
H58	-	SALIX	-	-	-		0.05	2,155
H60	-	SALIX	S, Y	-	-		0.37	15,956
H61	-	SALIX	-	-	-		0.01	497
H62	-	SALIX	-	-	-		0.01	556

Table H-1. Attribute Summary of Riparian Vegetation and Substrate along Hell Hole Reservoir Inflows and Shoreline (continued).

Corresponding Map Polygon Number ¹	Bank	Attribute				Notes	Area (acres)	Area (square feet)
		Dominant Species						
		Dominant Species Present ²	Structure ³	Sub-Dominant Species	Dominant Substrate			
H64	-	POBAT, SALIX	M	-	gravel-sand		0.15	6,541
H65	-	VICA5	Not applicable	-	-		0.04	1,840
H63	-	VICA5	Not applicable	-	-		0.05	2,145
H66	-	VICA5	Not applicable	-	-		0.07	3,126
H67	-	POBAT	S, M	-	-		0.01	460
H68	-	SALIX	-	-	-		0.12	5,304
H70	-	SALIX	-	-	-		0.01	576
H71	-	SALIX	-	-	-		0.02	677
H69	-	SALIX	-	-	-		0.05	2,066
H73	-	SALIX	Y, O	-	-		0.02	820
H72	-	SALIX	-	-	-		0.02	858
H74	-	SALIX	-	-	-		0.02	682
H76	-	SALIX	-	-	-		0.01	457
H75	-	SALIX	O	-	-		0.03	1,142
H79	-	SALIX	-	-	-		0.02	659
H78	-	SALIX	-	-	-		0.02	1,070
H77	-	SALIX	-	-	-		0.01	496
H80	-	SALIX	M	-	-		0.02	795
H81	-	VICA5	Not applicable	-	-		0.05	1,981
H82	-	VICA5	Not applicable	-	-		0.02	724
H84	-	VICA5	Not applicable	-	-		0.02	832
H83	-	VICA5	Not applicable	-	-		0.03	1,188
H85	-	SALIX (dead)	M	-	-		0.03	1,482
H86	-	POBAT, SALIX, VICA5	-	-	-		0.42	18,477
H87	-	SALIX	S, Y, O	-	fines		0.02	763
H43	-	SALIX	S, Y	-	sand		0.00	102
H88	-	SALIX	S, Y	-	-		0.16	6,873
H36	-	SALIX	S, Y, M, O	-	cobble-sand		0.02	814
H89	-	SALIX	M	-	fines		0.00	62
H90	-	SALIX	S, Y, O	-	fines		0.02	849
H91	-	SALIX	M	-	fines		0.00	65

Table H-1. Attribute Summary of Riparian Vegetation and Substrate along Hell Hole Reservoir Inflows and Shoreline (continued).

Corresponding Map Polygon Number ¹	Bank	Attribute				Notes	Area (acres)	Area (square feet)
		Dominant Species						
		Dominant Species Present ²	Structure ³	Sub-Dominant Species	Dominant Substrate			
H92	-	SALIX, POBAT	S, Y, M, O	-	fines		0.03	1,375
H93	-	SALIX	S, Y, M	-	fines		0.13	5,823
H94	-	SALIX	S, Y, M	-	fines		0.61	26,434
H95	-	POBAT	M	-	bedrock-boulder		0.00	186
H96	-	SALIX	M	-	fines		0.00	90
H97	-	SALIX	S, Y, M	-	fines		0.01	411
H98	-	SALIX	S, Y, M	-	fines		0.00	31
H35	-	SALIX	Y, M	-	cobble-sand		0.25	11,025
H37	-	ALINT	Y	-	-		0.00	198
H99	-	SALIX	S, Y, M	-	fines-cobble		0.01	337

¹ Map polygon numbers refer to the polygons labeled on the Map H-3. GIS shapefiles the riparian vegetation were overlain on contour maps of the bed and shoreline of Hell Hole Reservoir. Contour maps of the downstream (westernmost) portion of the reservoir were created using an interpolation of USGS 7.5 minute quadrangle contours. Contour maps of the upper (easternmost) portion of the reservoir were developed from topographic measurements collected by Air Maps USA in fall 2007 using aerial photogrammetric mapping techniques supported by ground control surveys.

² Species present:

Scientific Name	Common Name	Species Code	Scientific Name	Common Name	Species Code
<i>Agrostis oregonensis</i>	Oregon bentgrass	AGOR	<i>Equisetum laevigatum</i>	smooth scouring rush	EQLA
<i>Alnus rhombifolia</i>	white alder	ALRH2	<i>Gayophytum diffusum</i>	spreading ground smoke	GADI2
<i>Anaphalis margaritacea</i>	pearly everlasting	ANMA	<i>Pseudognaphalium canescens</i> (= <i>Gnaphalium canescens</i>)	wooly everlasting cudweed	GNCA2 (PSLU6)
<i>Aster sp.</i>	aster	ASTER sp.	<i>Pseudognaphalium ramosissimum</i> (= <i>Gnaphalium ramosissimum</i>)	pink cudweed	GNRA
<i>Brickellia californica</i>	brickellbush	BRCA3	<i>Heuchera micrantha</i>	crevice alumroot	HEMI7
<i>Carex athrostachya</i>	slender leaved sedge	CAAT3	<i>Hypericum perforatum</i>	Klamath weed	HYPE
<i>Calocedrus decurrens</i>	incense cedar	CADE27	<i>Juncus sp.</i>	rush	JUNCUS sp.
<i>Chenopodium botrys</i>	Jerusalem oak	CHBO2	<i>Juncus nevadensis</i>	Sierra rush	JUNE
<i>Cinna latifolia</i>	wood reedgrass	CILA2	<i>Juncus phaeocephalus</i> var. <i>paniculatus</i>	brown headed rush	JUPHP
<i>Cirsium vulgare</i>	bull thistle	CIVU	<i>Leersia oryzoides</i>	rice cutgrass	LEOR
<i>Coryza canadensis</i>	Canada horseweed	COCA5	<i>Lotus oblongifolius</i> var. <i>oblongifolius</i>	streambank trefoil	LOOB2
<i>Darmera peltata</i>	Indian rhubarb	DAPE	<i>Mellilotus officinalis</i> (= <i>Mellilotus alba</i>)	yellow sweetclover	MEOF
<i>Dichanthelium acuminatum</i> var. <i>acuminatum</i>	western panicum	DIAC2	<i>Melica stricta</i>	rock melicgrass	MEST

Table H-1. Attribute Summary of Riparian Vegetation and Substrate along Hell Hole Reservoir Inflows and Shoreline (continued).

Scientific Name	Common Name	Species Code	Scientific Name	Common Name	Species Code
<i>Dryopteris arguta</i>	wood fern	DRAR3	<i>Diplacus aurantiacus</i> (= <i>Mimulus aurantiacus</i>)	sticky monkeyflower	MIAU
<i>Epilobium canum</i> ssp. <i>latifolium</i>	California fuchsia	EPCA3	<i>Mimulus cardinalis</i>	crimson monkeyflower	MICA3
<i>Epilobium ciliatum</i>	hairy willow herb	EPCI			
<i>Mimulus lewisii</i>	Lewis's monkeyflower	MILE2	<i>Quercus kelloggii</i>	California black oak	QUKE
<i>Mimulus moschatus</i>	musky monkeyflower	MIMO3	<i>Rostraria cristata</i>	Mediterranean hairgrass	ROCR3
<i>Pinus ponderosa</i>	ponderosa pine	PIPO	<i>Rorippa curvipes</i>	bluntleaf yellowcress	ROCU2
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood	POBAT	<i>Salix lasiolepis</i> /spp.	arroyo willow	SALA6
<i>Potentilla glandulosa</i>	gland cinquefoil	POGL9	<i>Salix</i> sp.	willow	SALIX
<i>Polystichum kruckebergii</i>	Kruckeberg's sword fern	POKR	<i>Spiraea splendens</i> var. <i>splendens</i> (= <i>Spiraea densiflora</i>)	spiraea	SPSPS (SPDE)
<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas fir	PSME	<i>Verbascum thapsus</i>	wooly mullein	VETH
<i>Pteridium aquilinum</i> var. <i>pubescens</i>	bracken fern	PTAQP2	<i>Vitis californica</i>	California wild grape	VICA5
<i>Quercus chrysolepis</i>	canyon live oak	QUCH2	<i>Vulpia microstachys</i>	small fescue	VUMI
			<i>Woodwardia fimbriata</i>	giant chain fern	WOFI

³ Mapped for a sub-sample of the polygons.

Age Codes:

(S) Seedlings

(Y) Young: Shrubs with less than 10 stems per individual, or trees with diameters (diameter at breast height (DBH) less than 3 inches).

(M) Medium-Aged: Shrubs with between 10 and 60 stems per individual, trees with DBHs between 3 and 9 inches.

(O) Mature/Old: Shrubs with more than 60 stems per individual, trees with DBHs greater than 9 inches.

⁴ Only dominant species information was surveyed along the reservoir shoreline. Data on ages present and substrate were completed for a sub-sample of the polygons surveyed. Additional substrate information is provided in the AQ 9 - Geomorphology TSR (PCWA 2009).

Table H-2. Riparian Vegetation in the Study Area around Hell Hole Reservoir for the Existing Project¹.

Dominant Species	Corresponding Map Polygon Number ²	Area (acres)	Area (square feet)
Area 1: Below Maximum Normal Operating Water Surface Elevation (4,630 feet msl)			
Rubicon River Upstream from Hell Hole Reservoir			
Alder and Willow	UH47	0.00	159
none	UH42	0.17	7,350
none	UH41	0.29	12,541
none	UH43	0.19	8,249
none	UH44	0.17	7,490
none	UH45	0.10	4,480
none	UH46	0.13	5,852
none	UH48	0.07	3,155
none	UH49	0.03	1,292
Total none		1.16	50,409
Total Woody Riparian Vegetation Area 1 Rubicon River		0.00	159
Five Lakes Creek			
Alder	UH18	0.06	2,728
Alder and Black Cottonwood	UH12	0.02	736
Alder and Willow	UH07	0.04	1,609
Alder and Willow	UH19	0.15	6,636
Alder and Willow	UH23	0.05	2,210
Alder and Willow	UH25	0.06	2,503
Alder and Willow	UH28	0.08	3,669
Alder and Willow	UH29	0.21	8,944
Alder and Willow	UH30	0.06	2,528
Total Alder and Willow		0.65	28,100
Alder, Willow and Black Cottonwood	UH08	0.02	782
Alder, Willow and Black Cottonwood	UH16	0.10	4,419
Alder, Willow and Black Cottonwood	UH27	0.09	3,911
Total Alder, Willow, and Black Cottonwood		0.21	9,111
Black Cottonwood	UH13	0.01	634
Black Cottonwood	UH21	0.01	554
Black Cottonwood	UH24	0.06	2,619
Total Black Cottonwood		0.09	3,807
none	UH09	0.02	941
none	UH10	0.02	846
none	UH14	0.01	461
none	UH26	0.06	2,634
Total none		0.11	4,881
Willow	UH17	0.11	4,707
Willow	UH20	0.08	3,343
Total Willow		0.18	8,050
Willow and Black Cottonwood	UH11	0.02	1,009
Willow and Black Cottonwood	UH15	0.39	16,787
Total Willow and Black Cottonwood		0.41	17,796
Total Area 1 Woody Riparian Vegetation Five Lakes Creek		1.61	70,328

Table H-2. Riparian Vegetation in the Study Area around Hell Hole Reservoir for the Existing Project (continued).

Dominant Species	Corresponding Map Polygon Number ²	Area (acres)	Area (square feet)
Area 1: Below Maximum Normal Operating Water Surface Elevation (4,630 feet msl) (continued)			
Un-named Tributary			
Alder	UH36	0.03	1,232
California Wild Grape	UH32	0.19	8,372
California Wild Grape	UH34	0.09	3,989
Total California Wild Grape		0.28	12,361
none	UH35	0.09	4,067
none	UH37	0.06	2,617
none	UH39	0.16	6,854
Total None		0.31	13,538
Ponderosa Pine	UH31	0.03	1,406
Willow	UH33	0.09	3,794
Willow	UH40	0.55	23,903
Total Willow		0.64	27,698
Willow and California Wild Grape	UH38	0.07	3,175
Total Woody Riparian Vegetation Area 1 Un-named Tributary		0.77	33,510
Hell Hole Reservoir Shoreline			
Alder	H37	0.00	198
Alder and Willow	H42	0.41	17,994
Alder, Willow and Black Cottonwood	H52	0.13	5,479
Black Cottonwood	H38	0.04	1,696
Black Cottonwood	H50	0.01	641
Black Cottonwood	H67	0.01	456
Black Cottonwood	H95	0.00	186
Total Black Cottonwood		0.07	2,979
California Wild Grape	H11	0.02	1,042
California Wild Grape	H29	0.01	554
California Wild Grape	H30	0.05	2,389
California Wild Grape	H39	0.03	1,193
California Wild Grape	H63	0.05	1,986
California Wild Grape	H65	0.04	1,840
California Wild Grape	H66	0.04	1,919
California Wild Grape	H81	0.01	403
California Wild Grape	H82	0.02	724
California Wild Grape	H83	0.03	1,188
California Wild Grape	H84	0.01	447
Total California Wild Grape		0.31	13,684
Willow	H01	0.00	189
Willow	H04	0.24	10,654
Willow	H05	0.01	361
Willow	H06	0.01	361
Willow	H07	0.01	493
Willow	H08	0.01	302
Willow	H09	0.01	552
Willow	H10	0.02	804

Table H-2. Riparian Vegetation in the Study Area around Hell Hole Reservoir for the Existing Project (continued).

Dominant Species	Corresponding Map Polygon Number²	Area (acres)	Area (square feet)
Area 1: Below Maximum Normal Operating Water Surface Elevation (4,630 feet msl) (continued)			
Willow	H13	0.10	4,378
Willow	H14	0.06	2,806
Willow	H15	0.00	179
Willow	H16	0.05	2,326
Willow	H17	0.08	3,286
Willow	H18	0.02	922
Willow	H19	0.01	414
Willow	H20	0.01	327
Willow	H21	0.01	340
Willow	H22	0.03	1,477
Willow	H23	0.01	288
Willow	H24	0.01	384
Willow	H25	0.01	283
Willow	H26	0.04	1,751
Willow	H27	0.34	14,676
Willow	H28	0.02	669
Willow	H33	0.03	1,100
Willow	H35	0.25	11,025
Willow	H36	0.02	814
Willow	H41	0.01	316
Willow	H43	0.00	102
Willow	H44	0.25	10,963
Willow	H45	0.10	4,530
Willow	H47	0.26	11,268
Willow	H48	0.02	662
Willow	H49	0.04	1,942
Willow	H51	0.02	824
Willow	H53	0.00	215
Willow	H54	0.01	242
Willow	H55	0.01	514
Willow	H56	0.01	290
Willow	H57	0.04	1,541
Willow	H58	0.05	2,141
Willow	H59	0.01	653
Willow	H60	0.37	15,956
Willow	H61	0.01	497
Willow	H62	0.01	556
Willow	H68	0.12	5,304
Willow	H69	0.05	2,066
Willow	H70	0.01	576
Willow	H71	0.02	677
Willow	H72	0.02	858
Willow	H73	0.01	399
Willow	H74	0.02	682

Table H-2. Riparian Vegetation in the Study Area around Hell Hole Reservoir for the Existing Project (continued).

Dominant Species	Corresponding Map Polygon Number ²	Area (acres)	Area (square feet)
Area 1: Below Maximum Normal Operating Water Surface Elevation (4,630 feet msl) (continued)			
Willow	H75	0.03	1,120
Willow	H76	0.01	457
Willow	H77	0.01	496
Willow	H78	0.02	1,070
Willow	H79	0.02	659
Willow	H80	0.02	795
Willow	H85	0.03	1,482
Willow	H87	0.02	763
Willow	H88	0.16	6,873
Willow	H89	0.00	62
Willow	H90	0.02	849
Willow	H91	0.00	65
Willow	H93	0.13	5,823
Willow	H94	0.61	26,434
Willow	H96	0.00	90
Willow	H97	0.01	411
Willow	H98	0.00	31
Willow	H99	0.01	337
Total Willow		3.97	172,754
Willow and Black Cottonwood	H02	0.10	4,514
Willow and Black Cottonwood	H03	0.42	18,186
Willow and Black Cottonwood	H12	0.10	4,438
Willow and Black Cottonwood	H32	0.18	8,009
Willow and Black Cottonwood	H34	0.01	341
Willow and Black Cottonwood	H64	0.15	6,541
Willow and Black Cottonwood	H92	0.03	1,375
Total Willow and Black Cottonwood		1.00	43,405
Willow, Black Cottonwood and California Wild Grape	H86	0.41	17,834
Total Woody Riparian Vegetation Area 1 Hell Hole Reservoir Shoreline		5.98	260,643
Total Woody Riparian Vegetation Area 1		8.37	364,640
Area 2: Between Maximum Normal Operating Water Surface Elevation (4,630 feet msl) and Maximum Flood Pool Elevation (4,640 feet msl)			
Rubicon River Upstream from Hell Hole Reservoir			
none	UH43	0.01	526
none	UH44	0.00	31
none	UH45	0.06	2,479
none	UH46	0.04	1,930
none	UH48	0.05	2,172
none	UH49	0.05	2,355
Total none		0.22	9,493
Total Woody Riparian Vegetation Area 2 Rubicon River		0.00	0
Five Lakes Creek			
Alder	UH03	0.01	464
Alder and Black Cottonwood	UH02	0.03	1,190

Table H-2. Riparian Vegetation in the Study Area around Hell Hole Reservoir for the Existing Project (continued).

Dominant Species	Corresponding Map Polygon Number ²	Area (acres)	Area (square feet)
Area 2: Between Maximum Normal Operating Water Surface Elevation (4,630 feet msl) and Maximum Flood Pool Elevation (4,640 feet msl) (continued)			
Alder and Willow	UH04	0.01	274
Alder and Willow	UH06	0.01	586
Alder and Willow	UH05	0.04	1,537
Alder and Willow	UH07	0.07	3,017
Total Alder and Willow		0.12	5,415
Alder, Willow and Black Cottonwood	UH08	0.04	1,592
Black Cottonwood	UH13	0.01	518
none	UH09	0.00	87
none	UH10	0.01	328
Total none		0.01	415
Willow and Black Cottonwood	UH11	0.00	171
Total Woody Riparian Vegetation Area 2 Five Lakes Creek		0.20	8,832
Un-named Tributary			
Ponderosa Pine	UH31	0.00	2
California Wild Grape	UH32	0.00	1
Total Woody Riparian Vegetation Area 2 Un-named Tributary		0.00	0
Hell Hole Reservoir Shoreline			
Alder and Willow	H42	0.03	1,219
Black Cottonwood	H67	0.00	4
California Wild Grape	H63	0.00	159
California Wild Grape	H66	0.03	1,207
California Wild Grape	H81	0.04	1,571
California Wild Grape	H84	0.01	384
Total California Wild Grape		0.08	3,322
Willow	H04	0.00	68
Willow	H17	0.01	228
Willow	H20	0.00	80
Willow	H45	0.01	575
Willow	H58	0.00	14
Willow	H73	0.01	422
Willow	H75	0.00	21
Total Willow		0.03	1,407
Willow, Black Cottonwood and California Wild Grape	H86	0.01	644
Total Woody Riparian Vegetation Area 2 Hell Hole Reservoir Shoreline		0.08	3,274
Total Woody Riparian Vegetation Area 2		0.28	12,106
Area 3: Above Maximum Flood Pool Elevation (4,640 feet msl)³			
Rubicon River Upstream from Hell Hole Reservoir			
Alder	UH53	0.00	187
Alder	UH52	0.00	179
Alder	UH51	0.00	144
Alder	UH55	0.01	576
Total Alder		0.02	1,086

Table H-2. Riparian Vegetation in the Study Area around Hell Hole Reservoir for the Existing Project (continued).

Dominant Species	Corresponding Map Polygon Number ²	Area (acres)	Area (square feet)
Area 3: Above Maximum Flood Pool Elevation (4,640 feet msl)³ (continued)			
none	UH46	0.00	145
none	UH48	0.06	2,554
none	UH49	0.05	2,262
Total none		0.11	4,961
Willow	UH50	0.00	207
Willow	UH54	0.02	1,012
Total Willow		0.03	1,218
Total Woody Riparian Vegetation Area 3 Rubicon River		0.05	2,304
Five Lakes Creek			
Alder	UH03	0.01	564
Alder and Black Cottonwood	UH02	0.05	2,068
Alder and Willow	UH05	0.01	264
Willow	UH01	0.00	172
Total Woody Riparian Vegetation Area 3 Five Lakes Creek		0.07	3,068
Hell Hole Reservoir Shoreline			
California Wild Grape	H81	0.00	7
Total Woody Riparian Vegetation Area 3 Hell Hole Reservoir Shoreline		0.00	0
Total Woody Riparian Vegetation Area 3		0.12	5,372

¹ Refer to Schematic 1 in the text. No riparian vegetation was mapped in Area 4.

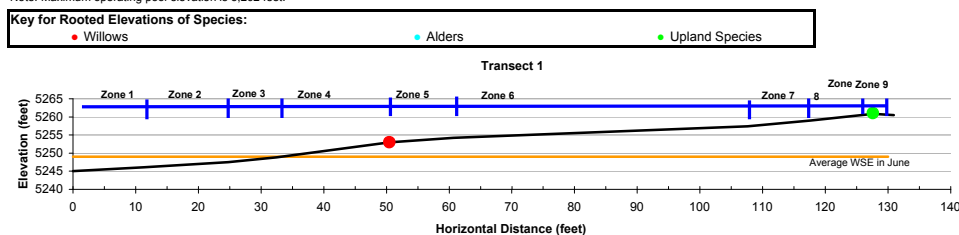
² Map polygon numbers refer to the polygons labeled on the MapH-3.

³ No vegetation was present in Area 3 along the un-named tributary.

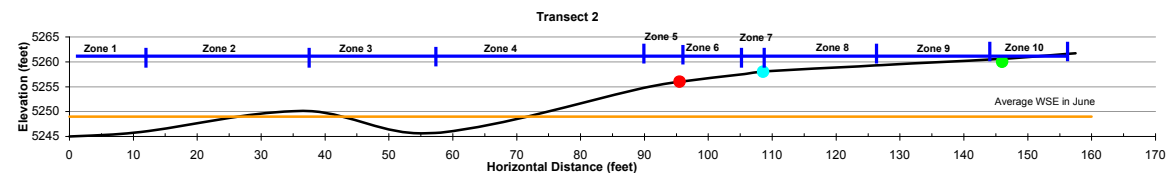
FIGURES

Figure H-1. Plant Community Zones and Substrate Characteristics along Surveyed Transects around French Meadows Reservoir¹.

Note: Maximum operating pool elevation is 5,262 feet.

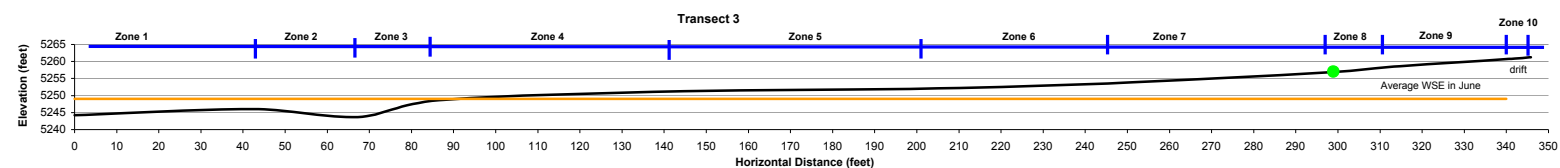


Zone	Plant Community Classification ²	Dominant Species ³ (>25% cover)	Subdominant Species	Substrate	Zone start (ft)	Zone end (ft)
1	Bedrock and Boulder Alliance Group	/	EQAR, GNPA	boulder, cobble	0.0	11.3
2	Unconsolidated Materials Alliance Group	/	EQAR	cobble, gravel	11.3	24.8
3	Unconsolidated Materials Alliance Group	/	AGOR, GNPA, GNLU	cobble, silt, fines	24.8	32.5
4	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	AGOR	GNPA, PLMA2, AGST2	gravel, cobble	32.5	50.5
5	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	SALA3	AGST2, AGOR	silt/fines, gravel	50.5	60.7
6	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	/	AGOR, AGST2, GNPA, moss	silt/fines, gravel	60.7	107.6
7	Arroyo willow/Douglas' sagewort Plant Association	/	AGST2	fines/silt	107.6	117.6
8	Lodgepole pine/Sedge Plant Association	/	PTAQP2	bedrock, fines; driftwood	117.6	127.6
9	Lodgepole pine/Sedge Plant Association	PIPO, PTAQP2	/	boulder, fines; driftwood, litter/duff	127.6	130.9



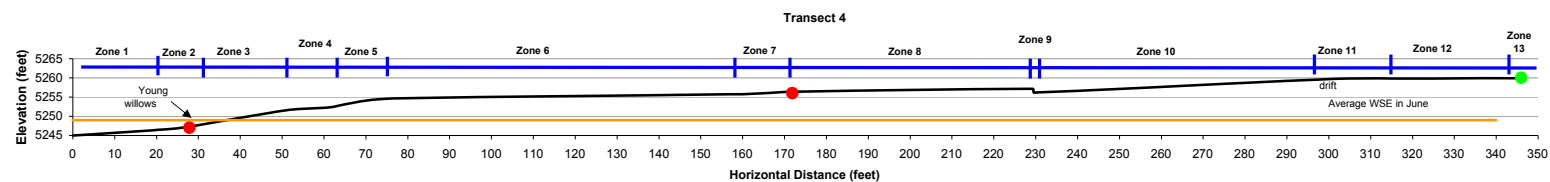
Zone	Plant Community Classification ²	Dominant Species ³ (>25% cover)	Subdominant Species	Substrate	Zone start (ft)	Zone end (ft)
1	Unconsolidated Materials Alliance Group	/	/	gravel, loose sand	0.0	11.2
2	Bedrock and Boulder Alliance Group	/	GNCA2	bedrock	11.2	36.6
3	Bedrock and Boulder Alliance Group	/	MILE2, Vegetation in cracks	bedrock, cobble	36.6	57.3
4	Unconsolidated Materials Alliance Group	/	GNPA, JUPHP <1% vegetation	cobble, boulder	57.3	89.9
5	Unconsolidated Materials Alliance Group	/	AGOR	fines	89.9	95.5
6	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	SALA3	PRVU, AGOR		95.5	105.6
7	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	AGOR	PRVU	soil, fines	105.6	108.3
8	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	ALINT, AGOR	EPCI, CAAN15, MUF12	soil, fines	108.3	126.0
9	Thinleaf alder Alliance	PICO	LOOB2, PTAQP2, ASOCY	fines, duff	126.0	146.3
10	Thinleaf alder Alliance	ABCO	PTAQP2, SYMO, THFE	fines, duff	146.3	157.5

Figure H-1. Plant Community Zones and Substrate Characteristics along Surveyed Transects around French Meadows Reservoir¹.



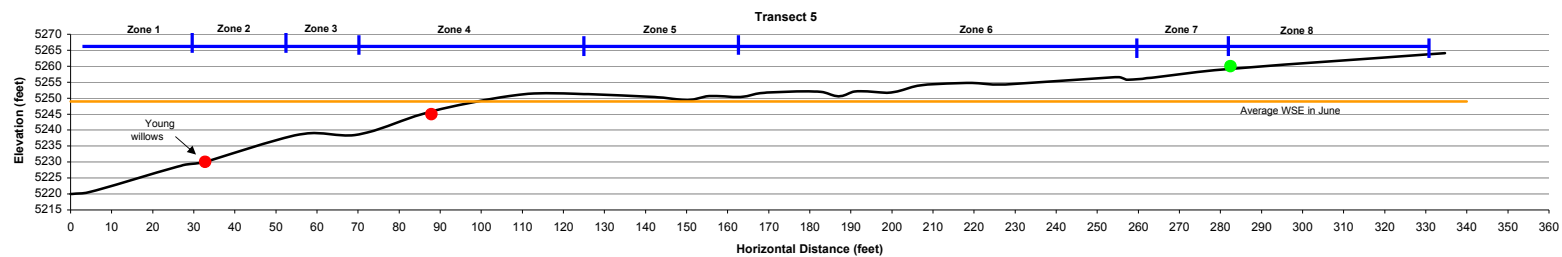
Zone	Plant Community Classification ²	Dominant Species ³ (>25% cover)	Subdominant Species	Substrate	Zone start (ft)	Zone end (ft)
1	Unconsolidated Materials Alliance Group	/	EQAR	cobble, gravel	0.0	41.7
2	Unconsolidated Materials Alliance Group	/	JUPHP, GNPA, EPCI	fines, silt, boulder	41.7	66.9
3	Unconsolidated Materials Alliance Group	/	ELPA, SALA3, ELPA, POAR11, germinants	fines, silt, boulder	66.9	86.6
4	Unconsolidated Materials Alliance Group	/	VETH, AGOR, GNPA, SPRU, LOPU3, AGST2, HOJU	fines, silt	86.6	141.1
5	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	AGOR	CALE9, CAAN15, GNPA, HOMU	fines	141.1	201.8
6	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	/	PODO4, SALA3	fines	201.8	248.4
7	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	ASOCY, AGOR	AGOR, ASOCY, PRVU, Moss, CAAN15	fines	248.4	298.9
8	Lodgepole pine/Sedge Plant Association	PICO	ASOCY, AGOR, PRVU	fines, duff	298.9	313.3
9	Lodgepole pine/Sedge Plant Association	PICO	ARDO3, PTAQP2, bracket drift line	fines, duff	313.3	341.2
10	Lodgepole pine/Sedge Plant Association	PICO	PTAQP2, SYMO, past drift line	duff, fines	341.2	345.8

Figure H-1. Plant Community Zones and Substrate Characteristics along Surveyed Transects around French Meadows Reservoir¹.



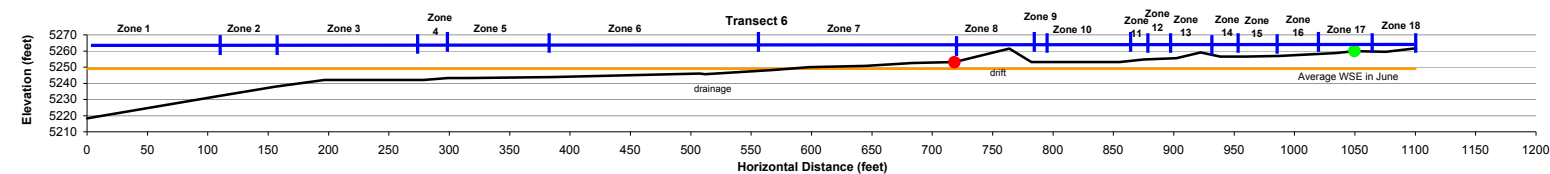
Zone	Plant Community Classification ²	Dominant Species ³ (>25% cover)	Subdominant Species	Substrate	Zone start (ft)	Zone end (ft)
1	Unconsolidated Materials Alliance Group	/	GNPA, EQAR, SALA3 (small), SAEX (small)	gravel, fines, cobble	0.0	19.7
2	Blister Sedge Plant Association	CAVEV2	ELPA	fines, cobble	19.7	28.9
3	Blister Sedge Plant Association	SALA3	AGOR, CAVEV2, PLER3	fines, cobble	28.9	50.5
4	Blister Sedge Plant Association	CAVEV2	AGOR, SAME2 (small)		50.5	62.0
5	Blister Sedge Plant Association	SALA3	AGOR, CAVEV2, GNPA		62.0	75.1
6	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	AGOR	PRVU, GNPA, ASOCY, PLER3, AGST2, GNLU, CAAN15, VETH, HYAN2	fines	75.1	158.8
7	Douglas' knotweed-Groundsmoke Plant Association	SALA3	PRVU, GNPA, ASOCY, PLER3, AGST2, GNLU, CAAN15, VETH, HYAN2	fines	158.8	171.9
8	Douglas' knotweed-Groundsmoke Plant Association	/	PRVU, GNPA, ASOCY, PLER3, AGST2, GNLU, CAAN15, VETH, HYAN2	fines	171.9	229.3
9	Douglas' knotweed-Groundsmoke Plant Association	/	STAJ, GAER2, PRVU, GNPA, ASOCY, PLER3, AGST2, GNLU, CAAN15, VETH, HYAN2	fines	229.3	229.7
10	Douglas' knotweed-Groundsmoke Plant Association	/	STAJ, GAER2, PRVU, GNPA, ASOCY, PLER3, AGST2, GNLU, CAAN15, VETH, HYAN2	fines	229.7	299.5
11	Douglas' knotweed-Groundsmoke Plant Association		AGST2, GADI2, RUAC3, CAAT3	drift	299.5	317.3
12	Lodgepole pine/Sedge Plant Association	SALA3	AGST2, CAAT3	drift	317.3	346.8
13	Lodgepole pine/Sedge Plant Association	PICO			346.8	346.8+

Figure H-1. Plant Community Zones and Substrate Characteristics along Surveyed Transects around French Meadows Reservoir¹.



Zone	Plant Community Classification ²	Dominant Species ³ (>25% cover)	Subdominant Species	Substrate	Zone start (ft)	Zone end (ft)
1	Bedrock and Boulder Alliance Group	/		large boulder, fine sand, gravel	0.0	33.5
2	Unconsolidated Materials Alliance Group	/	SAEX seedlings	fine silt/sand	33.5	55.8
3	Narrowleaf willow/Douglas' sagewort Plant Association			boulder, fine sand	55.8	70.2
4	Narrowleaf willow/Douglas' sagewort Plant Association	SAEX SAME2	Thatch, 5-10%	bedrock, fine sand, boulder	70.2	125.0
5	Miscellaneous willow Alliance Group	SAEX SAME2	AGOR, GNPA, PLER3	finer, gravel, bedrocks	125.0	163.1
6	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	SALU AGOR	LOC06, BOMU, Moss, PLER3, PRVU, AGST2, ASOCYY	finer	163.1	263.1
7	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	/	ASOCY, AGST2, GNCA2	finer	263.1	282.5
8	Unclassified Woodland or Forest Community	PIJE CECO	ASOCY, SYMO	finer, leaf litter, boulder	282.5	334.6

Figure H-1. Plant Community Zones and Substrate Characteristics along Surveyed Transects around French Meadows Reservoir¹.



Zone	Plant Community Classification ²	Dominant Species ³ (>25% cover)	Subdominant Species	Substrate	Zone start (ft)	Zone end (ft)
1	Unconsolidated Materials Alliance Group	/		fines, boulders	0.0	106.3
2	Unconsolidated Materials Alliance Group	/	SPRU, CAUM2, ROCU2	fines with boulder outcrop	106.3	155.8
3	Douglas' knotweed-Groundsmoke Plant Association	SPRU	GNPA, HYAN2, ROCU2	fines with boulder outcrop	155.8	278.9
4	Douglas' knotweed-Groundsmoke Plant Association	/	AMCA	fines	278.9	298.9
5	Douglas' knotweed-Groundsmoke Plant Association	/	AMCA, GNPA, PODO4, SPRU, CAUM2, LOMI, MIME, POAR11	fines with some gravel	298.9	385.2
6	Douglas' knotweed-Groundsmoke Plant Association	SPRU	CAUM2, PODO4, SALA3, LOMI, LONE4	fines with interspersed cobble, infrequent boulders	385.2	567.6
7	Douglas' knotweed-Groundsmoke Plant Association	/	CAUM2, HYAN2, GNPA, AGST2, GADI2, CAVEV2	gravel/ cobble, fines	567.6	718.5
8	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	AGST2, AGOR, MUF12	GNPA, SPRU	fines	718.5	782.2
9	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	SAEX	SALA3, SAEX, MUF12, AGOR, AGST2, GNPA	fines (1 boulder)	782.2	797.3
10	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	AGST2, SAEX	GNPA, AGOR	fines	797.3	855.3
11	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	SAEX, AGST2	MUF12	gravel/cobble	855.3	875.0
12	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	/	CAUM2, AGST2	gravel/cobble (boulder)	875.0	902.2
13	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	SALA3	AGST2, AGOR, CAAT3	boulder, fines	902.2	938.3
14	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	/	AGST2, AGOR, MUF12, Moss, LONE4, GNPA, GNCA2		938.3	959.0
15	Narrowleaf willow/Douglas' sagewort Plant Association	SAEX, MUF12	AGST2	fines	959.0	987.5
16	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	/	MUF12, AGST2, PLLA, GILE	fines, duff	987.5	1033.8
17	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	/	AGST2, ASOCYY, PLLA, VETH, GNPA, LOCO6	fines, duff	1033.8	1075.8
18	Lodgepole pine/Sedge Plant Association	PICO, PIJE	RUAC3, HYPE, PHLE3		1075.8	1101.0

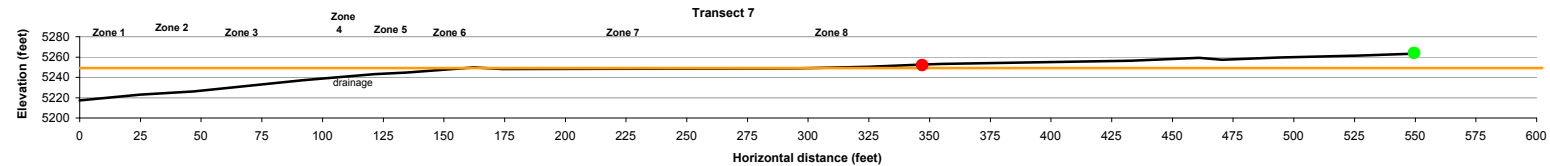
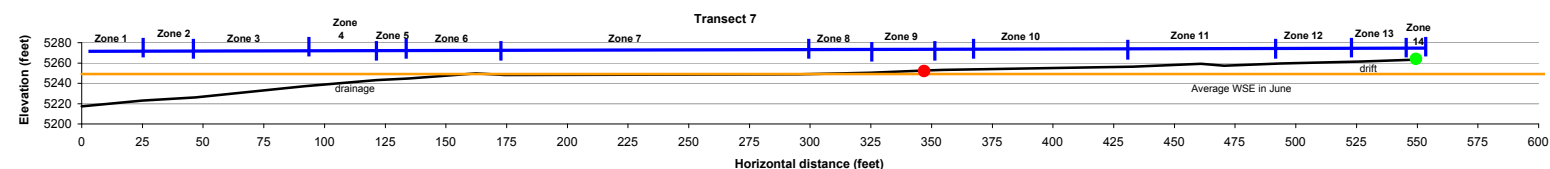
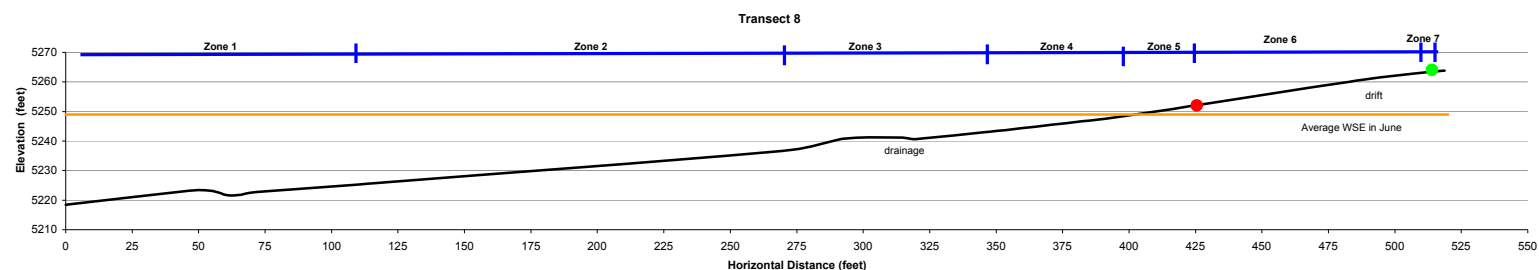


Figure H-1. Plant Community Zones and Substrate Characteristics along Surveyed Transects around French Meadows Reservoir¹.

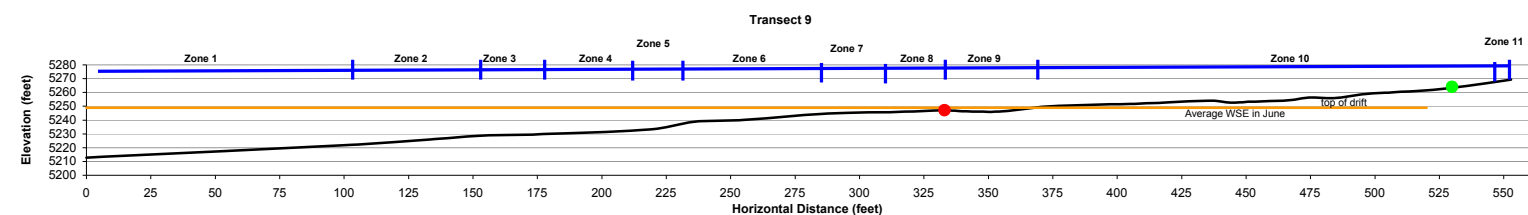


Zone	Plant Community Classification ²	Dominant Species ³ (>25% cover)	Subdominant Species	Substrate	Zone start (ft)	Zone end (ft)
1	Unconsolidated Materials Alliance Group	/		cobble, boulder	0.0	24.9
2	Unconsolidated Materials Alliance Group	/	Forb cotyledons	finer	24.9	46.9
3	Unconsolidated Materials Alliance Group	/		cobble	46.9	91.9
4	Unconsolidated Materials Alliance Group	/	AGOR	cobble	91.9	121.4
5	Douglas' knotweed-Groundsmoke Plant Association	PODO4	VETH	cobble, gravel	121.4	134.5
6	Douglas' knotweed-Groundsmoke Plant Association	/	RUAC3, GNPA, EQAR, VETH, AGOR	cobble, gravel	134.5	174.2
7	Douglas' knotweed-Groundsmoke Plant Association	/	VETH, RUAC3, SPRU, CAUM2	gravel, cobble	174.2	294.6
8	Douglas' knotweed-Groundsmoke Plant Association	/	PODO4, AGOR, CAUM2, GNPA, SPRU	sand, gravel	294.6	324.8
9	Narrowleaf willow/Douglas' sagewort Plant Association	SAEX	AGST2, GNPA	gravel, sand	324.8	355.0
10	Narrowleaf willow/Douglas' sagewort Plant Association	/	AGOR, SPRU, GNPA, PLLA	gravel, sand	355.0	433.1
11	Narrowleaf willow/Douglas' sagewort Plant Association	SALA3, SAEX	AGOR, PLLA, CAVEV2	gravel, sand	433.1	493.8
12	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	CAPR8, AGST2	PRVU, moss	sand, gravel, bottom of drift line	493.8	526.6
13	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	/	AGST2, P IJE/ CADE2727 overhang	litter, top of drift line	526.6	549.5
14	White fir-incense cedar/Arrowleaf groundsel Plant Association	PLJE, CADE2727	PHLE3, ASBO2, LANEN, Delphinium sp., AGFO	finer, litter	549.5	551.2

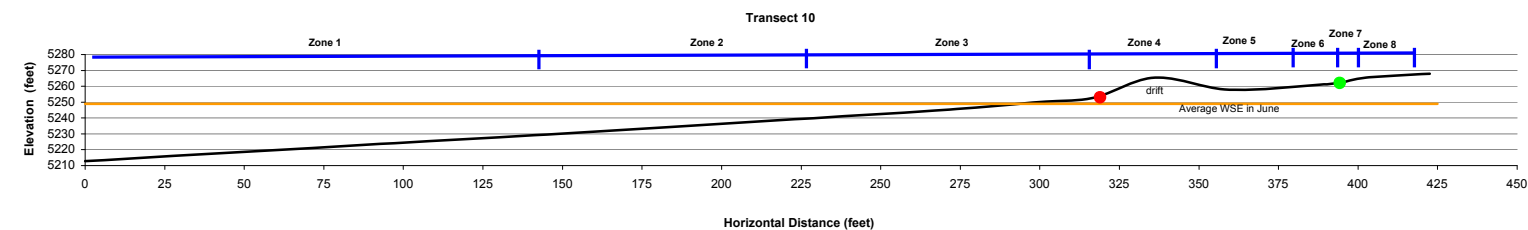


Zone	Plant Community Classification ²	Dominant Species ³ (>25% cover)	Subdominant Species	Substrate	Zone start (ft)	Zone end (ft)
1	Unconsolidated Materials Alliance Group	/		cobble, finer	0.0	113.8
2	Unconsolidated Materials Alliance Group	/	AGOR, AMCA <<<1%	cobble, finer	113.8	269.4
3	Unconsolidated Materials Alliance Group	/	AGOR	cobble, gravel	269.4	346.1
4	Douglas' knotweed-Groundsmoke Plant Association	PODO4	VETH, SPRU, AGOR	cobble, gravel	346.1	394.7
5	Douglas' knotweed-Groundsmoke Plant Association	/	VETH, CAUM2, LOMI, AGOR	cobble, gravel	394.7	425.5
6	Narrowleaf willow/Douglas' sagewort Plant Association	SAEX	VETH, AGOR, LOMI	cobble, gravel	425.5	514.4
7	White fir-incense cedar/Arrowleaf groundsel Plant Association	PICO, CADE27	CAOC6	cobble, litter	514.4	518.7

Figure H-1. Plant Community Zones and Substrate Characteristics along Surveyed Transects around French Meadows Reservoir¹.



Zone	Plant Community Classification ²	Dominant Species ³ (>25% cover)	Subdominant Species	Substrate	Zone start (ft)	Zone end (ft)
1	Unconsolidated Materials Alliance Group	/		cobble, gravel	0.0	102.4
2	Unconsolidated Materials Alliance Group	/		gravel, cobble, boulder	102.4	153.9
3	Unconsolidated Materials Alliance Group	/			153.9	175.2
4	Unconsolidated Materials Alliance Group	/	DIAC2	silt, cobble	175.2	218.2
5	Unconsolidated Materials Alliance Group	/			218.2	235.6
6	Unconsolidated Materials Alliance Group	/	CHBO2, DIAC2, VETH, ROCU, GNPA	cobble, boulder	235.6	287.7
7	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	DIAC2	GNCA2, VETH, GAER2	cobble, gravel	287.7	314.6
8	Douglas' knotweed-Groundsmoke Plant Association	VETH	DIAC2, CAUM2, GAER2, GNCA2		314.6	337.9
9	Narrowleaf willow/Douglas' sagewort Plant Association	SAEX	CAUM2		337.9	373.0
10	Narrowleaf willow/Douglas' sagewort Plant Association	SAEX		leaf litter, duff, cobble, gravel, silt, fine sand, boulder	373.0	549.9
11	White fir-incense cedar/Arrowleaf groundsel Plant Association	CADE2/27/ABCO	MOGL, CEIN3	boulder, gravel	549.9	556.1



Zone	Plant Community Classification ²	Dominant Species ³ (>25% cover)	Subdominant Species	Substrate	Zone start (ft)	Zone end (ft)
1	Unconsolidated Materials Alliance Group	/		gravel, Coarse sand with cobble, boulder	0.0	141.1
2	Unconsolidated Materials Alliance Group	/	DIAC2, CHBO2	cobble, gravel, m sand, boulder	141.1	225.1
3	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	AGOR	ROCU2	cobble, boulder, gravel	225.1	317.9
4	Shining willow/Common horsetail Plant Association	SALU	DIAC2, CAPR8	gravel, cobble	317.9	359.6
5	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	/	CAPR8, VETH, AGOR	gravel, cobble	359.6	388.1
6	Mid elevation Miscellaneous Riparian Graminoid Alliance Group	/	AGOR	cobble, gravel	388.1	394.4
7	White fir-incense cedar/Arrowleaf groundsel Plant Association	ABCO		drift, duff, large boulders at edge	394.4	402.6
8	White fir-incense cedar/Arrowleaf groundsel Plant Association	ABCO	PTAQP2, SYMO, CECO	litter, duff	402.6	421.6

¹ Reservoir WSEs dropped by approximately two feet (5,220.8 feet to 5,212.8 feet msl) between the dates of the surveys (August 24, 2007 to September 13, 2007). Flows in the Middle Fork American River into French Meadows Reservoir were less than 1 cfs at the time of the survey.

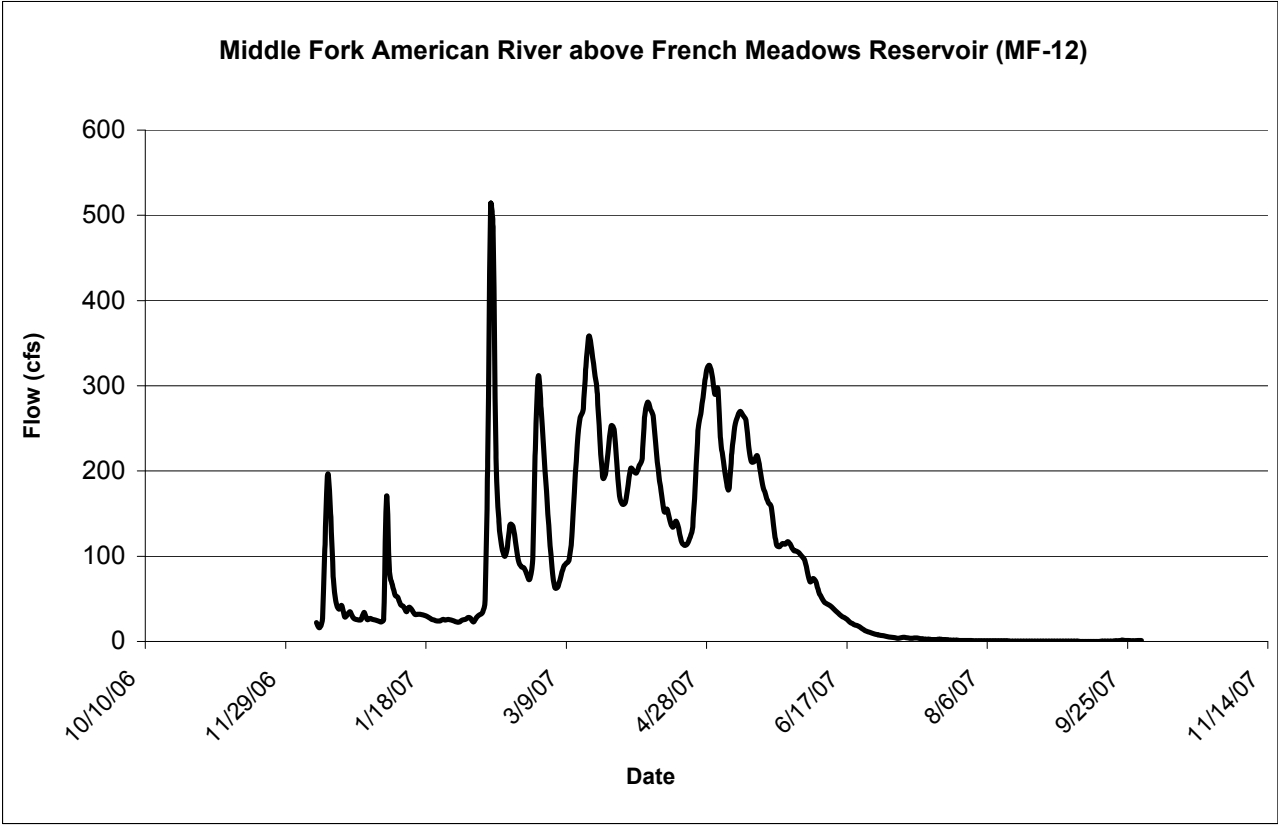
² Community Classifications developed using Potter (2005) from ENTRIX field data collected along the line-intercept.

Figure H-1. Plant Community Zones and Substrate Characteristics along Surveyed Transects around French Meadows Reservoir¹.

³ Species Present

Scientific Name	Common Name	Species Code	Scientific Name	Common Name	Species Code	Scientific Name	Common Name	Species Code
<i>Abies concolor</i>	white fir	ABCO	<i>Eleocharis pachycarpa</i>	black sand spike rush	ELPA	<i>Phalaris lemmonii</i>	Lemmon's canary grass	PHLE3
<i>Agrostis oregonensis</i>	Oregon bentgrass	AGOR	<i>Epilobium ciliatum</i>	narrow willow herb	EPCI	<i>Pinus contorta</i>	Lodgepole pine	PICO
<i>Agrostis stolonifera</i>	creeping bent grass	AGST2	<i>Equisetum arvense</i>	common horsetail	EQAR	<i>Pinus jeffreyi</i>	Jeffrey pine	PLJE
<i>Alnus incana</i> ssp. <i>tenuifolia</i>	mountain alder	ALINT	<i>Gayophytum diffusum</i>	spreading ground smoke	GADI2	<i>Pinus ponderosa</i>	ponderosa pine	PIPO
<i>Amaranthus californicus</i>	California pigweed	AMCA	<i>Gayophytum eriospermum</i>	Coville's ground smoke	GAER2	<i>Plantago erecta</i>	California plantain	PLER3
<i>Aquilegia formosa</i>	western columbine	AQFO	<i>Navaretia leptalea</i> (= <i>Gilia leptalea</i>)	Bridge's gilia	NALE12 (GILE)	<i>Plantago lanceolata</i>	English plantain	PLLA
<i>Artemisia douglasiana</i>	Douglas' sagewort (mugwort)	ARDO3	<i>Pseudognaphalium canescens</i> (= <i>Gnaphalium canescens</i>)	woody everlasting cudweed	GNCA2 (PSLU6)	<i>Plantago major</i>	common plantain (big plantain)	PLMA2
<i>Astragalus bolanderi</i>	Bolander's milkvetch	ASBO2	<i>Juncus phaeocephalus</i> var. <i>paniculatus</i>	brown headed rush	JUPHP	<i>Polygonum arenastrum</i>	dooryard knotweed	POAR11
<i>Symphoricarum spathulatum</i> var. <i>yosemitanum</i> (= <i>Aster occidentalis</i>)	mountain aster	SYSPS (ASOCY)	<i>Pseudognaphalium luteoalbum</i> (= <i>Gnaphalium luteoalbum</i>)	everlasting cudweed	PSLU6 (GNLU)	<i>Polygonum douglasii</i>	Douglas' knotweed	PODO4
<i>Botrychium multifidum</i>	broadleaf grapefern	BOMU	<i>Gnaphalium palustre</i>	western marsh cudweed	GNPA	<i>Prunella vulgaris</i>	self-heal	PRVU
<i>Carex angustata</i>	widefruit sedge	CAAN15	<i>Hordeum jubatum</i>	squirreletail foxtail barley	HOJU	<i>Pteridium aquilinum</i> var. <i>pubescens</i>	bracken fern	PTAQ2
<i>Carex athrostachya</i>	slender leaved sedge	CAAT3	<i>Hordeum murinum</i>	barley	HOMU	<i>Rorippa curvipes</i>	bluntleaf yellowcress	ROCU2
<i>Calocedrus decurrens</i>	incense cedar	CADE27	<i>Hypericum anagalloides</i>	tiniker's penny	HYAN2	<i>Rumex acetosella</i>	sheep sorrel	RUAC3
<i>Carex leporinella</i>	Sierra hare sedge	CALE9	<i>Hypericum perforatum</i>	Klamath weed	HYPE	<i>Salix exigua</i>	narrow leaf willow	SAEX
<i>Carex preslii</i>	Presli's sedge	CAPR8	<i>Lathyrus nevadensis</i> var. <i>nevadensis</i>	Sierra Nevada pea	LANEN	<i>Salix laevigata</i>	red willow	SALA3
<i>Cistanthe umbellata</i> (= <i>Calyptidium umbellatum</i>)	pussypaws	CIUMC (CAUM2)	<i>Lotus corniculatus</i>	bird's foot trefoil	LOCO6	<i>Salix lucida</i>	shining willow	SALU
<i>Carex vesicaria</i> var. <i>vesicaria</i>	blister sedge	CAVEV2	<i>Lotus micranthus</i>	small-flowered trefoil	LOMI	<i>Salix exigua</i> / <i>Salix melanopsis</i>	dusky willow	SAME2
<i>Ceanothus cordulatus</i>	mountain whitethorn	CECO	<i>Lotus nevadensis</i>	Sierra Nevada lotus	LONE4	<i>Spergularia rubra</i>	purple sand spurry	SPRU
<i>Ceanothus integerrimus</i>	deerbrush	CEIN3	<i>Lotus oblongifolius</i> var. <i>oblongifolius</i>	streambank trefoil	LOOB2	<i>Stachys ajugoides</i>	hedge nettle	STAJ
<i>Chenopodium botrys</i>	Jerusalem oak	CHBO2	<i>Lotus unifoliolatus</i> var. <i>unifoliolatus</i> (= <i>Lotus purshianus</i> var. <i>purshianus</i>)	Spanish clover	LOUNU (LOPU3)	<i>Symphoricarpos mollis</i>	creeping snowberry	SYMO
<i>Dichanthelium acuminatum</i> var. <i>acuminatum</i>	western panicum	DIAC2	<i>Monardella glauca</i>	post monardella	MOGL	<i>Thalictrum fendleri</i>	Fendler's meadow rue	THFE
			<i>Muhlenbergia filiformis</i>	slender muhly	MUF12	<i>Verbascum thapsus</i>	wooly mullein	VETH

Figure H-2. Middle Fork American River Flows above French Meadows Reservoir (December 2006 to October 2007)¹.



¹ This gaging station (MF-12) has only been in operation a short period of time (since December 2006).

Figure H-3. French Meadows Reservoir Water Surface Elevations During Water Year 2007.

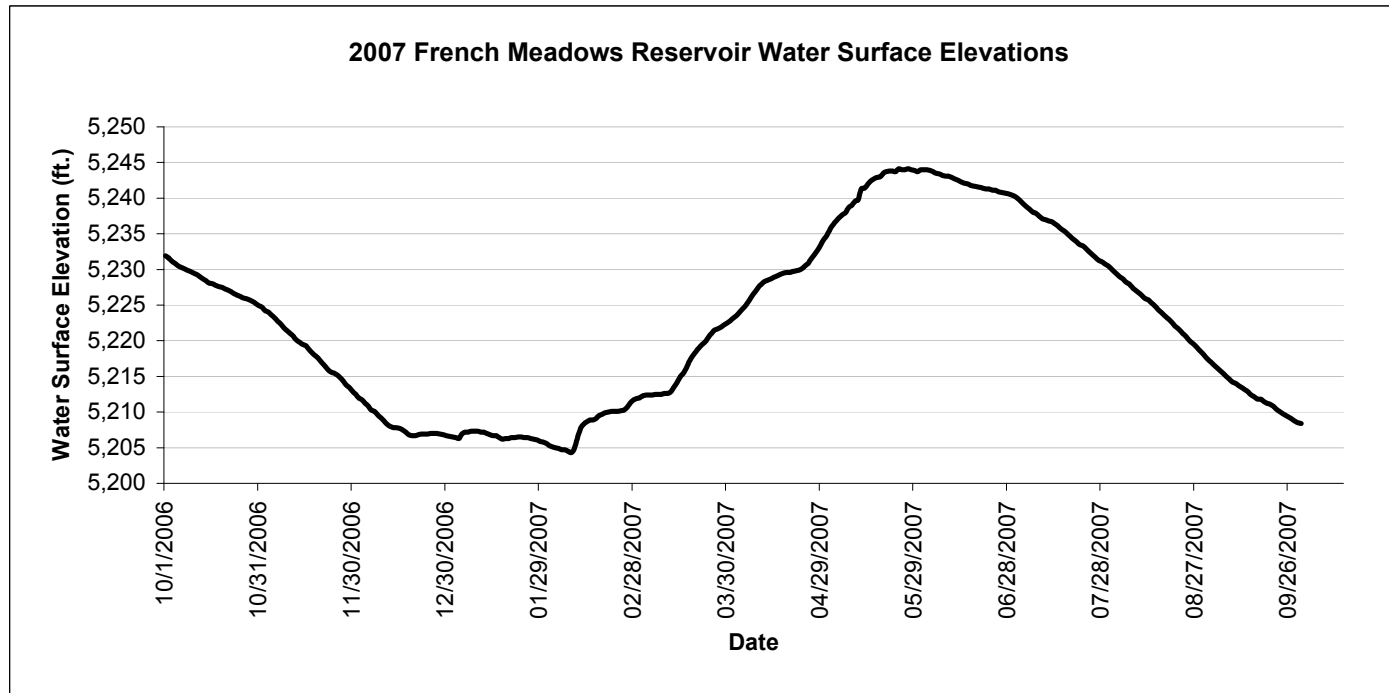
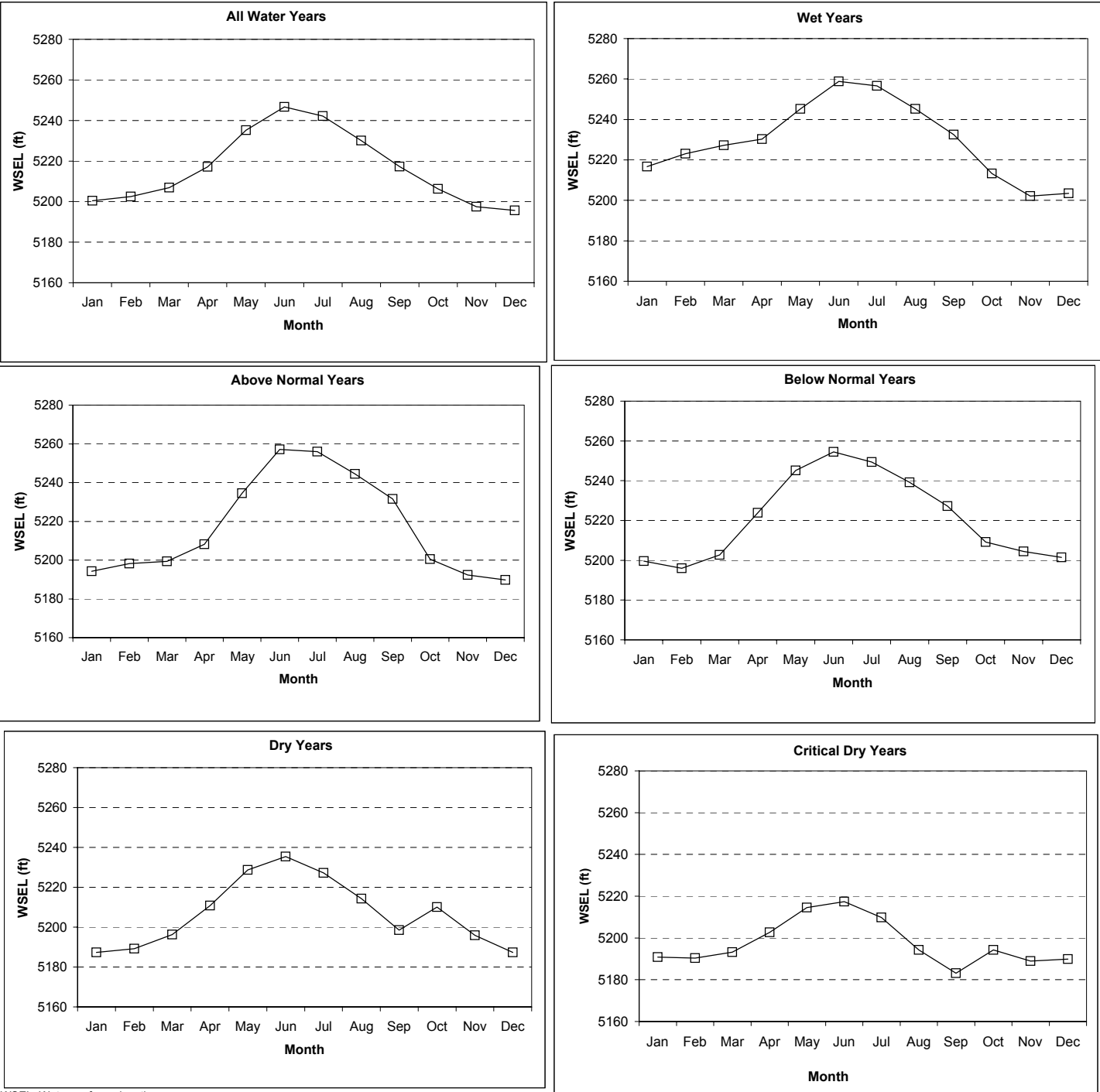
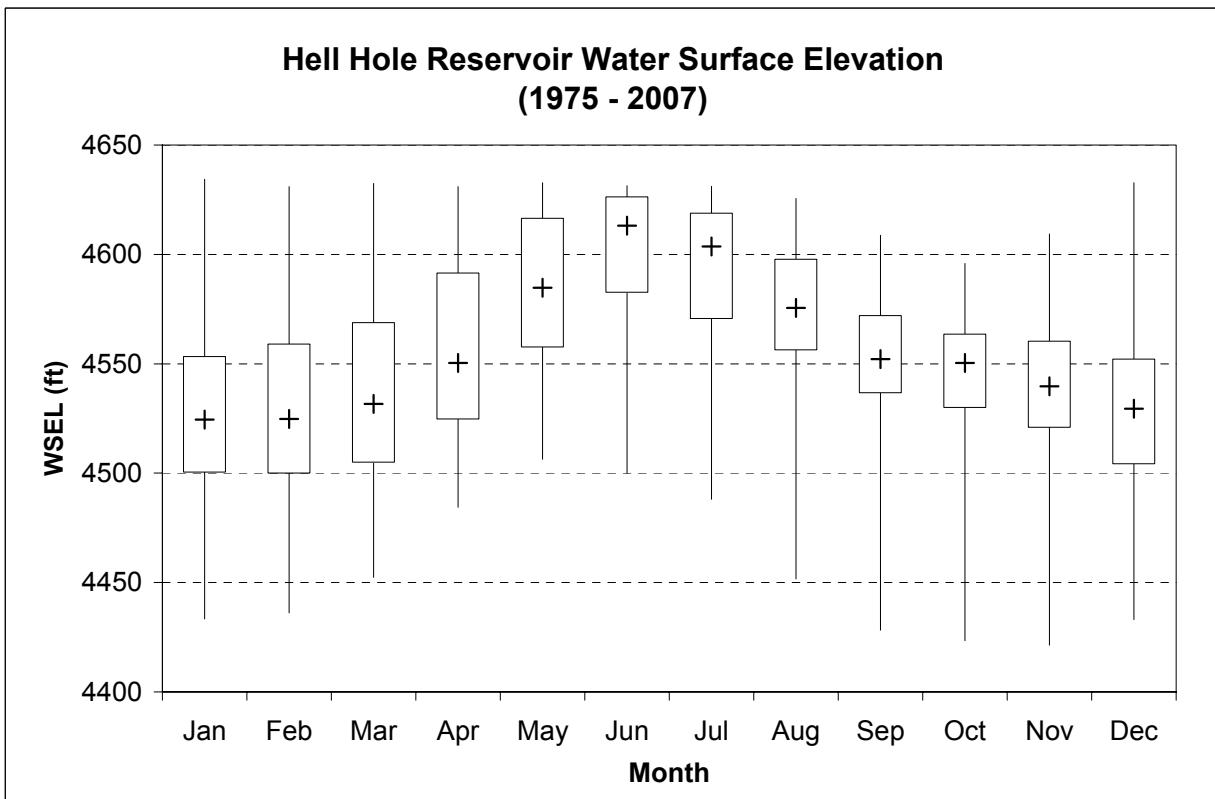
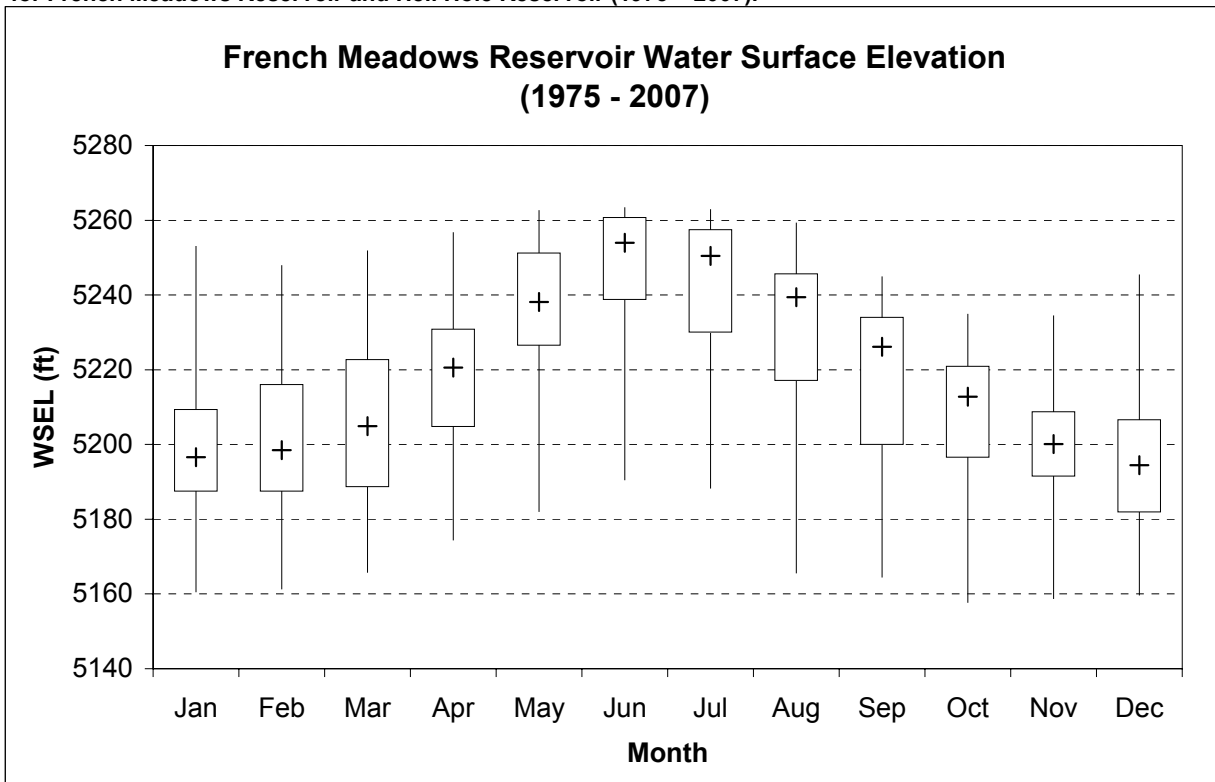


Figure H-4. French Meadows Reservoir Annual and Inter-annual Fluctuations in Water Surface Elevations (1975 – 2007).



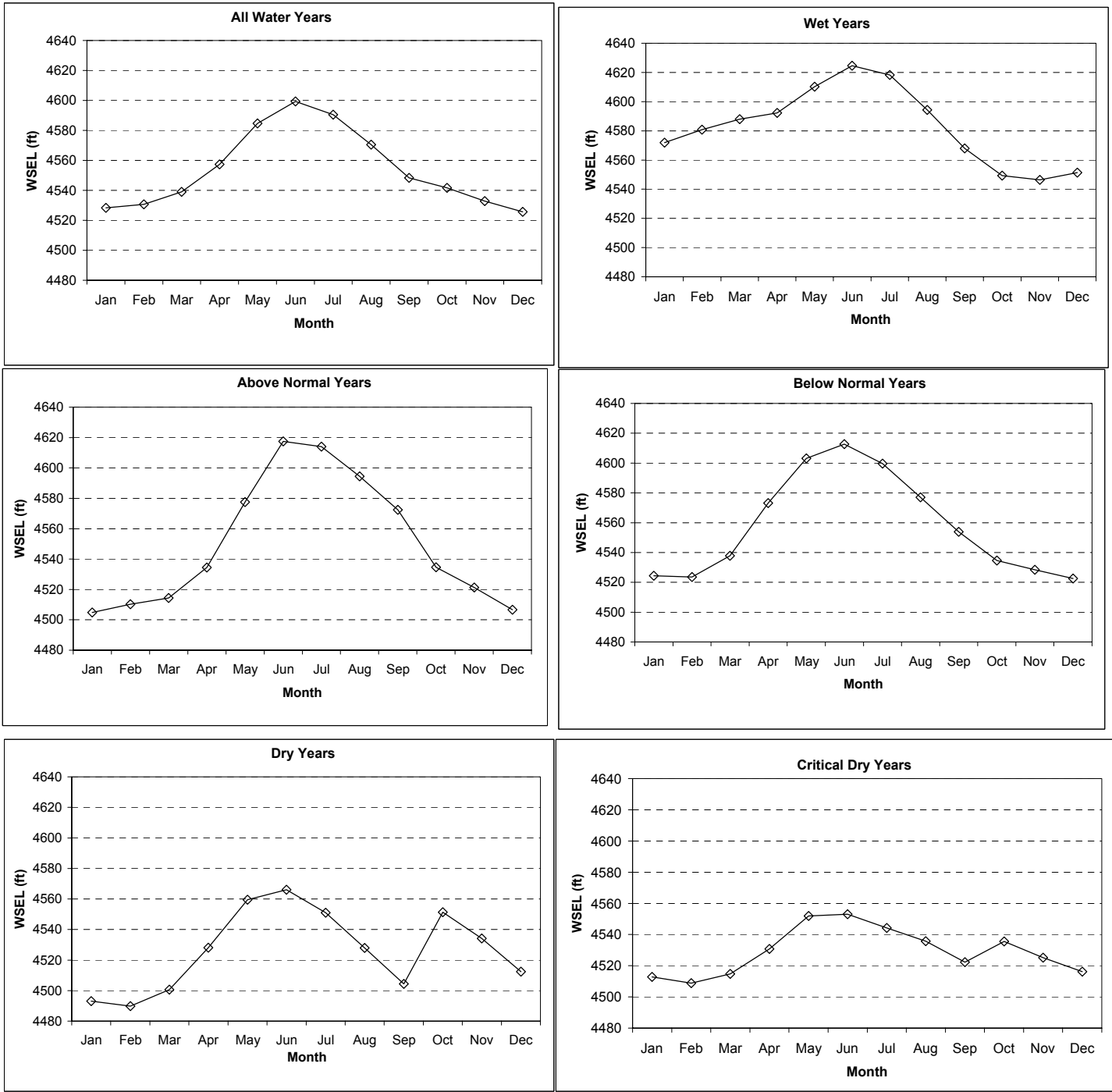
WSEL: Water surface elevation

Figure H-5. Median, Quartile (25% and 75%), Minimum, and Maximum Reservoir Water Surface Elevations by Month for French Meadows Reservoir and Hell Hole Reservoir (1975 – 2007).



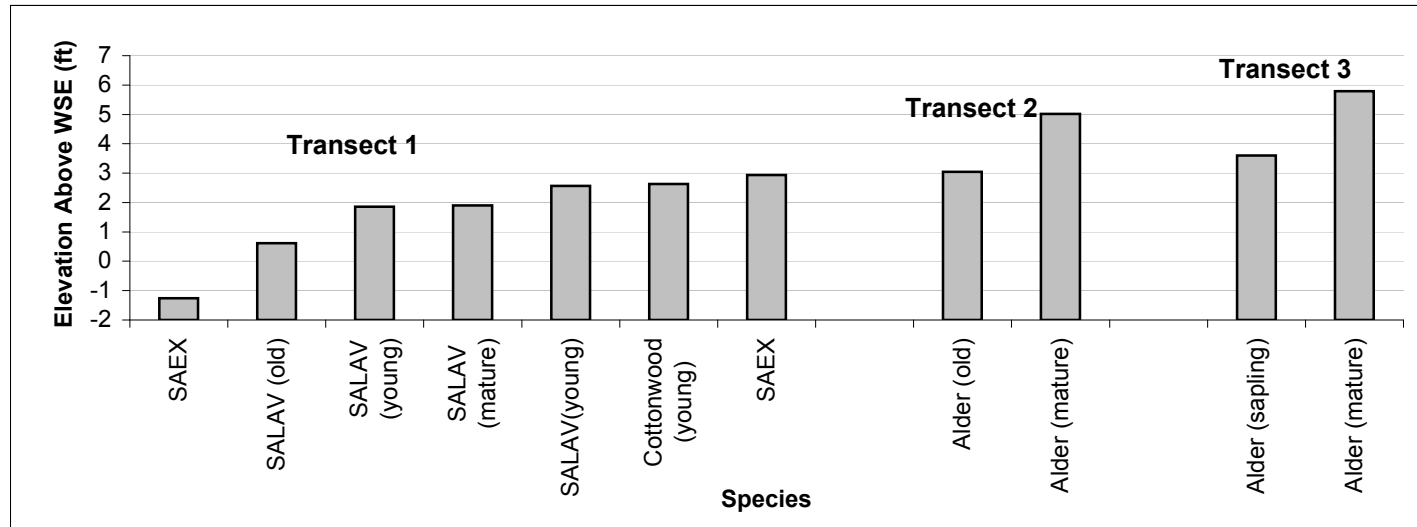
WSEL: Water surface elevation

Figure H-6. Hell Hole Reservoir Annual and Inter-annual Fluctuations in Water Surface Elevations (1975 - 2007).



WSEL: Water surface elevation

Figure H-7. Rooted Elevation of Riparian Individuals at Three Locations Along Ralston Afterbay.

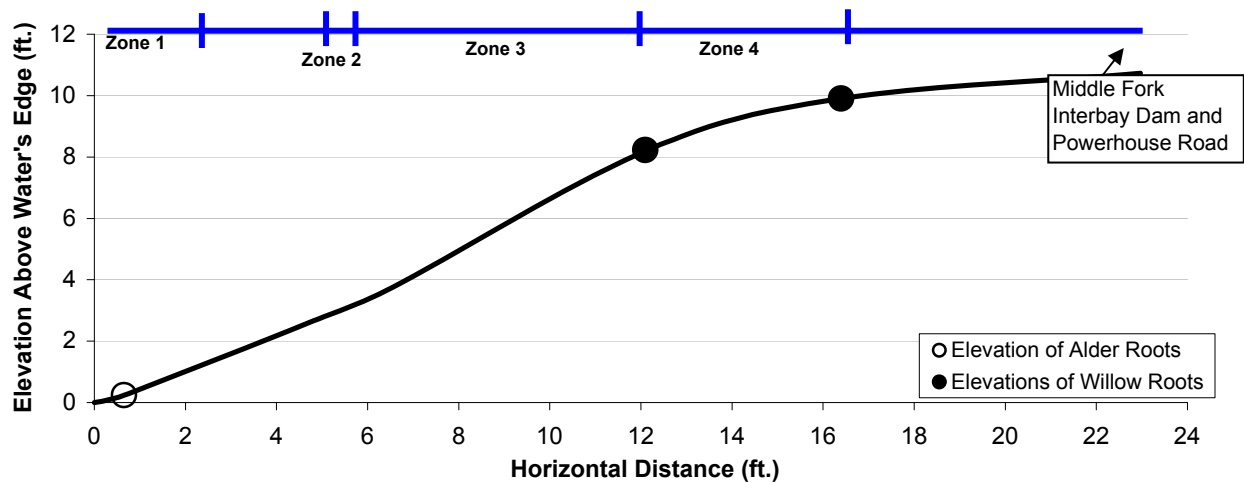


WSEL: water surface elevation

Species Present:

Scientific Name	Common Name	Species Code
<i>Alnus rhombifolia</i>	white alder	ALRH2
<i>Fremontii</i>	Fremont cottonwood	POFR2
<i>Salix exigua</i>	narrow leaf willow	SAEX
<i>Salix laevigata</i>	red willow	SALAV

Figure H-8. General Pattern of Riparian Vegetation Along Middle Fork Interbay in Relation to Elevation Above the Water Surface Elevation¹.



¹ Water surface elevations in Middle Fork Interbay have been kept relatively constant under existing operations at approximately 2,524 feet.

Transect Number	Zone	Plant Community Classification ¹	Dominant Species ² (>25% cover)	Subdominant Species	Substrate	Zone start (ft)	Zone end (ft)
1	1	White Alder/Sedge Plant Association	ALRH2	CALE9 fines	cobble	1.0	2.3
	2	Unclassified Woodland or Forest Community	ACMA		fines, cobble	4.9	5.2
	3	Unclassified Woodland or Forest Community	SALI		fines, cobble	5.2	12.1
	4	California Annual Grassland Alliance Group	BRHO2		fines, duff	12.1	16.4

¹ Community Classifications developed using Potter (2005) from ENTRIX field data collected along the line-intercept.

² Species Present:

Scientific Name	Common Name	Species Code
<i>Acer macrophyllum</i>	big leaf maple	ACMA3
<i>Alnus rhombifolia</i>	white alder	ALRH2
<i>Bromus hordeaceus</i>	soft cress	BRHO2
<i>Carex leporinella</i>	Sierra hare sedge	CALE9
<i>Salix ligulifolia</i>	strapleaf willow	SALI

MAPS

APPENDIX I

Hell Hole Reservoir Seasonal Storage Increase Betterment – Riparian Vegetation Distribution Maps and Hydrology Analyses

Project Betterments/ Improvements

Tables

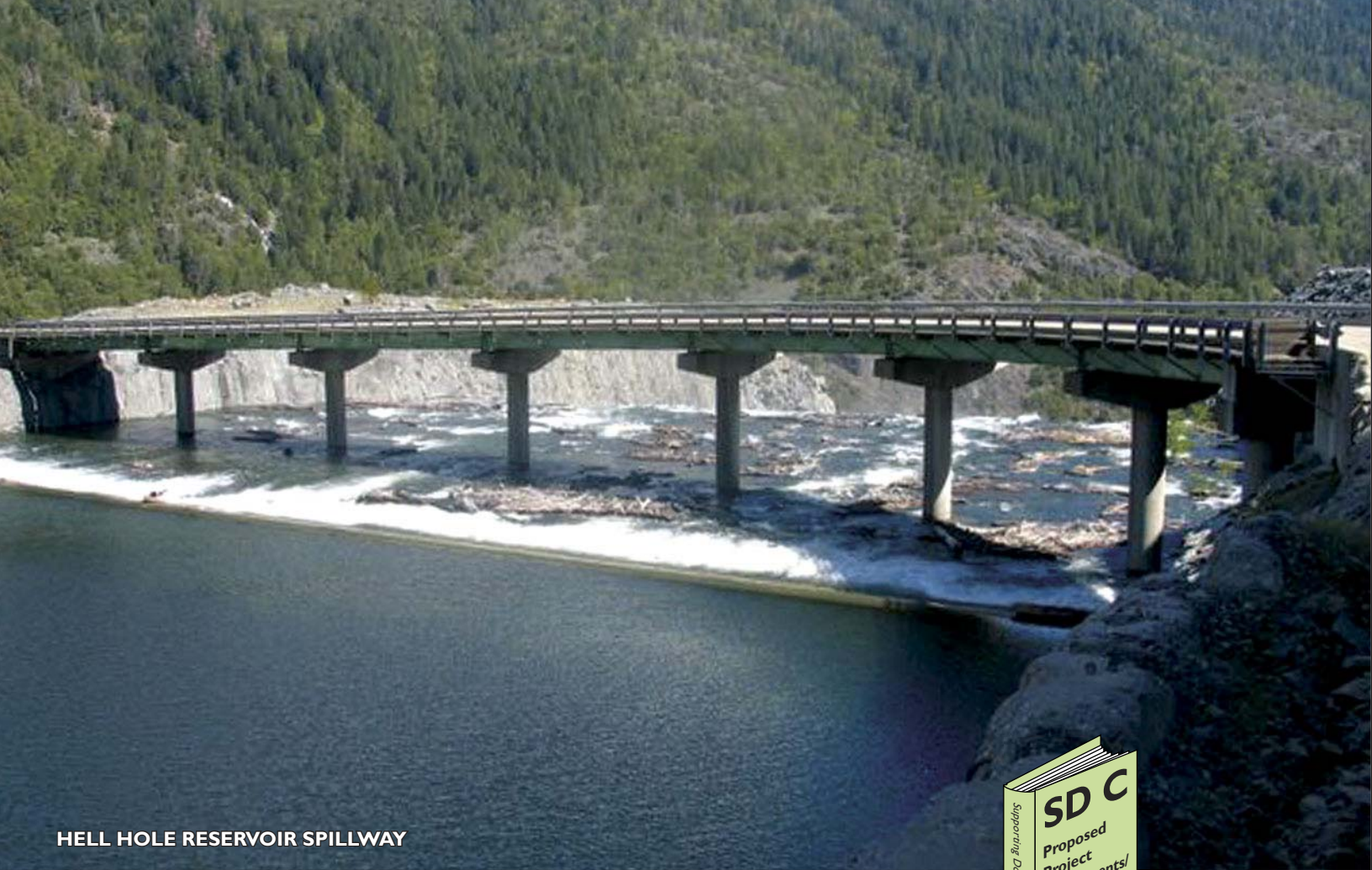
Table I-1.	Summary of Riparian Belt-Transect Data from Five Lakes Creek.
Table I-2.	Summary of Tree Core Data from Five Lakes Creek.
Table I-3.	Riparian Vegetation in the Study Area around Hell Hole Reservoir Associated with the Hell Hole Reservoir Seasonal Storage Increase Betterment.

Figures

Figure I-1.	Riparian Corridor Location and Width on Five Lakes Creek Along Surveyed Transects.

Maps

Map I-1.	Hell Hole Seasonal Storage Increase: Riparian Vegetation Mapped within the Buffer Area.
Map I-2.	Riparian Survey Transects along Five Lakes Creek.
Map I-3.	Riparian Vegetation Composition Associated with the Hell Hole Reservoir Seasonal Storage Increase Betterment.



HELL HOLE RESERVOIR SPILLWAY



Project Betterments/ Improvements

IN PREPARATION FOR THE RELICENSING OF THE MFP, PCWA conducted an assessment to identify potential modifications or additions (betterments) to existing Project facilities that would improve operations or maintenance of the Project, and result in an increase in net or peaking generation. As a result of this assessment, PCWA is including the following three potential Project betterments in the PAD:

- Hell Hole Reservoir Seasonal Storage Increase
- French Meadows Powerhouse Capacity Upgrade
- Ralston Powerhouse Capacity Upgrade

PCWA intends to further evaluate these potential betterments during relicensing with respect to their engineering and economic feasibility and the potential protection, mitigation, or enhancement measures that may be necessary to address potential effects on environmental and cultural resources. The specific Project betterments to be included in the License Application will be determined after reviewing the results of on-going engineering, economic, cultural, and environmental studies in relation to potential future license conditions.

HELL HOLE RESERVOIR SEASONAL STORAGE INCREASE

The purpose of this betterment would be to seasonally increase the storage capacity of Hell Hole Reservoir. The betterment would utilize a portion of the existing flood control pool, above the present normal maximum operating water level, to store additional water during the spring and summer after the peak of the runoff period. An approximate ~~9,750 ac-ft to 12,000 ac-ft~~ increase in seasonal storage in the reservoir would be achieved by installing ~~8-10 foot high crest gates~~ on the existing dam spillway. The crest gates would be raised when needed to increase reservoir storage. Operation of the crest gates would also seasonally increase the reservoir's inundation area within the existing flood pool by approximately ~~37 acres~~.



Installation of spillway gates on Hell Hole Reservoir will increase seasonal storage and power generation.

In years when either French Meadows or Hell Hole reservoirs would have spilled, this betterment would allow the MFP to capture additional water in storage in Hell Hole Reservoir which can later be used to increase net annual energy generation. In all but the driest years, the betterment would also allow the MFP to shift the timing of some generation from the spring run-off period to the summer peak energy demand period. While the shift in the timing of the generation will not increase total annual MFP generation, it will increase the benefit of the Project by increasing generation during the peak energy demand period. This betterment would require a new water right to allow for additional storage at Hell Hole Reservoir.

This betterment would require the following modifications to existing Project facilities:

7,600

6

- Hell Hole Dam Spillway - install ~~8-10 foot-high crest gates on the existing concrete spillway~~
- Hell Hole Dam - install ~~2 foot-high parapet walls on each end of the existing dam to maintain minimum freeboard requirements, if 10 foot high crest gates are installed~~
- French Meadow Powerhouse - install ~~4 foot-high parapet wall at the powerhouse to avoid inundation from wave action when the reservoir is at its maximum water surface elevation~~
- Hell Hole - Middle Fork Tunnel Gatehouse - install ~~4 foot high parapet wall around the gatehouse to avoid inundation from wave action~~
- South Fork Long Canyon Diversion Dam - install ~~3 foot-high crest gates on the diversion dam or a check valve at the drop inlet to avoid the backflow of water from the Hell Hole - Middle Fork Tunnel into South Fork Long Canyon Creek when Middle Fork Powerhouse is not operating~~

6

36

The betterment would also require construction of ~~three~~ **two** new Project facilities including:

- Hell Hole Dam Spillway Crest Gates Control Building - construct a small control building adjacent to the spillway to provide power to operate the spillway crest gates
- Hell Hole Dam Spillway Crest Gates Control Building Powerline - construct a short spur line (approximately 525 feet) from the control building to an existing powerline to provide power for spillway crest gate operations
- ~~South Fork Long Canyon Diversion Dam Generator Building - construct a control building with a generator to provide power to operate the crest gate~~

~~FRENCH MEADOWS POWERHOUSE CAPACITY UPGRADE~~

~~The purpose of this betterment would be to increase the generating capacity of the existing French Meadows Powerhouse from 15.3 MW to approximately 30 MW. Generating capacity would be increased by adding a second powerhouse immediately adjacent to the existing powerhouse. The existing French Meadows Powerhouse is only able to utilize approximately one half of the maximum hydraulic capacity of the French Meadows - Hell Hole Tunnel. The addition~~

**FRENCH MEADOWS POWERHOUSE**

The addition of a second French Meadows Powerhouse will allow PCWA to increase peaking generation.

of a second unit would allow the maximum hydraulic capacity of the tunnel to be used to transport more water over a shorter period of time from French Meadows Reservoir to Hell Hole Reservoir, thereby increasing the MFP's peaking generation capabilities. This betterment would require a new water right to allow for an increase in the permitted direct diversion rate from French Meadows Reservoir to Hell Hole Reservoir.

The new powerhouse would also increase the capability of the MFP to supply electrical grid support services. The new generating unit could be operated simultaneously or independently of the existing generating unit. The existing PG&E 60 kV French Meadows - Middle Fork Transmission Line will be used to interconnect the new powerhouse with the PG&E transmission system.

This betterment would require the following modifications to existing Project facilities:

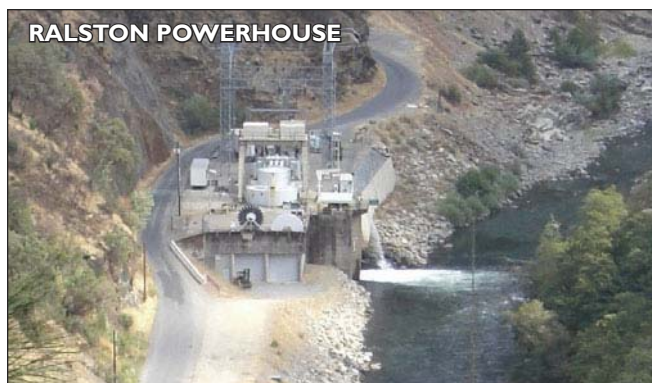
- French Meadows - Hell Hole Tunnel Intake Trash Rack - possible replacement of the existing cylindrical trash rack with a larger trash rack to reduce head losses and allow greater volume of water to flow into the tunnel
- French Meadows Powerhouse Switchyard - expand the existing switchyard to include additional buswork, transformers, and electrical switching equipment necessary to convey the additional power generated at the new powerhouse
- Middle Fork Powerhouse Upper Switchyard - upgrade the transformers and switchgear at the existing 60kV substation at Middle Fork Interbay to handle the additional power transfer

~~This betterment would also require construction of the following new Project facilities:~~

- ~~French Meadows Powerhouse - construct a second powerhouse with installed generating capacity of approximately 15 MW immediately adjacent to existing powerhouse~~
- ~~French Meadows Powerhouse Penstock - construct a second penstock, parallel to the existing penstock, to provide water to the new powerhouse~~
- ~~Additional Surge Capacity Facility - develop additional surge capacity through construction of a surge shaft, surge shaft and tank, or surge pipeline located above the French Meadows - Hell Hole Tunnel Portal, or installation of a bypass valve in the new powerhouse~~
- ~~French Meadows - Hell Hole Tunnel Surge Shaft or Pipeline Access Road - construct a new Project road from an existing Forest Service road to the surge shaft or pipeline and temporarily improve the existing Forest Service road~~

~~RALSTON POWERHOUSE CAPACITY UPGRADE~~

~~The purpose of this betterment is to improve the operating efficiency of the Middle Fork - Ralston system by increasing the hydraulic capacity of Ralston Powerhouse to match Middle Fork Powerhouse throughput, plus accretions at Middle Fork Interbay. This betterment would allow the MFP to maximize peaking generation during periods of high energy demand, thereby increasing the overall benefit of the MFP. This betterment would only require upgrades to electrical and mechanical equipment within the Ralston Powerhouse. This betterment may result in the ability of Ralston Powerhouse to utilize more than 1,000 cfs, in which case a new water right will be needed.~~

**RALSTON POWERHOUSE**

The Ralston Powerhouse upgrade will increase peaking generation opportunities.

TABLES

Table I-1. Summary of Riparian Belt-Transect Data from Five Lakes Creek.

Transect	Bank	Riparian Corridor Width (ft)	Riparian Corridor Dominant Substrate (%)	Riparian Woody Species Present ¹	Percent Cover (%)	Height (ft)	Size Classes Present (No. of Stems)	No. Seedlings	No. Young Individuals
R1T1	Left	46	Fines (90)	SALU	1	2	< 1/2" (33)	2	5
				ALRH2	<1	1	-	4	0
	Right	62	Fines (90)	SALU (shrub)	10	15	< 1/2" (60) 1/2 to 1" (5) 1 to 3" (2)	4	4
				SALU (tree)	60	30	< 1" (35) 1 to 3" (3) 3 to 6" (6) 6 to 9" (2)		
				ALRH2	<1	-	-	110	0
				POBAT	5	7	-	3	0
R1T2	Left	51	Fines (100)	ALINT	<2	2.5	< 1/2" (25)	25	10
				SALU	20	15	< 1/2" (135) 1/2 to 1" (40) 1 to 3" (20) 3 to 5" (3)	15	3
	Right	60	Fines (90), Bedrock-Boulder (10)	SAEX	20	5	< 1/2" (150) 1/2 to 1" (4)	0	4
				SALU	15	4	< 1/2" (80)	3	15
				SAGO	45	20	< 1" (40) 1 to 3" (10) 3 to 6" (5)	0	0
				ALINT	<1	-	-	6	3
R1T3	Left	16	Fines (95), Boulder (5)	SALU	75	7	< 1/2" (450)	3	7
				ALINT	<1	1	< 1/2" (5)	5	0
	Right	49	Boulder (90), Fines (10)	SAEX	25	7	< 1/2" (325) 1/2 to 1" (5)	30	45
				SALU	5	3	< 1/2" (165)	5	30
				ALINT	<1	<1	< 1/2" (35)	4	8
				SALU	85	8	< 1/2" (250) 1/2 to 1" (5)	5	15
R2T1	Left	10	Boulder (80), Gravel-fines (20)	ALRH2	<2	10	< 1" (3)	2	1
				SALU	20	15	< 1/2" (200) 1/2 to 1" (5) 1 to 3" (3)	55	7
	Right	14	Boulder (80), Fines (20)	ALRH2	<1	2	-	25	0
				SALU	30	2.5	< 1/2" (25)	175	75
				POBAT	10	3	-	20	0
				ALRH2	<1	<1	< 1" (2)	2	0
R2T2	Left	12	Bedrock (50), Boulder (50)	SALU	30	2.5	< 1/2" (150) 1/2 to 1" (50) 1 to 3" (10) 3 to 5" (1)	50	10
				POBAT	10	7	< 1" (7) 1 to 3" (3)	0	3
	Right	28	Boulder (90), Fines (10)	SALU	80	20	< 1/2" (150) 1/2 to 1" (50) 1 to 3" (10) 3 to 5" (1)	50	10
				POBAT	10	7	< 1" (7) 1 to 3" (3)	0	3
				SALU	<1	0.5	-	50	0
				POBAT	5	4	-	20	0
R2T3	Left	34	Cobble (50), Fines (50)	SALU	<1	0.5	-	50	0
				POBAT	5	4	-	20	0
	Right	34	Bedrock (90), Boulder (10)	SALU	45	12	< 1/2" (350) 1/2 to 1" (1) 1 to 3" (1)	3	5
				ALRH2	35	40	1 to 3" (1) 6 to 9" (2)	4	1
				ALRH2	<1	1	-	3	0
				SALU	<1	<1	-	30	0
R3T1	Left	1	Bedrock (100)	SAEX	<1	<1	< 1/2" (1)	-	-
				ALRH2	<1	<1	-	2	0
	Right	20	Bedrock (100)	POBAT	10	2	< 1" (5)	15	0
				ALRH2	<1	1	-	3	0
				SALU	<1	<1	-	30	0
				SAEX	<1	<1	< 1/2" (1)	-	-
R3T2	Left	9	Bedrock (100)	ALRH2	<1	2	-	1	0
				POBAT	<1	2	-	1	0
	Right	19	Bedrock (100)	-	-	-	-	-	-
				-	-	-	-	-	-
				SALU	<1	1	< 1/2" (6)	1	2
				POBAT	<1	3	< 1" (4)	3	0
R3T3	Left	17	Bedrock (95), Boulder (5)	SALU	<1	-	-	150	1
				POBAT	<1	-	-	150	1
	Right	25	Bedrock (100)	ALRH2	65	30	< 1" (52) 1 to 3" (8) 3 to 6" (4)	7	1
				POBAT	1 to 2	3	-	9	0
				SALU	5	8	< 1/2" (50)	100	0
				POBAT	10	10	< 1" (2) 1 to 3" (1)	3	1
R3T4	Left	27	Boulder (90), Fines (10)	ALRH2	<1	10	1 to 3" (1)	0	1
				SALU	5	10	< 1/2" (50)	5	1
	Right	32	Bedrock (95), Fines (5)	ALRH2	10	6	< 1" (5) 1 to 3" (1)	10	1
				POBAT	<1	1	-	2	0
				SALU	<1	1	-	2	0
				POBAT	<1	1	-	2	0

¹ Species Present:

Scientific Name	Common Name	Species Code
<i>Alnus incana</i> ssp. <i>terrestris</i>	mountain alder	ALINT
<i>Alnus rhombifolia</i>	white alder	ALRH2
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood	POBAT
<i>Salix exigua</i>	narrow leaf willow	SAEX
<i>Salix gooddingii</i>	Goodding's willow	SAGO
<i>Salix lucida</i>	shining willow	SALU

Table I-2. Summary of Tree Core Data from Five Lakes Creek.

Date	Tree No. ¹	Location of Tree ²	Bank	Species ⁴	Elevation above Summer Base Flow (ft) ³	DBH (cm)	Years of Growth	Year Established
8/26/2008	1	R1T1	LB	SALU	2.9	23.1	22	1986
8/26/2008	1	R1T1	LB	SALU	2.9	17.8	22	1986
8/26/2008	2	R1 NO TRANSECT	LB	POBAT	13.9	36.1	52	1956
8/26/2008	3	R1T2	LB	SAGO	9.68	8.9	12	1996
8/26/2008	4	R2T2	RB	SALU	2.5	10.2	10	1998
8/26/2008	5	R2T3	RB	ALRH2	2.85	31.5	39	1969
8/26/2008	6	R3T3	RB	ALRH2	3.01	11.2	13	1995
8/26/2008	6	R3T3	RB	ALRH2	3.01	10.2	13	1995
8/26/2008	7	R3T3	RB	ALRH2	9.16	10.7	12	1996
8/26/2008	7	R3T3	RB	ALRH2	9.16	8.1	13	1995

¹Trees with the same number are main trunks of the same tree. Cores were collected from the main trunks.

²R: Reach number; T: Transect number

³Flow on the day of the survey was less than 1 cfs.

⁴Species Present:

Scientific Name	Common Name	Species Code
<i>Alnus rhombifolia</i>	white alder	ALRH2
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood	POBAT
<i>Salix gooddingii</i>	Goodding's willow	SAGO
<i>Salix lucida</i>	shining willow	SALU

Table I-3. Riparian Vegetation in the Study Area around Hell Hole Reservoir Associated with the Hell Hole Reservoir Seasonal Storage Increase Betterment ¹.

Dominant Species	Corresponding Map Polygon Number ²	Area (Acres) ³	Area (square feet)
Area 2: Between Maximum Normal Operating Water Surface Elevation (4,630 feet msl) and New Maximum Operating Water Surface Elevation Associated with the Installation of a 6-foot Spillway Gate (4,636 feet msl)			
Rubicon River Upstream from Hell Hole Reservoir			
none	UH43	0.01	526
none	UH44	0.00	31
none	UH45	0.05	2,056
none	UH46	0.04	1,582
none	UH48	0.02	725
none	UH49	0.03	1,399
Total none		0.15	6,318
Total Woody Riparian Vegetation Area 2 Rubicon River		0.00	0
Five Lakes Creek			
Alder and Willow	UH07	0.03	1,095
Alder, Willow and Black Cottonwood	UH08	0.03	1,262
Black Cottonwood	UH13	0.01	518
none	UH09	0.00	87
none	UH10	0.01	328
Total none		0.01	415
Willow and Black Cottonwood	UH11	0.00	171
Total Riparian Vegetation Area 2 Five Lakes Creek		0.07	3,045
Un-named Tributary			
Ponderosa Pine	UH31	0.00	2
California Wild Grape	UH32	0.00	1
Total Woody Riparian Vegetation Area 2 Un-named Tributary		0.00	0
Hell Hole Reservoir Shoreline			
Alder and Willow	H42	0.03	1,219
Black Cottonwood	H67	0.00	4
California Wild Grape	H63	0.00	159
California Wild Grape	H66	0.03	1,154
California Wild Grape	H81	0.02	1,081
California Wild Grape	H84	0.01	384
Total California Wild Grape		0.06	2,779
Willow	H04	0.00	68
Willow	H17	0.01	228
Willow	H20	0.00	80
Willow	H45	0.01	575
Willow	H58	0.00	14
Willow	H73	0.01	422
Willow	H75	0.00	21
Total Willow		0.03	1,407
Willow, Black Cottonwood and California Wild Grape	H86	0.01	438
Total Woody Riparian Vegetation Area 2 Hell Hole Reservoir Shoreline		0.07	3,069
Total Woody Riparian Vegetation Area 2		0.14	6,114

Table I-3. Riparian Vegetation in the Study Area around Hell Hole Reservoir Associated with the Hell Hole Reservoir Seasonal Storage Increase Betterment¹ (continued).

Dominant Species	Corresponding Map Polygon Number ²	Area (Acres) ³	Area (square feet)
Area 3: New Maximum Operating Water Surface Elevation Associated with the Installation of a 6-foot Spillway Gate (4,636 feet msl) to Approximately 100 feet Above Normal Maximum Operating Water Surface Elevation (4,640 feet msl)			
Rubicon River Upstream from Hell Hole Reservoir			
none	UH45	0.01	423
none	UH46	0.01	349
none	UH48	0.03	1,447
none	UH49	0.02	956
Total none		0.07	3,175
Alder	UH53	0.00	187
Alder	UH52	0.00	179
Alder	UH51	0.00	144
Alder	UH55	0.01	576
Total Alder		0.02	1,086
Total Woody Riparian Vegetation Area 3 Rubicon River		0.02	1,086
Five Lakes Creek			
Alder	UH03	0.08	3,275
Alder and Black Cottonwood	UH02	0.04	1,586
Alder and Willow	UH04	0.01	274
Alder and Willow	UH06	0.01	586
Alder and Willow	UH05	0.04	1,806
Alder and Willow	UH07	0.04	1,923
Total Alder and Willow		0.10	4,320
Alder, Willow and Black Cottonwood	UH08	0.01	330
Willow	UH01	0.00	172
Total Woody Riparian Vegetation Area 3 Five Lakes Creek		0.23	9,953
Hell Hole Reservoir Shoreline			
California Wild Grape	H66	0.00	53
California Wild Grape	H81	0.00	14
Total California Wild Grape		0.01	67
Willow, Black Cottonwood and California Wild Grape	H86	0.00	206
Total Woody Riparian Vegetation Area 3 Hell Hole Reservoir Shoreline		0.00	206
Total Woody Riparian Vegetation Area 3		0.26	11,244

¹ Refer to Schematic 2 in the text. No riparian vegetation was mapped in Area 4. Area 1 is the same as those described in Table H-2.

² Map polygon numbers refer to the polygons labelled on the Map I-2.

³ Areas in acres and square feet were calculated in GIS.

FIGURES

Figure I-1. Riparian Corridor Location and Width on Five Lakes Creek Along Surveyed Transects.^{1,2}

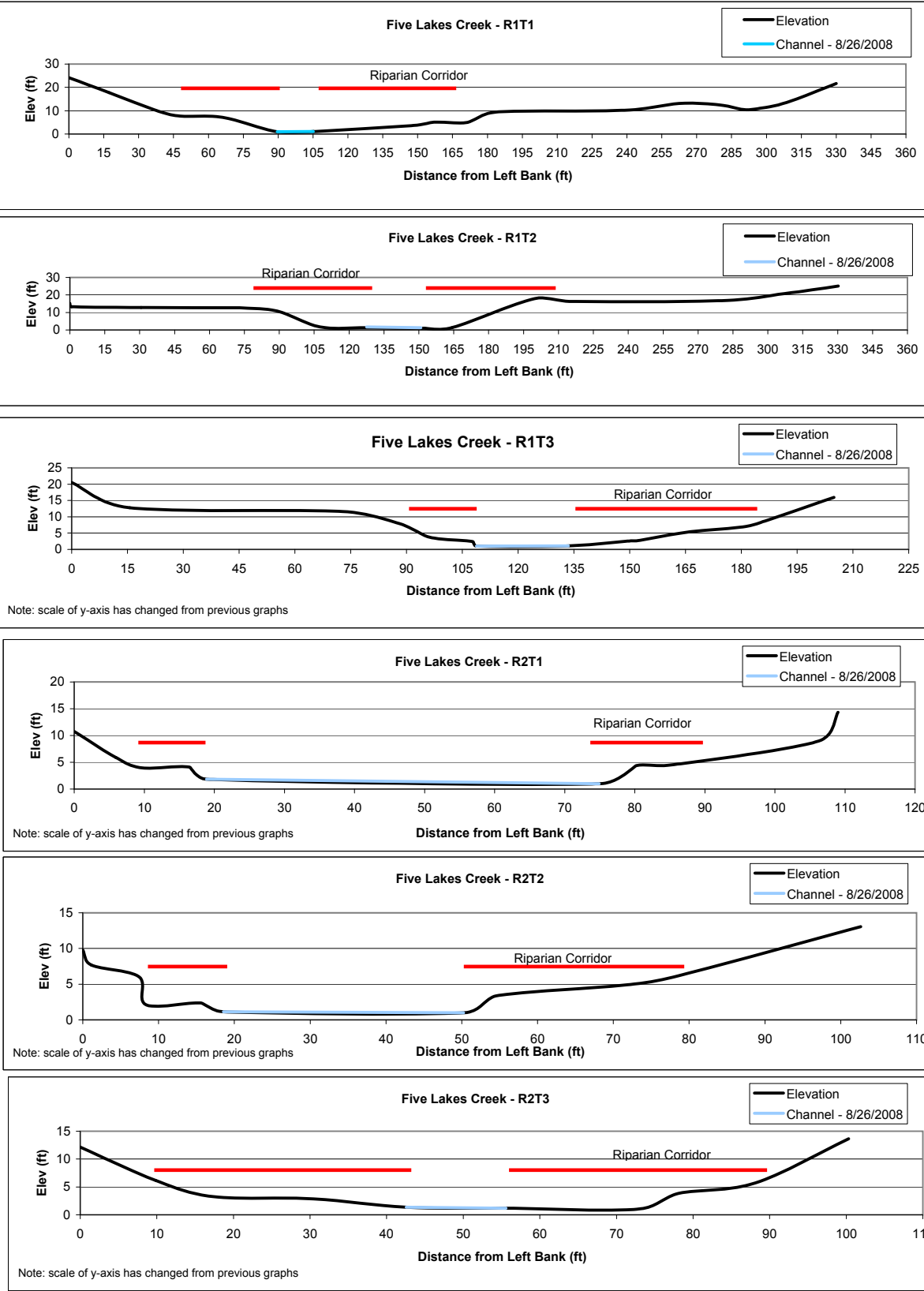
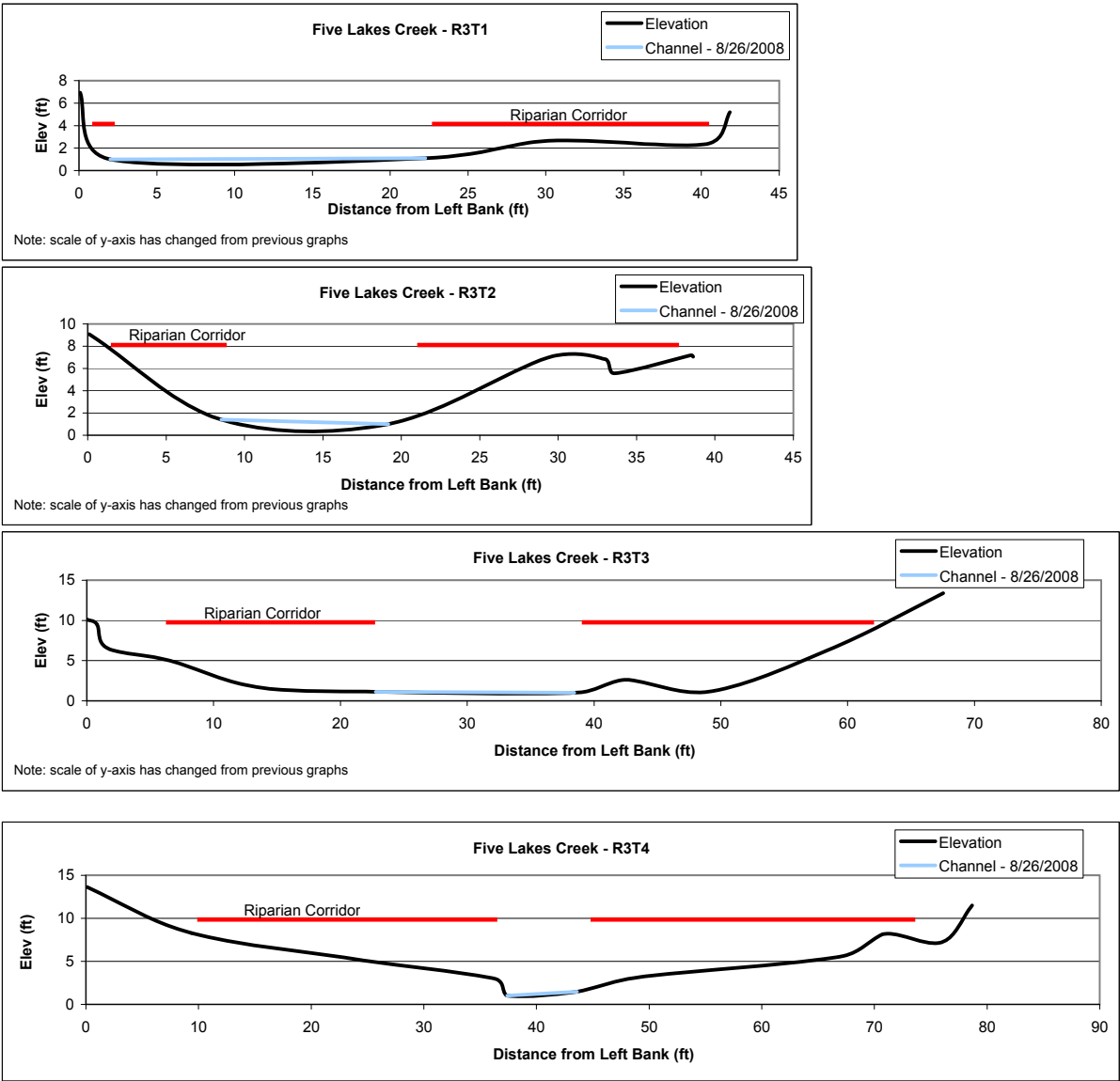


Figure I-1. Riparian Corridor Location and Width on Five Lakes Creek Along Surveyed Transects (continued).¹



¹ Dominant and sub-dominant species, age classes present, and dominant substrate types are provided in Table I-1.

² Flow on the day of the survey was less than 1 cfs.

MAPS

APPENDIX J

Vegetation Maintenance in the Project Area – Summary Tables

Tables

Table J-1.	Vegetation and Pest Management Activities and Known Occurrences of Riparian Conservation Areas at Project Facilities, Project Recreation Facilities, and New Betterment Facilities where Vegetations and Pest Management is Implemented.

TABLES

Table J-1. Vegetation and Pest Management Activities and Known Occurrences of Riparian Conservation Areas at Project Facilities, Project Recreation Facilities, and New Betterment Facilities where Vegetations and Pest Management is Implemented.

	USDA-FS – ENF or TNF	Vegetation Management				Pest Management		USDA-FS
		Trimming by Hand	Trimming with Equipment	Herbicide Use	Fungicide Use	Rodent Control		Land Allocations
						Physical Control	Fumigants	Riparian Conservation Areas (RCAs) ¹
Project Facilities								
Dams Reservoirs, and Diversion Pools								
Large Dams								
French Meadows Dam and Outlet Works	TNF	A		A			X	X
Hell Hole Dam and Outlet Works	ENF	A		A			X	X
Medium Dams								
Middle Fork Interbay Dam	TNF	A					X	X
Ralston Afterbay Dam	TNF	A					X	X
Small Dams								
Duncan Creek Diversion Dam	TNF	A						X
North Fork Long Canyon Diversion Dam	ENF	A						X
South Fork Long Canyon Diversion Dam	ENF	A						X
Small Diversion Pools								
Duncan Creek Diversion Pool	TNF	A						X
North Fork Long Canyon Diversion Pool	ENF	A						X
South Fork Long Canyon Diversion Pool	ENF	A						X
Water Conveyance Systems								
Diversion Pipes and Drop Inlets								
North Fork Long Canyon Diversion Pipe and Drop Inlet	ENF	A						X
South Fork Long Canyon Diversion Pipe and Drop Inlet	ENF	A						X
Surge Shafts and Adits								
Brushy Canyon Adit		A						X
Removable Sections and Portals								
Duncan Creek - Middle Fork Tunnel Portal	TNF	A						X
North Fork Long Canyon Crossing Removable Section	ENF	A						X
Intakes and Gatehouses								
Duncan Creek - Middle Fork Tunnel Intake	TNF	A						X
French Meadows - Hell Hole Tunnel Gatehouse	TNF	A						X
French Meadows - Hell Hole Tunnel Intake	TNF	A						X
Hell Hole - Middle Fork Tunnel Gatehouse	ENF	A						X
Hell Hole - Middle Fork Tunnel Intake	ENF	A						X
Middle Fork - Ralston Tunnel Intake and Gatehouse	ENF	A						X
Ralston - Oxbow Tunnel Intake	TNF	A						X
Penstocks and Valve Houses								
French Meadows Powerhouse Penstock and Butterfly Valve House	TNF	A		A				X
Middle Fork Powerhouse Penstock and Butterfly Valve House	ENF	A		A				X
Ralston Powerhouse Penstock and Butterfly Valve House	ENF	A		A				X

Table J-1. Vegetation and Pest Management Activities and Known Occurrences of Riparian Conservation Areas at Project Facilities, Project Recreation Facilities, and New Betterment Facilities where Vegetations and Pest Management is Implemented (continued).

	USDA-FS – ENF or TNF	Vegetation Management				Pest Management		USDA-FS Land Allocations
		Trimming by Hand	Trimming with Equipment	Herbicide Use	Fungicide Use	Rodent Control		Riparian Conservation Areas (RCAs) ¹
Water Conveyance Systems (continued)								
Powerhouses, Switchyards, and Substations								
French Meadows Powerhouse and Switchyard	TNF	A		A		X		X
Hell Hole Powerhouse	ENF	A				X		X
Middle Fork Powerhouse and Upper and Lower Switchyards	ENF	A		A		X		X
Ralston Powerhouse and Switchyard	ENF	A		A		X		X
Oxbow Powerhouse and Switchyard	TNF	A		A		X		X
Hell Hole Substation	ENF	A				X		X
Gaging Stations and Weirs								
Stream Gages and Weirs								
Duncan Creek Gage and Weir above Diversion Dam (USGS Gage and Weir No. 11427700)	TNF	A						X
Duncan Creek Gage and Weir below Diversion Dam (USGS Gage and Weir No. 11427750)	TNF	A						X
Middle Fork American River Gage and Weir below French Meadows Dam (USGS Gage and Weir No. 11427500)	TNF	A						X
Project Communication Lines and Powerlines								
French Meadows Area								
French Meadows Dam Generator Building to French Meadows Dam Outlet Works Powerline	TNF	A						X
French Meadows Dam Generator Building to French Meadows Dam Spillway Gates Powerline	TNF	A						X
Hell Hole Area								
French Meadows Powerhouse to French Meadows Powerhouse Penstock and Butterfly Valve House Communication Line/Powerline	ENF	A		A				X
French Meadows Powerhouse and Switchyard to Hell Hole - Middle Fork Tunnel Gatehouse, Dormitory Facility, Operator's Cottages, and Hell Hole Powerhouse Communication Line/Powerline	ENF	A						X
Hell Hole Powerhouse to Rubicon River Gage and Weir below Hell Hole Dam Communication Line/Powerline	ENF	A						X
Middle Fork Interbay Area								
Middle Fork Powerhouse to Middle Fork Powerhouse Butterfly Valve House Communication Line/Powerline	ENF	A		A				X
Middle Fork Powerhouse to Middle Fork - Ralston Tunnel Intake and Gatehouse Communication Line/Powerline	ENF	A						X
Middle Fork Powerhouse to Middle Fork American River Gage above Middle Fork Powerhouse Communication Line/Powerline	ENF	A						X

Table J-1. Vegetation and Pest Management Activities and Known Occurrences of Riparian Conservation Areas at Project Facilities, Project Recreation Facilities, and New Betterment Facilities where Vegetations and Pest Management is Implemented (continued).

	USDA-FS – ENF or TNF	Vegetation Management				Pest Management		USDA-FS Land Allocations
		Trimming by Hand	Trimming with Equipment	Herbicide Use	Fungicide Use	Physical Control	Fumigants	Riparian Conservation Areas (RCAs) ¹
Project Communication Lines and Powerlines (continued)								
Ralston - Oxbow Area								
Ralston - Oxbow Tunnel Intake to Ralston Powerhouse Communication Line	TNF	A						X
Ralston Powerhouse to Ralston Powerhouse Butterfly Valve House Communication Line/Powerline	TNF/ENF	A		A				X
Ralston Afterbay Dam Generator Building to Ralston - Oxbow Tunnel Intake Communication Line/Powerline	TNF	A						X
Oxbow Powerhouse to Ralston Afterbay Dam Generator Building Communication Line/Powerline	TNF	A						X
Photovoltaic Poles and Powerlines								
Photovoltaic Poles and Powerline to Duncan Creek Gage above Diversion Dam	TNF	A						X
Photovoltaic Pole and Powerline at Duncan Creek Gage below Diversion Dam	TNF	A						X
Photovoltaic Pole and Powerline at Middle Fork American River Gage below French Meadows Dam	TNF	A						X
Photovoltaic Pole and Powerline at Middle Fork American River Gage above Middle Fork Powerhouse	ENF	A						X
Photovoltaic Pole and Powerline at North Fork Long Canyon Gage at Diversion Dam	ENF	A						X
Photovoltaic Pole and Powerline at South Fork Long Canyon Gage at Diversion Dam	ENF	A						X
Photovoltaic Pole at Middle Fork American River Gage below Oxbow Powerhouse	TNF	A						X
Microwave Reflectors and Radio Towers								
Radio Communications Tower near French Meadows - Hell Hole Tunnel Gatehouse	ENF	I						X
Ancillary Facilities								
French Meadows Dam Generator Building	TNF	A		A		X		X
Ralston Afterbay Dam Generator Building	TNF	A		A		X		X
Project Fences								
Slope Fences								
French Meadows Powerhouse Penstock Rock Fence	ENF							X
French Meadows Powerhouse Slope Fence	ENF	I						X
Long Canyon Crossing Slope Fence	ENF	I						X
Middle Fork Powerhouse Upper Switchyard Slope Fence	ENF			I				X
Oxbow Powerhouse Slope Fence	TNF			I				X
Ralston Powerhouse Slope Fence	ENF			I				X

Table J-1. Vegetation and Pest Management Activities and Known Occurrences of Riparian Conservation Areas at Project Facilities, Project Recreation Facilities, and New Betterment Facilities where Vegetations and Pest Management is Implemented (continued).

	USDA-FS – ENF or TNF	Vegetation Management				Pest Management		USDA-FS Land Allocations
		Trimming by Hand	Trimming with Equipment	Herbicide Use	Fungicide Use	Physical Control	Fumigants	Riparian Conservation Areas (RCAs) ¹
Project Roads and Access Points								
Duncan Creek Area								
Duncan Creek Diversion Intake Road and Diversion Pool Access Point	TNF	A	A					X
Duncan Creek Diversion Dam Road	TNF	A	A					X
Duncan Creek Diversion Pool Road and Access Point	TNF	A	A					X
French Meadows Area								
Duncan Creek–Middle Fork Tunnel Portal Road and Spillway Access Point	TNF	A	A					X
French Meadows–Hell Hole Tunnel Gatehouse Road	TNF	A	A	I				X
French Meadows Dam Outlet Works and Leakage Weirs Road	TNF	A	A	A				X
French Meadows Dam Staging Area Road	TNF	A	A					
Hell Hole Area								
Hell Hole Dam and Powerhouse Road and Spillway Southern Access Point	ENF	A		A				X
Rubicon River Gage and Weir below Hell Hole Dam Road	ENF	A	A					X
Hell Hole Dam Leakage Weir Road	ENF	A	A					X
Hell Hole Dam Spillway and Northern Access Point	ENF	A	A					X
French Meadows Powerhouse Road	ENF	A	A					X
Hell Hole–Middle Fork Tunnel Gatehouse Road	ENF	A	A					X
Long Canyon Area								
North Fork Long Canyon Diversion North Road	ENF	A	A					X
North Fork Long Canyon Diversion South Road	ENF	A	A					X
South Fork Long Canyon Diversion and Drop Inlet Road	ENF	A	A					X
North Fork Long Canyon Crossing Removable Section North Road and Parking Area	ENF	A	A					X
North Fork Long Canyon Crossing Removable Section South Road	ENF	A	A					X
Middle Fork Interbay Area								
Middle Fork Powerhouse Penstock and Butterfly Valve House Road	ENF	A	A	A				X
Middle Fork Interbay Dam and Powerhouse Road and Interbay Access Points	ENF	A	A					X
Middle Fork Powerhouse Upper Switchyard Road	ENF	A	A					X
Project Recreation Facilities								
French Meadows Reservoir								
Ahart Campground	TNF	A			I			X
Poppy Campground	TNF	A			I			X
French Meadows Campground	TNF	A			I			X
Gates Group Campground	TNF	A			I			X
Lewis Campground	TNF	A			I			X

Table J-1. Vegetation and Pest Management Activities and Known Occurrences of Riparian Conservation Areas at Project Facilities, Project Recreation Facilities, and New Betterment Facilities where Vegetations and Pest Management is Implemented (continued).

	USDA-FS – ENF or TNF	Vegetation Management				Pest Management		USDA-FS Land Allocations
		Trimming by Hand	Trimming with Equipment	Herbicide Use	Fungicide Use	Physical Control	Fumigants	Riparian Conservation Areas (RCAs) ¹
Project Recreation Facilities (continued)								
Hell Hole Reservoir								
Big Meadows Campground	ENF	A			I			X
Upper Hell Hole Campground	ENF	A			I			X
Hell Hole General Parking Area/Hell Hole Boat Ramp and Parking Area	ENF	A						X
Ralston Afterbay								
Ralston Afterbay Picnic Area	TNF	A						X
Ralston Picnic Area Cartop Boat Ramp	TNF	A						X
Indian Bar Rafting Access and General Parking	ENF	A						X
Long Canyon Creek								
Middle Meadows Group Campground	ENF	A			I			X
Project Recreation Facility Water Supplies								
Dolly Creek Water Supply	TNF	I						X
French Meadows Campground Water Supply and Trail	TNF	I						X
Big Meadows Campground Water Supply and Trail	ENF	I						X
Middle Meadows Group Campground Water Supply and Trail	ENF	I						X
New Project Betterment Facilities								
Hell Hole Reservoir Seasonal Storage Increase Betterment								
Hell Hole Dam Spillway Crest Gates Control Building	ENF	A				X		X
Hell Hole Dam Spillway Crest Gates Control Building Powerline	ENF	A						X
French Meadows Powerhouse Capacity Upgrade								
French Meadows Powerhouse and Switchyard (new powerhouse)	ENF	A				X		X
French Meadows Powerhouse Penstock	ENF	A						X

A = Activity occurs on an annual basis.
I = Activity occurs on an infrequent basis.
¹Facility is within 300' of a Riparian Conservation Area (RCA) (i.e., perennial stream, intermittent or ephemeral stream, or special aquatic site (e.g., lake, meadow, seep, spring, seasonal wetland)).