



**El Dorado Hydroelectric Project  
FERC Project No. 184**

# **Riparian Vegetation Species Composition Monitoring Plan**

EL DORADO IRRIGATION DISTRICT  
2890 Mosquito Road  
Placerville, CA 95667

July 2010  
Version 1.0

This study plan has been developed to satisfy the riparian vegetation species composition monitoring requirements of the Federal Energy Regulatory Commission license for the El Dorado Hydroelectric Project No. 184 (Project 184).

## **1.0 License Requirements**

The Project 184 Monitoring Program<sup>1</sup> defines the specific riparian vegetation species composition monitoring requirements:

### **1. Riparian Vegetation Species Composition**

**Method:** Collection of pertinent data along fourteen existing transects at eight study sites in representative habitat types. Methods in accordance with those used in *Composition of Riparian Herb Communities on Streams with Regulated and Unregulated Streamflow*, Eldorado National Forest, California (Harris and Lindquist 2000a). The study sites and transect locations are listed in this study.

**Frequency:** Every 5 years.

**Rationale:** Collection of transect data provides for more detailed evaluation of riparian condition and response to changes in streamflow regime. Monitoring at the end of each 5-year period provides an index of changes in riparian conditions over that period of modified streamflow (it should be noted that, depending on the water year cycle that occurs, 5 years may be a relatively short response time for riparian vegetation).

## **2.0 Background**

Riparian vegetation species composition monitoring was conducted in 2000 during the Project 184 relicensing process (Harris and Lindquist, 2000a). The objective of this effort was to collect data about riparian herb communities associated with regulated and unregulated streams to establish a baseline for analyzing effects of flow regulation. Harris and Lindquist (2000a) found conditions on the South Fork American River suggestive of relatively rich riparian herb communities, comparable to those found on unregulated streams. Additionally, this study noted that conditions on Caples Creek are affected by many factors including recreational and livestock traffic, beaver dams, and Project No. 184 and recommended that monitoring meadow composition, in conjunction with additional hydrologic and geomorphic monitoring, might be useful for providing guidance on future management.

---

<sup>1</sup> Section 7 of the El Dorado Relicensing Settlement Agreement, U.S. Forest Service 4(e) Condition No. 37, and California State Water Resources Control Board Section 401 Clean Water Act Water Quality Certification Condition No. 13

### **3.0 Study Plan Objective**

The objective of this monitoring effort is to evaluate the status of riparian vegetation species composition at selected locations to help determine if ecological resource objectives are achievable and being met, as specified in the Project 184 Adaptive Management Program<sup>2</sup>.

The ecological resource objectives identified in Appendix B, Section 1, of the El Dorado Relicensing Settlement Agreement provides the following riparian habitat objective:

#### **1. Riparian Habitat Objective**

Maintain or restore riparian resources. Maintain and restore instream flows sufficient to sustain desired conditions of riparian, aquatic, wetland, and meadow habitats.

### **4.0 Survey Locations**

The Riparian Vegetation Species Composition component of the Project 184 Monitoring Program states that data will be collected at fourteen existing transects at eight study sites in representative habitat types as listed in Harris and Lindquist (2000a).

Study sites were selected on three stream reaches affected by Project No. 184: Caples Creek downstream from Caples Lake (5 transects), South Fork American River downstream from the Echo Lake conduit (1 transect), and South Fork American River in the vicinity of Phillips (1 transect).

Study sites were also selected on unregulated streams including: Foster Meadow (1 transect), Bryan Meadow (2 transect), Benwood Meadow (1 transect), Round Meadow (1 transect) and Kirkwood Meadow (2 transect).

District staff has not been able to locate the Figure 1 location map referenced in Harris and Lindquist (2000a). However, the general location of each study site was identified using topographical maps (Figures 1-4). Monitoring crews will attempt to relocate transects from previous surveys at each study site. However, if these transects cannot be re-located, new transects will be selected in the vicinity using the criteria described in Harris and Lindquist (2000a). Suitable survey transects will have distinctive, relatively extensive (at least several hundred square feet) riparian meadows that are free from excessive forest or shrub cover. If possible, the survey transects will be located on or near fluvial deposits where riparian vegetation recruitment would be expected.

If Harris and Lindquist (2000a) transects cannot be relocated at Caples Creek, three survey transects established in 2008 as part of the monitoring associated with the emergency repairs of Caples Lake Main Dam may be reoccupied (EID 2009). Two additional transects may need to be established to achieve the required 5 transects at this study site.

---

<sup>2</sup> Section 8 of the El Dorado Relicensing Settlement Agreement and U.S. Forest Service 4(e) Condition No. 38

## **5.0 Schedule**

Consistent with the timing of previous surveys, monitoring is planned to occur during the summer when the sites can be safely accessed and when most of the vegetation is identifiable.

## **6.0 Data Collection**

The data to be collected during this monitoring effort include: 1) species composition monitoring along transects and 2) photo documentation of each survey site.

Species composition monitoring will occur at previously established or new survey transects. Transects will be approximately 200 feet long (depending upon field conditions), positioned perpendicular to the stream channel, and will cross the stream channel. The “toe-point” or similar method will be used to collect vegetation composition and frequency data (Harris and Lindquist, 2000a). Plants will be recorded to the species level when possible and grouped by the following categories; sedge, rush, graminoid, forb, willow, other shrub, barren / litter, or water. If species were not identifiable, a genus or life form category will be recorded. The data will be tabulated to determine vegetation category frequency and percent frequency for each site. A complete species list for each site will be prepared.

The survey sites will be photo-documented, marked with flagging, and mapped using a GPS device. The sites will be photographed across, downstream, and upstream from the GPS photo-points.

## **5.0 Data Analysis**

The data collected for this monitoring effort will be compiled into a tabular and/or graphical format similar to the format of Harris and Lindquist (2000a). A summary will be prepared that compares the data collected for this monitoring effort with the previous monitoring efforts.

## **6.0 Reporting**

The data collected under this plan will be compiled into a report and distributed to the FS, ERC, and SWRCB for review and consideration at least two weeks prior to the annual ERC meeting. The report will include discussion appropriate to results and supportive of analyses and conclusions will be provided. All reports will be prepared in a format so that they can easily be reviewed by the ERC and filed with the FERC after approval.

A summary of the findings of the monitoring effort and an electronic copy of the report will be included in the Project 184 annual monitoring report, which the District is required to file with FERC by June 30 of each year. The District will distribute the draft annual monitoring report to the FS, ERC, and SWRCB at least 30 days to review prior to filing with FERC.

## **6.0 Literature Cited**

EID. 2009. Caples Lake Main Dam Emergency Repair Project: Caples Creek Stream Channel and Riparian Community Monitoring Report November 2008 to July 2009. Prepared by EN2 Resources. September 8, 2009. Available online at:

[http://www.project184.org/doc\\_lib/documents/2010/2008-2009\\_CaplesRiparianStreamMonRpt.pdf](http://www.project184.org/doc_lib/documents/2010/2008-2009_CaplesRiparianStreamMonRpt.pdf)

Harris and Lindquist. 2000a. Riparian Vegetation Establishment and Survival on Caples Creek and Kirkwood Creek. October 2000.

## FIGURES

FIGURE 1

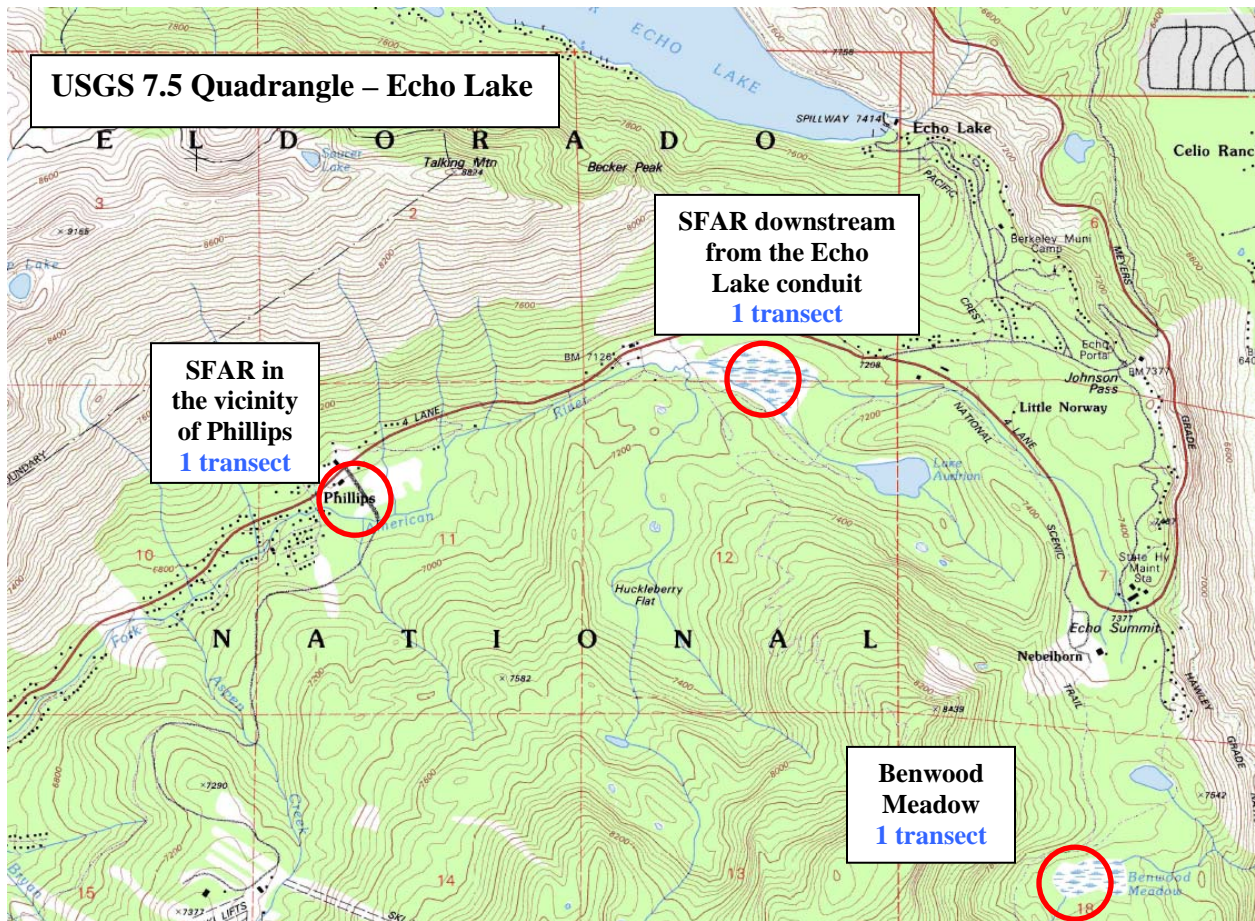


Figure 1. Approximate location of study sites: South Fork American River downstream from the Echo Lake conduit, South Fork American River in the vicinity of Phillips, and Benwood Meadow

FIGURE 2

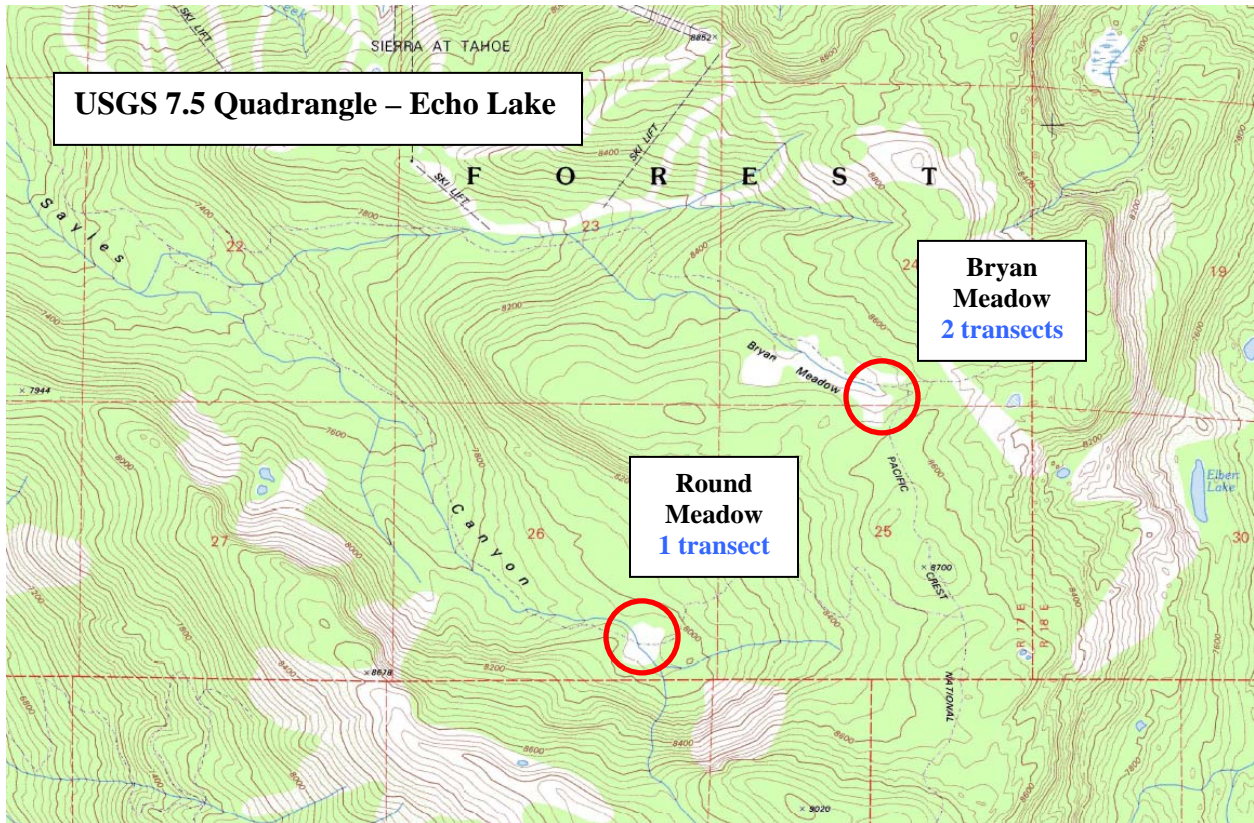


Figure 2. Approximate location of study sites: Bryan Meadow and Round Meadow



FIGURE 3

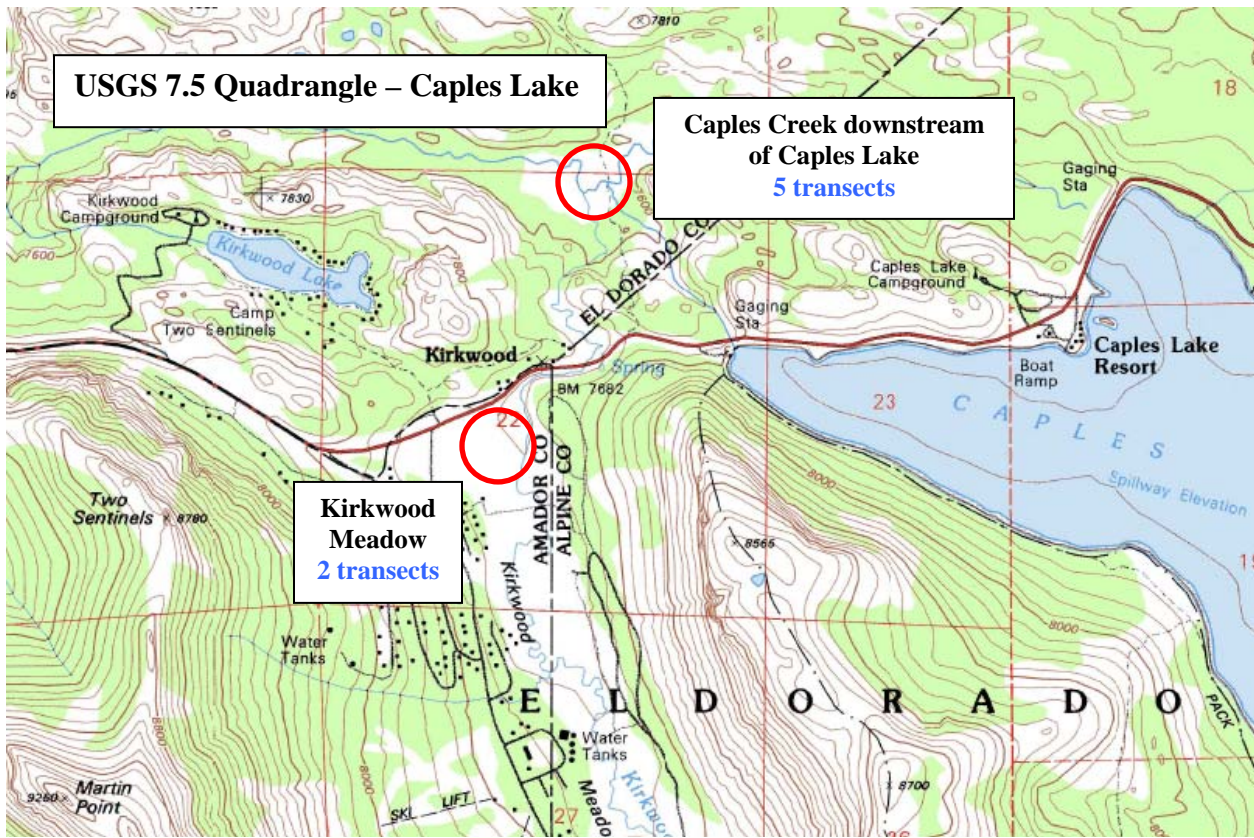


Figure 3. Approximate location of study sites: Caples Creek downstream of Caples Lake and Kirkwood Meadow

FIGURE 4

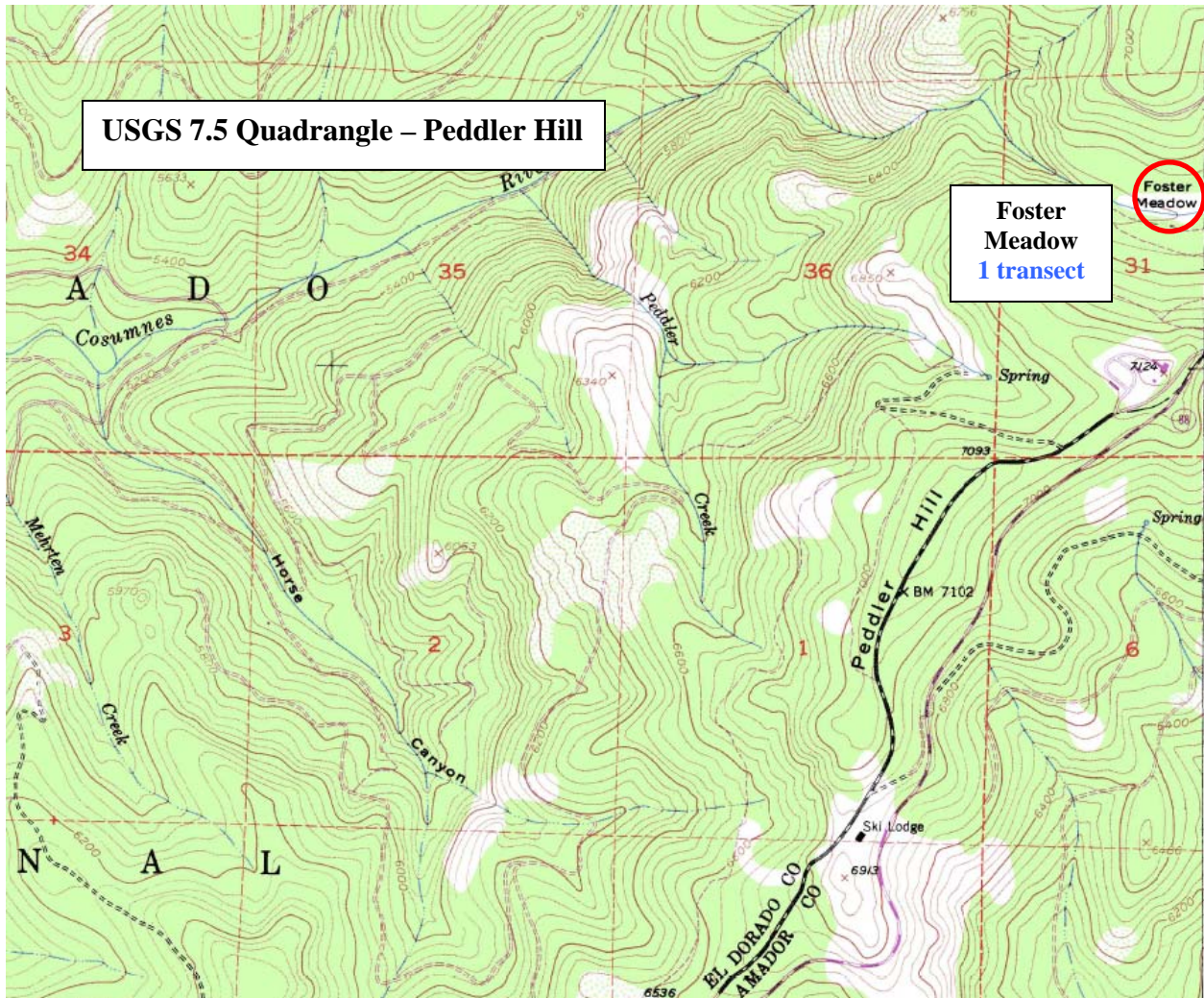


Figure 4. Approximate location of Foster Meadow study site

## APPENDIX A

Composition of Riparian Herb Communities on Streams with  
Regulated and Unregulated Streamflow, Eldorado National  
Forest, California

Richard R. Harris, Ph.D. and Donna Lindquist  
October, 2000

(Harris and Lindquist, 2000a)

# **Composition of Riparian Herb Communities on Streams with Regulated and Unregulated Streamflow, Eldorado National Forest, California**

Richard R. Harris, Ph.D. and Donna Lindquist  
October, 2000

## **Introduction**

This study was carried out at the request of the USDA-Forest Service, Eldorado National Forest. The objective was to collect data about riparian herb communities associated with regulated and unregulated streams. The intended use of these data was to establish a baseline for analyzing effects of flow regulation.

There is a relatively extensive literature that describes the responses of meadow vegetation to changes in groundwater (Ponce and Lindquist 1990). Reduced groundwater levels can occur when streams incise to levels below their floodplains. When this occurs, vegetation composition may change from species adapted to high soil moisture to more drought tolerant species. These effects are thought to be common in the Sierra Nevada (Kattelman 1996). Raising a water table through geomorphic restoration or use of instream structures can reverse these vegetation changes.

There have been few studies that have looked specifically at the effects of stream flow regulation on herb communities. When streams have been completely diverted in and regions there have been changes in species composition from mesic to xeric herb species (Ham's et. al. 1987). In cases such as Project No. 184 where hydrologic changes are relatively complex, responses of herb communities have not been studied. Soils, light and other environmental variability plus land use history confound attempts at such studies.

The information presented below does not provide a comprehensive assessment of the many regulated and unregulated streams in the Eldorado National Forest. It does provide a benchmark for considering whether or not herb monitoring might be warranted to determine future operational effects of Project No. 184.

## **Methods**

We defined suitable study sites as having distinctive, relatively extensive (at least several hundred square feet) riparian meadows free from excessive forest or shrub cover. Study sites were selected on three stream reaches affected by Project No. 184: Caples Creek downstream from Caples Lake, South Fork American River downstream from the Echo Lake conduit, and South Fork American River in the vicinity of Phillips (Figure 1). Other regulated stream reaches on the South Fork, Caples Creek, and Silver Fork were evaluated for sampling but eliminated due to the absence of significant riparian herb communities. Study sites on unregulated streams were selected in consultation with Forest Service staff. These included Foster Meadow, Bryan Meadow, Benwood Meadow, Round Meadow and Kirkwood Meadow (Figure 1). All sites, including those affected by Project No. 184, are located at altitudes greater than 6000 feet. None are within active grazing allotments although they may receive limited grazing from horses passing through.

Sampling occurred in July-August, 2000 corresponding to the time when most species would be identifiable. At each site, experienced ecologists selected sampling locations. The objective was to select locations that typified the vegetation community. In some cases, more than one location was required.

The study design consisted of establishing transects that were generally 200 feet long, but that varied somewhat based on the diversity of vegetation and topography, width of meadow dominated sites, and accessibility. The transects were placed perpendicular to the channel, with a roll tape that was stretched across the creek where possible and secured with metal pegs at each end to hold it in place. The toe-point method was used to collect vegetation composition data (Anon. 1996). A pointed wooden dowel was used at one foot intervals along the transect to identify plant "hits" providing frequency data. Hits were recorded to the species level when possible, but grouped by the following categories: sedge, rush, graminoids, forbs, willow, barren, litter or water. Sedges and rushes are typical wet meadow plants. They have especially high value for streambank stabilization. Graminoids include all annual and perennial grasses. Forbs include all broad-leaved herbaceous plants, some of which are associated with wet or dry sites. Typical forbs include clovers, Indian paintbrush and lilies. Willows include any willow species. Data were recorded on a field data form along with relevant field notes and each site was photographed and described to facilitate finding the same location at a later date. Species that could not be identified in the field were later identified by a local botanist. Phenology prohibited developing complete lists of all species but the dominant species at each site were identified. Only inconspicuous or sparsely distributed species would have been missed.

Analysis included compiling tabulations of vegetation category frequency and percent frequency data for each site and for regulated and unregulated streams, combined. A species list was compiled for each site as well. Statistical analysis was performed to determine if there were significant differences between frequency of vegetation categories on regulated versus unregulated streams.

## **Results and Discussion**

In all, data were collected on 14 transects at the eight study sites. This included five transects at Caples Creek, two at Kirkwood and Bryan Meadows and one each at the other sites. Appendix A contains lists of the plant species encountered at each site. Appendix B and C contain frequency distributions for vegetation units at regulated and unregulated sites, respectively. Appendix D is a chart of pooled data for regulated versus unregulated streams.

Species composition at regulated versus unregulated sites was not indicative of any specific effects of streamflow regulation. Because these sites have not been heavily grazed for many years, it was more indicative of natural meadow succession. All sites had essentially complete cover. Bare ground, litter and rock ranged from four to 16 percent cover on the transects.

Table I summarizes percentage frequency data for regulated and unregulated streams. Overall, the proportional distribution of vegetation categories on regulated versus unregulated streams was similar except for the sedge and water categories. Three transects on Caples Creek had relatively low proportions of sedge and relatively high proportions of graminoids. There was also more surface water present at Caples Creek than at other sites. This is an artifact of the flow regime which is augmented during normally low flow periods. When water was excluded from the transects i.e., only vegetation or bare ground hits were included, and proportions were recalculated, the difference in sedge cover between regulated and unregulated transects was reduced (average 35 percent on regulated versus average 42 percent on unregulated).

Table 1: Proportions of Vegetation Units by Study Transect (values in percentages)

Site	Sedge	Grass	Shrub	Forb	Willow	Bare	Litter	Water	Rush
South Fork	34	7	1	37.5	0	1.5	11.5	0	7.5
South Fork	44.5	3.5	0	31.5	0	0	3.5	9	8
Caples	12	23	0	31	5.5	8.5	4	12.5	3.5
Caples	28	40.5	0	7.5	3.5	0	3	17.5	0
Caples	16	22.5	0	34	1.5	1.5	2	17.5	5
Caples	18	13	0	29.5	11.5	2.5	2	17.5	6
Caples	30.5	11.5	0	21.5	5	3.5	9.5	12.5	6
Average	26.1	17.3	0.1	27.5	3.9	2.5	5.1	12.4	5.1
Benwood	65	12	0	7	0	12	4	0	0
Bryan	31.5	17	0	25	7.5	7.5	1	2.5	8.5
Bryan	40	18	0	17	8	8	1	3	6
Foster	29	6	0	50	0	8	0	0	7
Kirkwood	36	17	0	32	5	1	9	0	0
Kirkwood	21	19	0	50	6	1	3	0	0
Round	48	14	0	24	5	3	1	2	0
Average	39	15	0	29	4.5	5.8	2.7	1.1	3.1

A chi-square analysis was performed to determine if samples from regulated versus unregulated streams differed in frequency distributions of vegetation categories, excluding water. Regulated streams had higher frequencies of barren, forb, and graminoid hits than unregulated streams, and lower frequencies of sedge and willow hits. Overall, the differences were highly significant ( $p < 0.001$ ). Riparian herb communities characterized by high proportions of sedges and rushes occurred on all sites to at least some degree. The somewhat higher proportions of graminoids on some Caples Creek transects may be indicative of a locally lowered groundwater table. Additional data on hydrology and channel morphology would be required to confirm this condition. Theoretically, reduced groundwater at Caples Creek could result from reduced frequency and magnitude of overbank flooding or it could be due to incision caused by the 1997 flood.

**Conclusions**

Because of the limited scope of this study it is not appropriate to draw any general conclusions. The conditions on the South Fork American River, where peak flows are not reduced and only low summertime flows are affected by Project No. 184, are suggestive of relatively rich riparian herb communities, comparable to those found on unregulated streams. Conditions at Caples Creek, where many factors have affected the stream, including recreational and livestock traffic, beaver dams and Project No. 184, suggest that monitoring meadow composition, in conjunction with additional hydrologic and geomorphic monitoring, might be useful for providing guidance on future management.

**Literature Cited**

Anonymous. 1996. Sampling vegetation attributes: integrated technical reference. USDI/BLM. Report No. BLM/RS/ST-96/002-1730.

Harris, R.R., Fox, C.A. and Risser, R.J. 1987. Impacts of hydroelectric development on riparian vegetation in the Sierra Nevada region, California, USA. Environmental Management 11:519527.

Kattelman, R. 1996. Riparian areas and wetlands. Sierra Nevada Ecosystem Project: Final Report to Congress, vol. 111, Assessments, Commissioned Reports, and Background information. Davis: University of California, Centers for Water and Wildland Resources Report No. 38.

Ponce, V.M. and D.S. Lindquist, 1990. Management of Baseflow Augmentation: A Review. Water Resources Bulletin, vol.26, no.2:259-268.

## **Appendix A: Species Lists for Study Sites (note that grasses are in Italics)**

### **Project Affected Sites**

**Caples Creek:** sampled July 17, 2000.

Achillea millefolium

Aconitum columbianum

Agrostis sp.

Aster occidentalis

Bromus inermis

Calamagrostis canadensis

Carex utriculata (Old name C. rostrata)

Carex sp.

Castilleja sp.

Deschampsia cespitosa

Elymus glaucus

Epilobium sp.

Heracleum lanatum

Hordeum brachyantherum

Ligusticum grayi

Pascopyrum smithii

Pen'den'dia sp.

Phleum pratense

Potentilla glandulos

Potentilla gracilis

Rumex sp.

Senecio triangularis

Sisyrinchium bellum

Lupinus polyphyllus

Mimulus sp.

Polygonum bistortoides

Potentilla gracilis

Salix lemmoni

Salix lucida ssp. lasiandra

**South Fork American River:** sampled July 18, 2000.

Site #1

**Sierra at Tahoe, Phillips Station meadow**

Agrostis sp.

Aster apiginus var. andersonii

Carex nebrascensis  
Carex sp.  
Hordeum brachyantherum  
Juncus balticus Juncus xiphioides Periden'dia sp.

Site #2  
**Above Sierra at Tahoe and Audrain Way**

Aster alpinginus var. andersomi  
Carex nebrascensis  
Carex sp.  
Lilium parvum  
Muhlenbergia filiformis  
Penstemon rydbergii  
Phleum alpinum  
Salix eastwoodiae  
Trifolium longipes

### **Control Sites**

**Round Meadow:** sampled July 25, 2000.

Agrostis idahoensis  
Allium validum  
Carex echinata ssp. echmata  
Carex luzulma  
Carex utriculata  
Deschampsia caespitos  
Muhlenbergi filifon-nis  
Pamassia sp.  
Periden'dia parisbii  
Platanthera leucostachys  
Salix castwoodiae  
Scirpus sp.  
Senecio hydrophiloides

**Foster Meadow:** sampled July 25-26, 2000.

Achnatherum nelsonii ssp. dore  
Agrostis capillaris  
Agrostis stolonifera  
Aster alpiginus var. andersonii  
Aster integrifolius  
Carex lemmomi  
Carex sp.  
Castilleja miniata ssp. miniata  
Danthonia californica  
Delphinium glaucum  
Homalothecium aeneum (moss)  
Juncus xiphioides



Ligusticum grayi  
Luzula comosa  
Mimulus pumiloides  
Muhlenbergia richardsonis  
Peridefidia so.  
Poa pratensis  
Polygonum bistortoides  
Senecio triangularis  
Scirpus congdonii

**Kirkwood Creek:** sampled July 25, 2000.

Achillea millefolium  
Artemisia douglasian  
Carex lemmomi  
Carex nebrascensis  
Castilleja miniata ssp. miniata  
Deschampsia cespitosa  
Hordeum brachyantherum  
Poa pratensis  
Trifolium longipes

**Bryan's Meadow:** sampled July 26, 2000.

Agrostis sp.  
Aster alpinginus var. andersonii  
Carex angustata  
Carex echinata ssp. echinata  
Carex illota  
Carex sp. (2)  
Deschampsia cespitosa  
Dodecatheon alpinum  
Epilobium sp.  
Muhlenbergia filiformis  
Pamassia sp.  
Polygonum bistortoides  
Ranunculus sp.  
Salix eastwoodiae  
Salix orestera  
Sambucus racemosa var. microbotrys  
Senecio triangulari  
Trifolium longipes  
Benwood Meadow: sampled July 27, 2000.

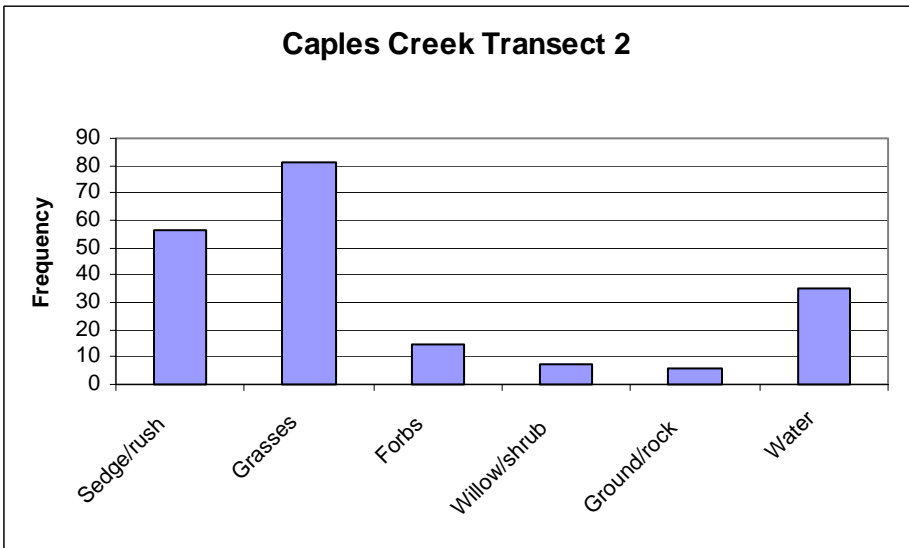
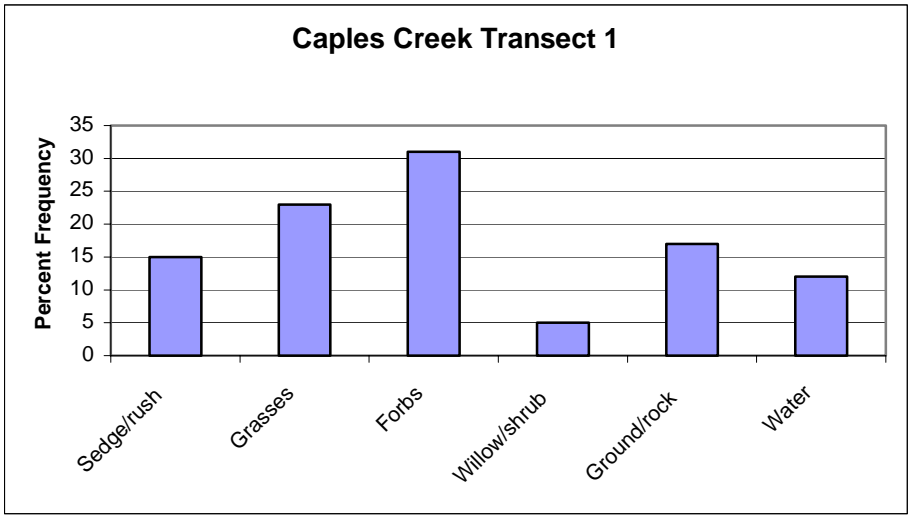
Atlium validum  
Aster alpiginus var. andersonii  
Carex nebrascensis  
Deschampsia cespitosa  
Deschampsia elongata

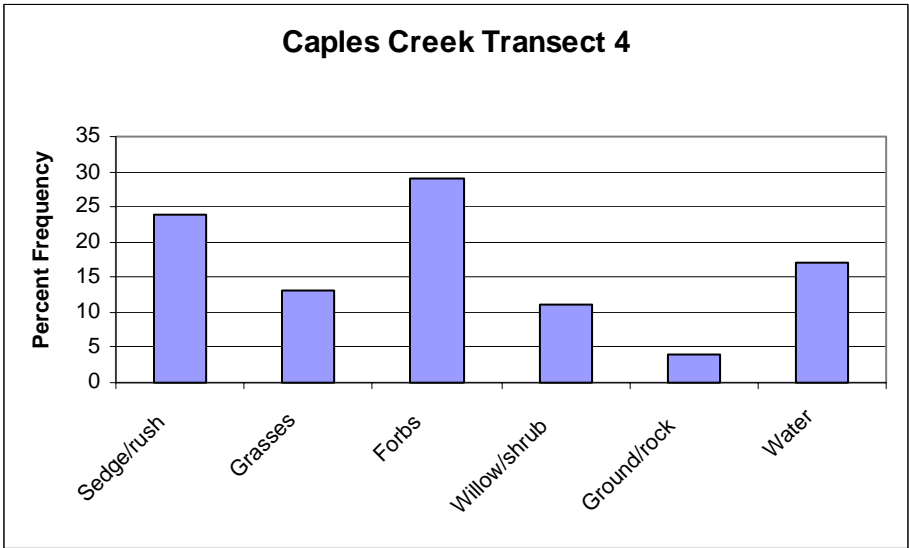
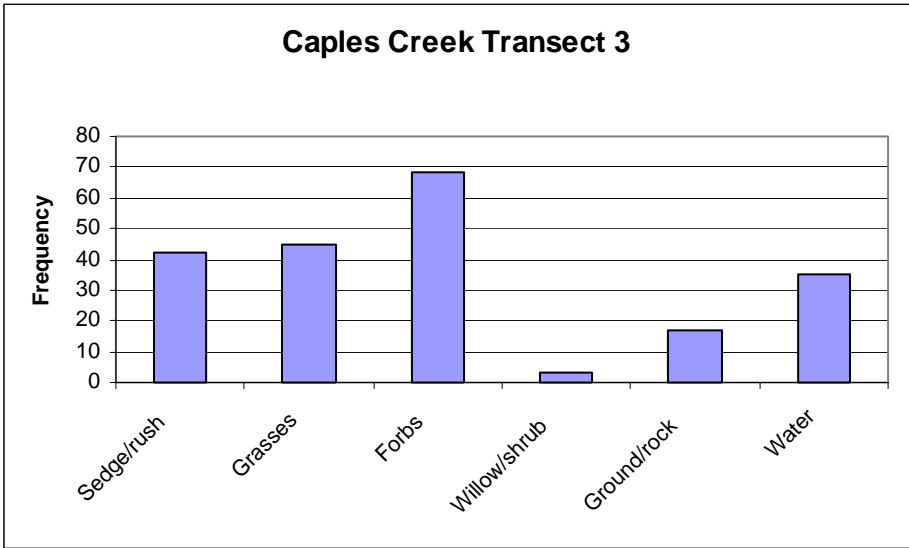
Penstemon rydbergii

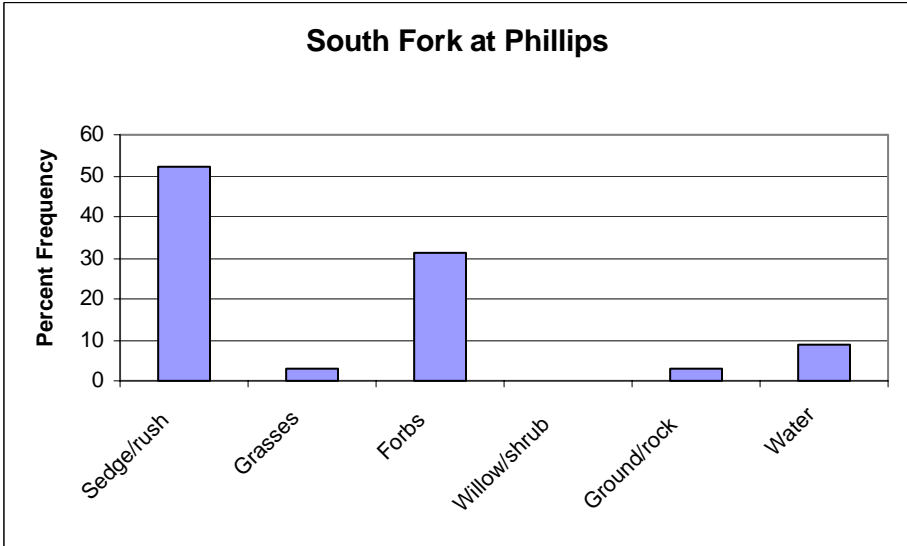
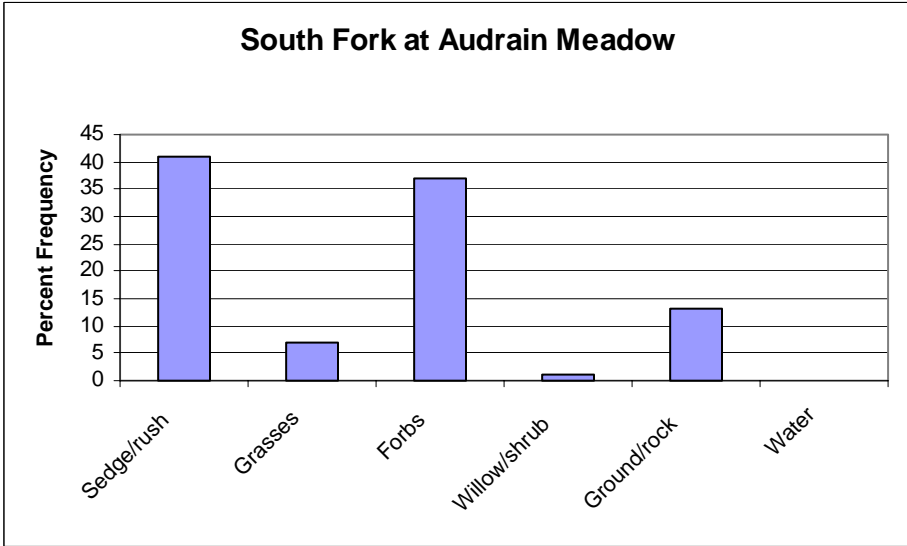
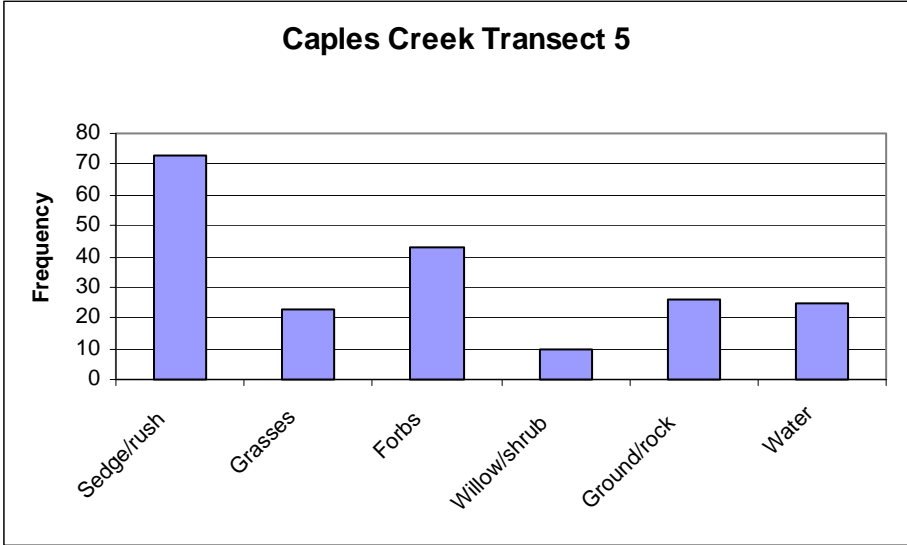
Peridn\*dia sp.

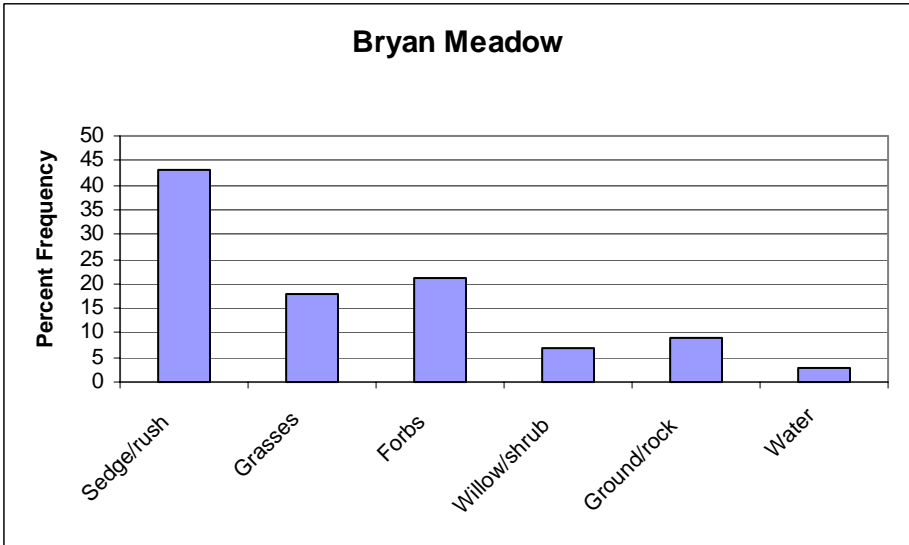
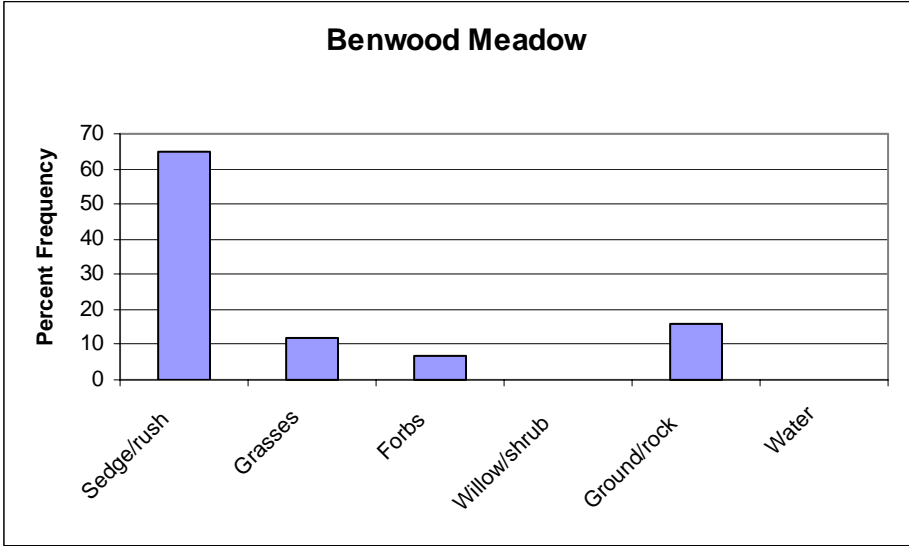
Polygonum bistortoides

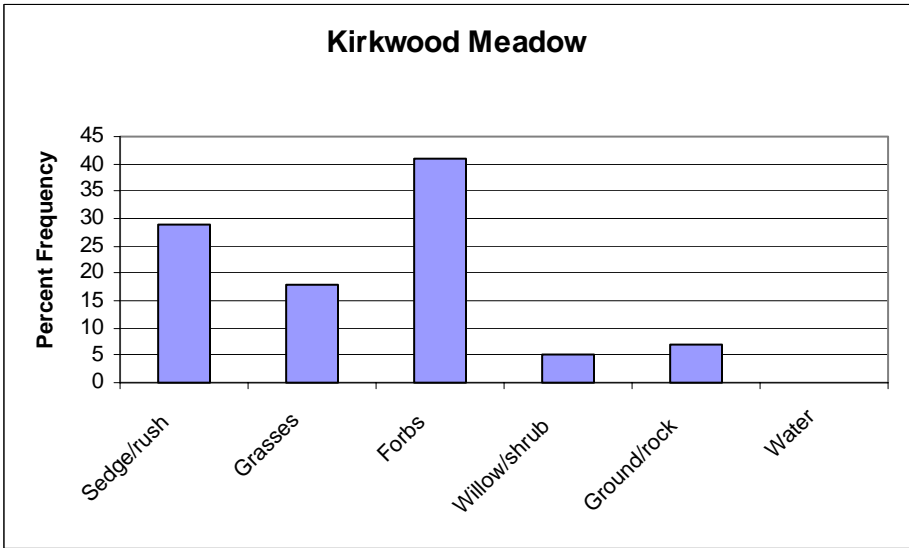
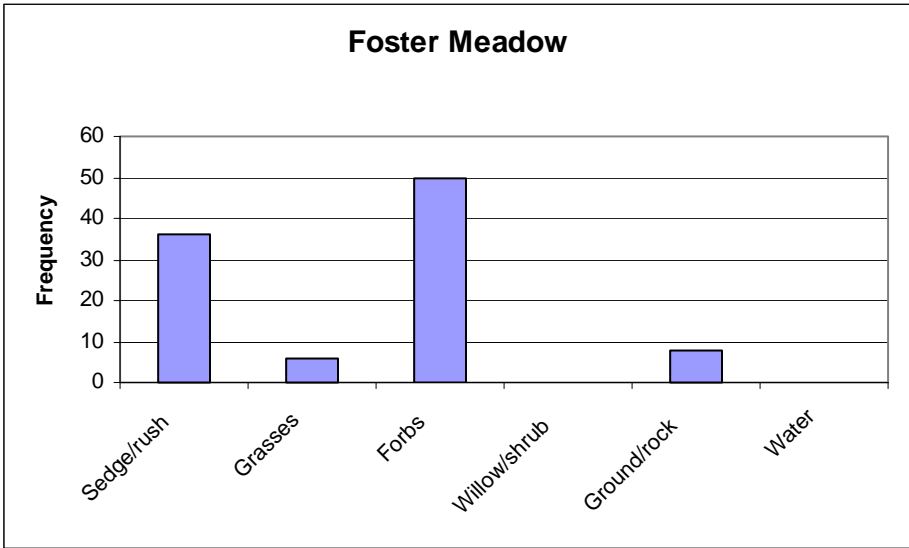
Sphenosciadium capitellatum

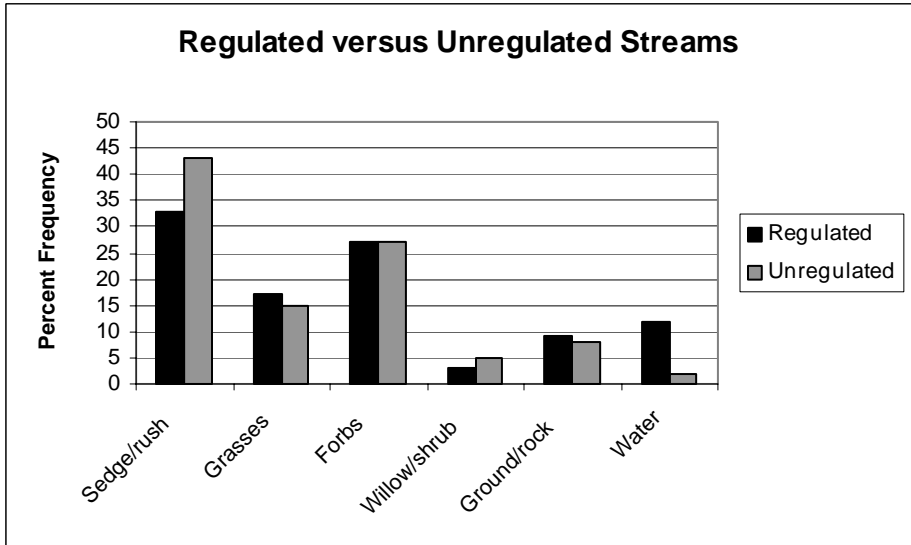
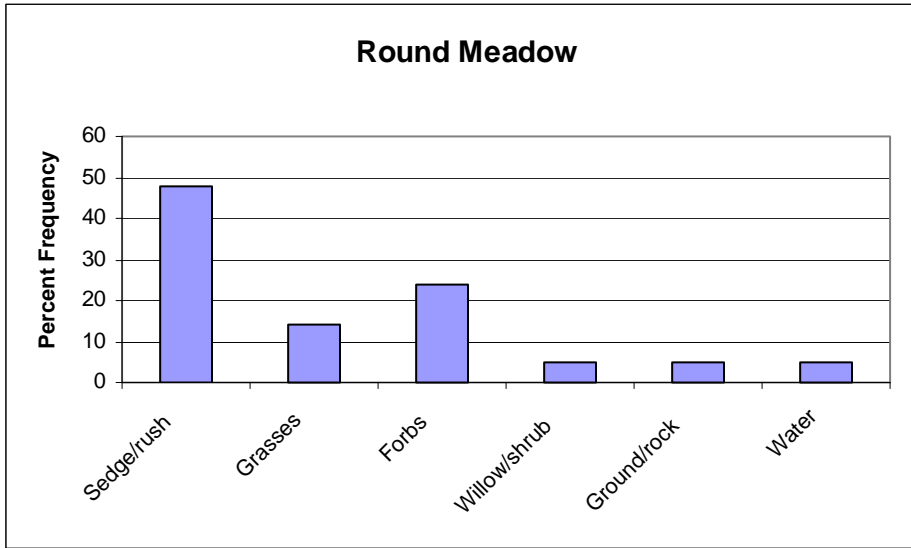














134 FERC ¶ 62,105  
UNITED STATES OF AMERICA  
FEDERAL ENERGY REGULATORY COMMISSION

El Dorado Irrigation District

Project No. 184-216

ORDER APPROVING RIPARIAN VEGETATION SPECIES MONITORING PLAN  
UNDER ARTICLE 401(A)

(Issued February 4, 2011)

1. On January 27, 2011, El Dorado Irrigation District (licensee) filed its Riparian Vegetation Species Monitoring Plan, pursuant to Article 401(a) of the El Dorado Hydroelectric Project license.<sup>1</sup> The project is located on the South Fork of the American River and its tributaries in El Dorado, Alpine, and Amador Counties, California, and occupies federal lands administered by the U.S. Forest Service (USFS).

2. Article 401(a) of the project license requires that the licensee file for Commission approval, various plans found in the USFS's Final 4(e) Terms and Conditions and the California State Water Resources Control Board's (State Water Board) Section 401 water quality certification. The State Water Board's certification Condition No. 13 and USFS 4(e) Condition No. 37 require that the licensee file for Commission approval, various monitoring and study plans. Among these plans, the licensee is required to file a plan to monitor the composition of riparian vegetation species, in order to evaluate riparian conditions and their response to changes in streamflow regime. Monitoring is to be conducted every five years along fourteen existing transects at eight study sites in representative habitat types. The plan should be developed in consultation with, and approved by the USFS, Ecological Resource Committee (ERC), and the State Water Board.

3. The licensee proposes to monitor riparian vegetation species composition at fourteen existing transects at eight study sites, representing stream reaches affected and unaffected by project operations. The licensee proposes to conduct monitoring at: Caples Creek downstream from Caples Lake; South fork American River downstream from the Echo Lake conduit; South Fork American River in the vicinity of Phillips; Foster Meadow; Bryan Meadow; Round Meadow; and Kirkwood Meadow. The licensee proposes to conduct composition and frequency monitoring during the summer using the "toe-point" method and to identify plants to the species level and to group species into representative categories. The license also proposes to photo document, physically flag,

---

<sup>1</sup> See 117 FERC ¶ 62,044. Order Issuing New License (Issued October 18, 2006).

and collect GPS data at each sampled site. Collected data would be compiled into tabular and/or graphical format for comparison with previous monitoring efforts. The licensee proposes to submit monitoring data and a discussion of the results to the USFS, the ERC, and the State Water Board at least two weeks prior to its annual ERC meeting. Following a 30-day agency review and comment period, the licensee proposes to file a final monitoring report with the Commission by June 30 of each year following monitoring, as part of its annual project monitoring report.

4. The licensee submitted a final draft of the plan to the USFS, the ERC, and the State Water Board on October 28, 2010. Individual members of the ERC approved the plan by separate correspondence dated November 10, November 11, December 23, and December 27, 2010. The State Water Board formally approved the plan by letter dated November 9, 2010. The USFS also approved the plan by letter dated January 3, 2011.

5. The licensee's plan includes a proposal to conduct riparian vegetation monitoring at eight locations every five years, and to file corresponding monitoring reports with the Commission each year following monitoring. The licensee's plan is consistent with the requirements of the project license and should adequately assess the effects of project operations on riparian species composition and aid in determining if management goals are being met, and should be approved.

The Director orders:

(A) El Dorado Irrigation District's (licensee) Riparian Vegetation Species Monitoring Plan, filed with the Federal Energy Regulatory Commission on January 27, 2011, pursuant to Article 401(a) of the El Dorado Hydroelectric Project license, is approved.

(B) This order constitutes final agency action. Any party may file a request for rehearing of this order within 30 days from the date of its issuance, as provided in section 313(a) of the FPA, 16 U.S.C. § 8251 (2006), and the Commission's regulations at 18 C.F.R. § 385.713 (2010). The filing of a request for rehearing does not operate as a stay of the effective date of this order, or of any other date specified in this order. The licensee's failure to file a request for rehearing shall constitute acceptance of this order.

Thomas J. LoVullo  
Acting Chief, Aquatic Resources Branch  
Division of Hydropower Administration  
and Compliance

Document Content(s)

P-184-216.DOC.....1-2