# Appendix C

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## M & M Consultants
### Consultants Report

# MAD RIVER: 1850-1925

# THE EFFECTS OF FLOOD EVENTS
# &
# LAND USE ON SEDIMENT TRANSPORT PROCESSES

Presented to:

Humboldt County Department of Planning
3015 H Street
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Presented By:
M.J. Scalici
M & M Resource Consultants
6220 Lanphere Road
Arcata, CA. 95521

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## Introduction

The transport and disposition of sediment in any given segment of river channel depends on many factors. Geology, climate, vegetation and land use activities being some of the more important variables. Each variable is not mutually exclusive, and each interacts with the others. A river channel responds to changes in these variables by adjusting its morphology through time. The most rapid adjustment periods often takes place during "channel forming" events. At any given location on a stream, conditions may favor the erosion of a bank at that point, and deposition of sediment at some location downstream.

Little is known about sediment transport processes of the pre- and early sediment period on Mad River. An understanding of the geomorphic agents controlling sediment transport processes in the river, and how historic land use activites have acted as geomorphic agents is relevant when making well-informed management decisions, and will be the focus of this report.

In terms of sediment transport processes, river morphology and riparian vegetation, Mad River in the 1850's was a very different river than it is today. Many of the features that regulated the disposition of sediment through the river, such as riparian vegetation, were removed, thereby producing more rapid transport of sediments through the project reaches.

The location, spatial distribution, and nature of river meanders and locations of flood-induced bank erosion and sediment deposition provide a marker for exploring the changes in river morphology since first settlement took place. A review of the more significant events during the first 75 years of settement will be presented as outlined below:

1). A description river morphology and vegetative conditions of the floodplains at a time shortly after the first settlers arrived in the early 1850's.

2). The geomorphic resoponse of the river to flood events, and the reconstruction of the geomorphic history of the river between 1861 and 1925.

From this, the following evaluations can be made:

1). The interaction between flood events and early land use activities as explained in newspaper accounts of the time.

2). The role of land use activities on river morphology and sediment transport mechanisms .

The following three periods will be discussed separately:

a). 1850 - 1889, *Early Settlement.*
b). 1890 - 1917, *Big Floods, Aggradation and the Railoads.*
c). 1917 - 1925, *Drought and the Onset of Bed Lowering*

## The Study Site

The study site includes roughly the lower 25 miles of Mad River up to, but not including, its estuary. The study site will be broken into four distinct reaches based on general geomorphic features. Figure 1 shows the project reaches which are:

Reach 1: Sweazey Dam Site to Fish Hatchery
Reach 2: Blue Lake Valley- Fish Hatchery to Lindsay Creek
Reach 3: Lindsay Creek to North Bank Road Meander
Reach 4: North Bank Road Meander to Highway 101 Bridge

## A few things to keep in mind

There are a few things the reader should keep in mind when reading this report:

1). Conditions in the upper catchment and surrounding hillslopes influence the delivery of sediment to the into the project reaches. Although not the main topic of this report, this should not be ignored when considering the origin of sediments.

2). Where the river can spread laterally across its floodplain, the amount and thickness of vegetation growing on the floodplain and terraces influences the rate of sediment transport and the sizes of sediment travelling through the reach. Hydraulic roughness is a term used to equate the degree to which physical features in a river bed and on the floodplain can slow water down as it flows.

3). River and floodplain management should take into consideration pre-existing conditions of a river when making decisions affecting the balance of sediments in the river.

4). A reasonable understanding of the role of geology and land use activities as geomorphic agents and as regulators of sediment transport processes will provide for better informed management decisions.

Abbreviations used:

SBF = Susie Baker Fountain papers, Humboldt State University
AU = Arcata Union, Arcata CA.
HT = Daily Humbodlt Times, Eureka, CA.
FE = Ferndale Enterprise, Ferndale, CA.
WCS = West Coast Signal, Eureka, CA.
HDS = Humboldt Daily Standard, Eureka, CA.

Figure 1. The project reaches. See figure 2

## Methods

Mapping Early Settlement Features

The U.S.Coast and Geodetic Surveys of 1854 and 1874, and photographs of the time provide a glimpse of the landscape that existed when the area was first settled in the mid-1800's. To recreate the course of Mad River and the vegetation that existed prior to significant landscape modifications, the U.S. Coast and Geodetic Survey notes (Foreman, 1874) and plat maps were obtained. Pertinent spatial information, such as the location of the river course and slough channels, vegetation breaks and marker trees, was first traced from the map onto matte acetate. These features were then manually digitized using Intergraph software to develop computer-generated maps. Section corners and quarter sections were used as control points.

Flood Events, Land Use, and Geomorphic Changes of Mad River

The geomorphic changes associated with specific flood events and the people's responses to these events were reconstructed using original newspaper accounts contained on microfiche; the Susie Baker Fountain Papers, a collection of historic papers found in the Humboldt State Library; and Haynes (1986). Land ownership was obtained using the 1898 and 1921 Belcher's maps and descriptive information contained in newspaper articles. Site specific information mapped in the fashion explained above.

## Summary

Large flood events combined with land use activities that precipitated bank migration dramatically altered the ways in which course sediments were delivered to and transported through the project reaches. Early land uses involved the clearing of vegetation on the floodplains and terraces along most of the project reach. The logging boom in the 1870's drove men and mills up the river and into Blue Lake valley where old-growth redwood and other timber on the valley terraces and lower hillslopes, were cut for lumber and homesteading. Early attempts to float the logs donwstream to the canal resulted in severe bank erosion (Haynes, 1986). During the flood events of 1878, '79, and 1880, moderate to severe erosion took place along much of the project reach. This dramatically increased the volume of sediment entering the project reaches that had been previously stored in raised fluvial terraces . The channel's responses were bank migration and bed aggradation. At the same time, efforts were being undertaken to stabilize the banks and prevent channel migration at certain locations. These sites, a few floods later, tended to be targets of erosion and would often fail.

The most catastrophic flood year was 1890 when one storm after another resulted in erosion in a number of places. A late February rain-on-snow event did severe damage in Blue Lake, West End, around Valley West, and near the old canal. It was this flood that placed the confluence of the North Fork with Mad River in a mid-valley position. The net effect has been an increase in gradient of the channel and a more rapid transport of sediment through the Blue Lake valley, a situation that has persisted ever since.

By the 1890's, technologic advances and a greater demand for the export of lumber, encouraged the expansion of logging and railroading further upstream and in the tributaries, and the expansion of the city of Blue Lake. During the 1902, '03, and '07 floods, more bank erosion and landslides occurred, resulting in damage to many structures, now built closer to the river. This resulted in pulses of sediment deposition into the river throughout the early 20th century.

After 1917, few devastating floods occurred. By the early 1920's, little of the sediment once stored in the Blue Lake valley terraces remained, although logging operations higher in the catchment probably still contributed large amounts of sediments as a result of bank erosion and slides. River bars along Arcata Bottom provided copious amounts of gravel for many local projects. By the late 1920's, signs that the river bed was starting to downcut became evident, a trend which has continued to the present. Removal of sediments from the project reaches, both by nature and by human extraction at rates that exceed the rate of recruitment into them, has resulted in a "net negative" balance of sediments and the bed lowering observed today.

## Geologic and Geomorphic Setting

Figure 2 shows some general geologic and geomorphic features which affect the project reaches. The delivery of sediment into the project area and its subsequent transport through it are strongly influenced by thrust faulting in the vicinity and is described below. For a technical discussion of regional tectonics, see Clarke and Carver (1991) and references.

## Reach Description

### Reach 1: Sweazey Dam Site to Fish Hatchery

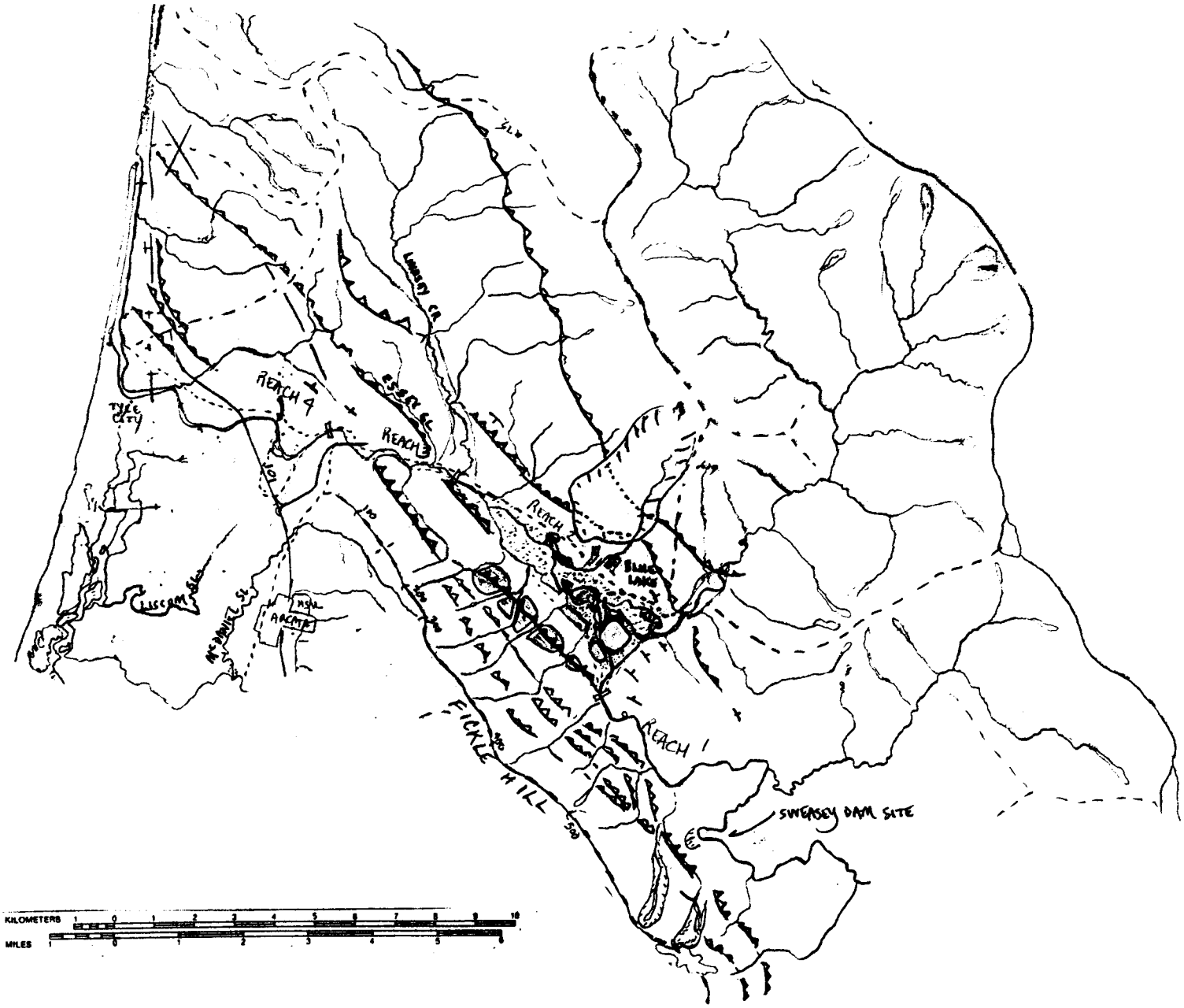
Reach 1 is a narrow canyon about 9 km long with a sinuosity of 1.6. The first 1.9 km is follows a northeast-trending ridge until it reaches the Canyon Creek meander. This meander is about 600 meters long by 400 meters wide and possesses at least 3 terraces. The river then flows west about 2.7 km contacting the Mad River fault zone where it deflects north-northwest. The river then parallels this fault boundary for the lowermost 3 km of this reach. From here, it empties out to the broad unconfined Reach 2, known as the Blue Lake valley.

### Reach 2: Blue Lake Valley

Blue Lake valley is an elongated, triangular basin that has inflows; one at its southern end and one on its eastern end. The apex of the triangle is the outlet flowing northwestward. It is about 2 km wide along its southern base, narrowing to less than 1 km wide at its apex near Glendale. The delivery of sediments into the valley comes from several sources. The most relevant input of course sediments (gravels and cobbles) into the valley comes from the main stem Mad River. Its drainage area (da) is about 780 $km^2$ and flows into the valley from the south. The North Fork Mad River has a drainage area about 7.5 times smaller (da =105 $km^2$) and entered from the east. Relative to the main Mad River, the North Fork probably contributes an additional 10-15% the amount of sediment to reach 2.

The valley is sandwiched between thrust faults of the McKinleyville and Mad River fault zones. This faulting increases the quantity of sediments entering the valley. Three steep, fault-bound gulches (Quarry, Palmer and Kelly Creeks) descend from Fickle Hill contributing sediments along the western margins of the valley. Episodes of earthquake-induced slumps, earthflows, and debris torrents have occurred down these gulches that have incised uplifted fluvial terraces at their bases. Descending down the southwestern flank of Liscom Hill some

time in the recent geologic past was a large earthflow (figure 2) that probably dumped a wide mix of sediments across the northern margin of Blue Lake valley.




Earthflow

Thrust fault

Uplifted fluvial terrace

Strike and dip of bedding

Figure 2. Some general geologic and geomorphic features affecting sediment delivery into the project reaches.

On the periphery of the valley are uplifted fluvial terraces. Trenches across the McKinleyville fault near the town of Blue Lake showed late Pleistocene and Holocene river terraces that are offset due to thrust faulting (Carver, et al., 1991). Thrusted overbank floodplain sediments and scarp-derived colluvium were found representing 4 distinct events, occurring at roughly 3,000-5,000 year intervals, with the last one occurring more than 660 years ago (Carver, et al., 1991). Each event had 3 to 3.5 meters of slip on a northeast-dipping fault (Carver, et al., 1991).

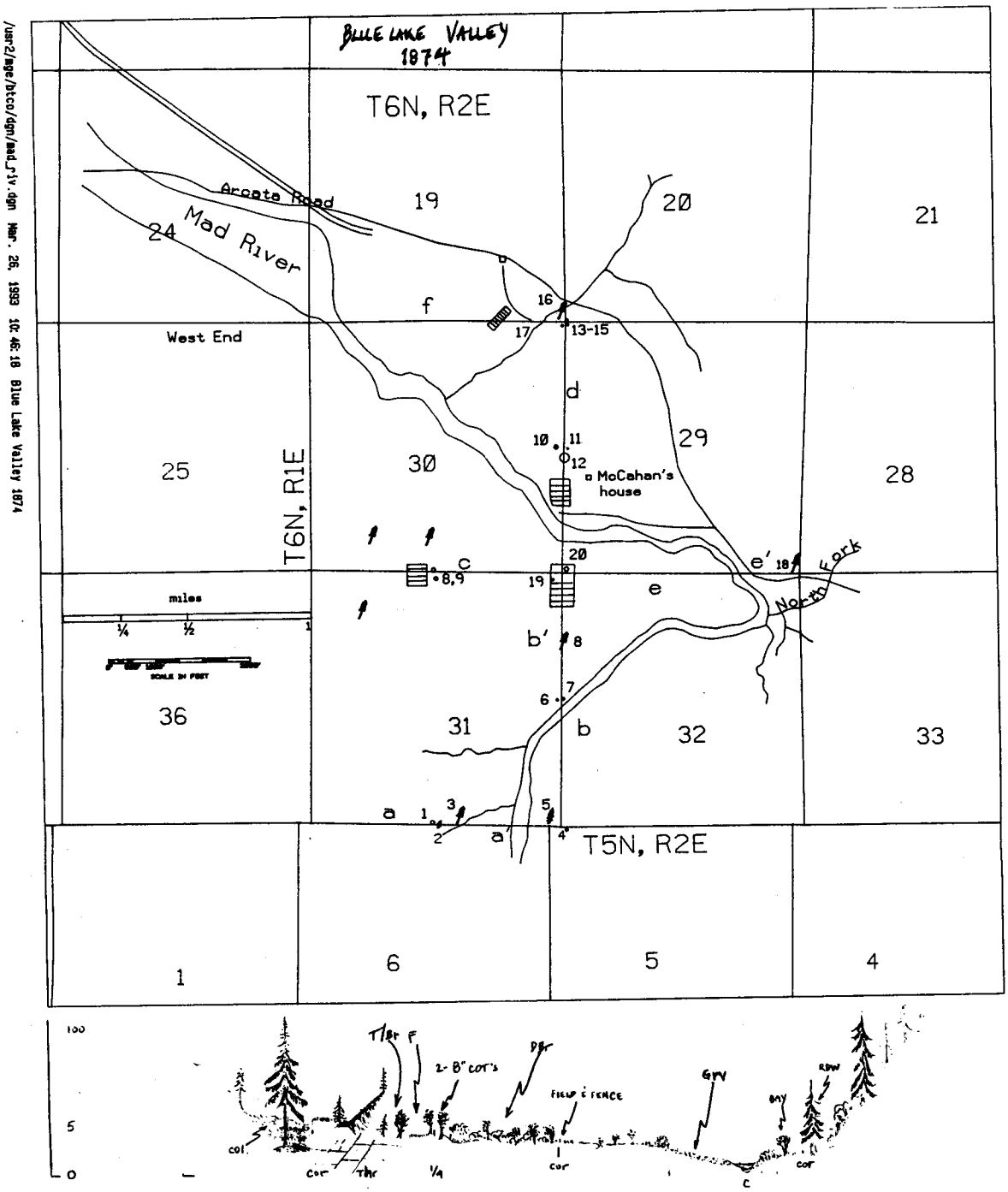
## Geomorphology & Vegetation of Reach 2, 1870's

Figure 3 is reproduction of the U.S.Coast and Geodetic Survey map of Blue Lake valley, surveyed by S.W. Foreman in 1874. It shows the approximate location of the river course and the vegetation that existed at the time. Total length of the river between the east-west line between section 31, T6N-R2E and section 6 in T5N-R2E to the river's crossing of the north-south line of sections 19 and 24 was about 4 miles (6.4 km). The linear distance between these two points is 2.38 miles (3.84 km), giving a sinuousity of 1.67.* The following is the description of the valley given by Foreman in 1874:

> "Along the East boundary and in sections 29 and 34, there are small prairies good for grazing. Timber is of excellent quality being mostly redwood, pine, and oak. The latter will afford a great quantity of tanbark. Mad River runs diagonally through the township from southeast to northwest. It is a rapid stream, well adapted to floating timber to the sea."

Only the section boundaries (1 mile intervals) were surveyed and the descriptions given below will be referenced to these boundaries. In figure 3, note the course of the river as it entered the valley. The lower 1,680 feet (510 meters) flowed directly north much as it does today. Following the dip of the bedding, the river deflected northeastward toward its confluence with the North Fork around an uplifted terrace. An area of "brush and timber" grew on this uplifted terrace, which forced the river in this direction. Prior to being wiped out by flood events of the late 1800's, this terrace probably received much of the finer sediments coming down from Mad River basin. The vegetation here consisted of "redwood, cottonwood, pepperwood (bay laurel), hazel, and salmon brush". This thickly-vegetated terrace slowed the velocity of overbank flows and received deposits of fine sediments coming down from the upper parts of the basin. The soil on the line between sections 30 and 31 was considered "first rate" and the land was "generally level".

*NOTE: Sinuousity is the ratio of a length of river from one point to another to the linear distance between those two points. As will be seen later, the length of river between these two points today is about 2.46 miles (4 km) giving a sinuosity is now nearly 1.0. This is important when considering the transport of sediments through the valley.




Diagrammatic cross sectional view, west to east along the southern border of sections 25, 30, 29 and 28.

| | |
|---|---|
| T/Br = timber & brush | Grv = gravel |
| Thr = Thrust fault | Rdw = redwood |
| D.Br = dense brush | Col = colluvium |

Transect descriptions, Foreman, 1874.

a. Land steep, hill broken by tributaries of Mad River. Pine, cedar, bay, oak, fir.
a'. On river bottom. Undergrowth dense oak brush.
b. Timber redwood, cottonwood, pepperwood, pine, hazel & salmon brush.
b'. Brush and timber
c. Land level, soil 1st rate. Redwood, cottonwood, pepperwood, hazel, salmon brush.
d. Land level, soil 1st rate. Redwood, maple, pine.
e. Waste land of river bed. No timber.
e'. Timber- redwood, pepperwood.
f. Timber & brush (T/Br).

Marker trees

| | | | |
|---|---|---|---|
| 1 | 10 in. bay | 10 | 3 in. maple |
| 2 | 3 ft. pine | 11 | 6 in. maple |
| 3 | 12 ft. redwood | 12 | 24 in. maple |
| 4 | 30 in. oak | 13 | 4 in. fir |
| 5 | 36 in. cedar | 14 | 4 in. fir |
| 6 | 10 in. cottonwood | 15 | 6 in. fir |
| 7 | 10 in. cottonwood | 16 | 16 ft. redwood |
| 8 | 10 ft. redwood | 17 | 3 ft. fir |
| 9 | 2- 8 in. cottonwoods | 18 | 8 ft. redwood |

Figure 3. Blue Lake Valley, 1870's. From Foreman, 1874. The letters represent general vegetation descriptions along each surveyed transect and the numbers represent trees that the survey used as markers.

The river flowed northwestward for about 5,900 feet (1,800 m) and was joined by the North Fork at the eastern corner of the valley. On the east end of the line between sections 29 & 32, (transect *e'* ) timber consisted of old-growth redwood and bay laurel. With the additional water and sediment contributed by the North Fork, the river was then deflected westward across the southern boundary of section 29. The land was "level", soil "first rate except on water land in bed of (Mad) river." (transect *e*). This area was described as "waste land of the river bed" and "contained no timber." This was apparently a site where course sediments such as gravels, would deposit and spread laterally in the valley. A road traversed the valley on the north side of the river, probably an historic Indian trail that was used by the miners accessing their claims in the Trinity mines.

The river then flowed northwestward paralleling the Mad River fault zone. Where it crossed the line between sections 29 adn 30, its active channel was 100 feet (30 meters) wide. About 650 feet (200 meters) south of the river (at the corner of sections 29, 30, 31, and 32), a 4 foot diameter bay laurel and a 30 inch diameter cottonwood stood as marker trees (veg.#'s 19 $ 20) with "no other tree in marking distance." North of the river along this line, they crossed a field and McCahan's place. Two small maples (veg.#'s 10 & 12) were the 1/4 section marker trees that grew 1,530 feet (465 m) north of the river, probably well away from . Another 420 feet (128 m) north, the survey entered brush and timber consisting of "redwood cottonwood, pepperwood, pine, and hazel and salmon brush." (transect *d*) The soil along this line was considered "first rate."

Reach 3: Lindsay Creek to North Bank Road Meander

Reach 3 cuts through a narrow, bedrock gorge, crossing at least three fractures of the Mad River fault zone. Lindsay Creek and Essex Gulch enter from the north and Warren Creek from the south, bringing mostly fine sand and silt to the river.

The survey notes are of little use here. On a north line between sections 14 & 15, T6N, R1E, the survey crossed Mad River near today's Highway 299 bridge. The channel was 225 feet (69 meters) wide. Downstream from the 299 bridge, the river deflects off the valley wall below North Bank Road and flows southwestward toward Valley West.

The course of the river through this canyon may be a geologically recent one. Although not well understood, geomorphic evidence indicates that Mad River may have flowed through Fieldbrook valley long ago. Tectonic uplift in the Fieldbrook valley and newly-formed fractures in the presently occupied canyon forced the river to find a new course through this gorge.

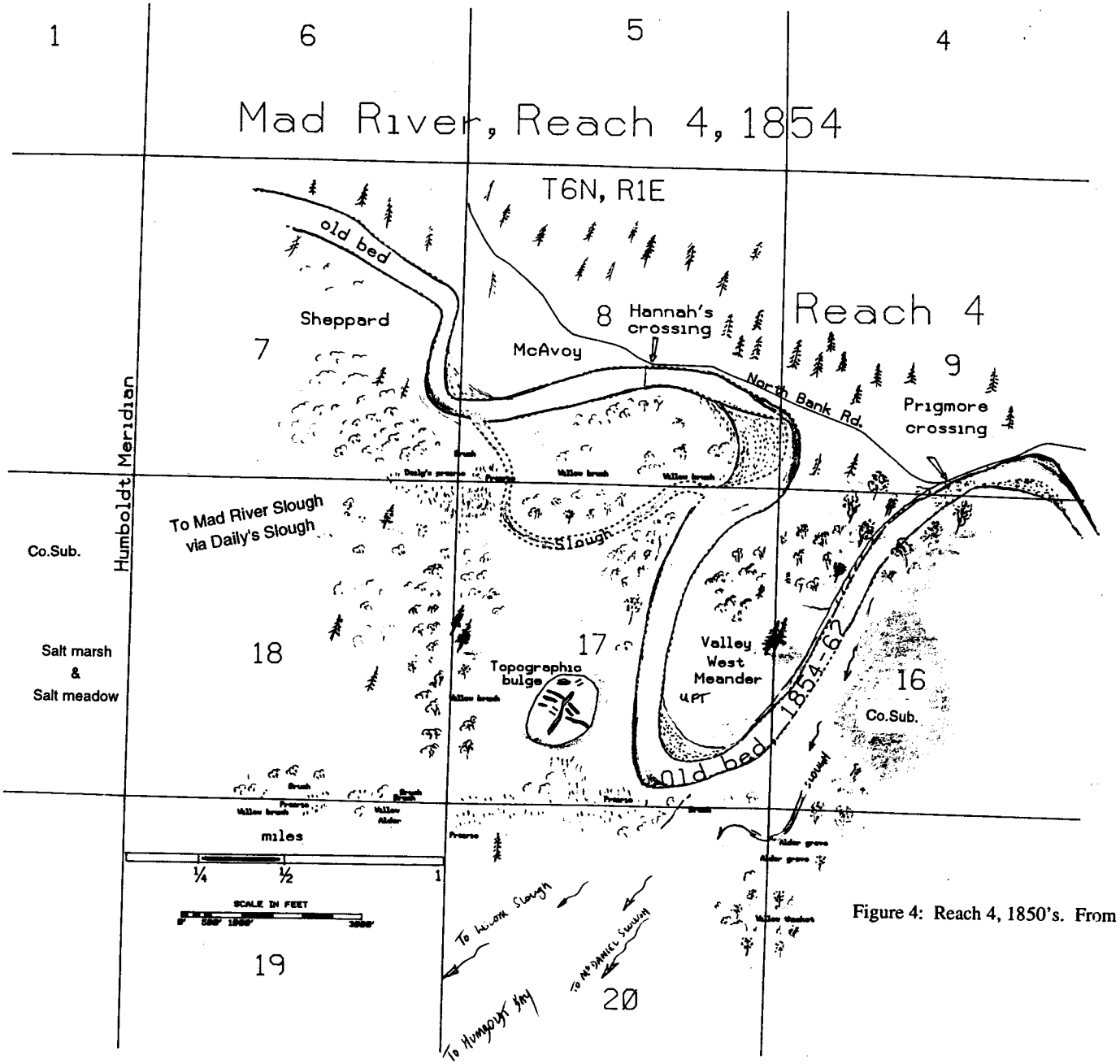
Reach 4: North Bank Road Meander to Highway 101 Bridge, Geomorphology & Vegetation, 1854

Once the river deflects southwestward off the bedrock bank below North Bank Road, it once again has a chance to spread laterally across a wide floodplain. It flows southwestward toward the Valley West Meander. When first surveyed in 1853-4, the length of channel from the North Bank Road meander to the meander was 6,530 feet (1,990 meters) (Figure 4). At the apex of this meander, distributaries would carry ordinary winter flood waters southwestward into upper Humboldt Bay, via Janes Creek and Liscom Slough. These and other distributaries are shown in Figure 4.

As a result of this lateral spreading of flood waters across the Arcata Bottom, the soil here consisted of deltaic deposits of Mad River. When the Arcata Bottom was first surveyed in 1853-54, the area between Arcata (then Uniontown) and Mad River was referred to as "the Spruce Belt." Old-growth Sitka spruce trees dominated the scene. Willow brush thickets occurred along the riparian margins of the river and a few patches of prairie could be found.

The low-lying area east and south of the Valley West meander, known as Aldergrove, was an area of earthquake-induced subsidence, while on the west side of this meander, a site of uplift occurred. This topography, shaped by large magnitude Cascadia Subduction Zone earthquakes, is the primary factor responsible for the position of this meander. The last of

which is thought to have occurred some 300 years before present (Clarke & Carver, 1992). Two 4-foot diameter Sitka spruce trees were found in the middle of the Valley West meander, a site of geologic uplift. This indicates that the river bed had not passed through this location for at least 100 years and may have even predated the 300 ybp earthquake (Scalici, 1993).




Co.Sub. = Coseismic subsidence

Arrows indicate direction of flood waters

Figure 4: Reach 4, 1850's. From U.S. Coast & Geodetic Survey, 1854.

## 1850 - 1889, *Early Settlement.*

The discovery of gold in the Trinity and Klamath mountains brought a rush of settlers to Northern Coastal California in the late 1840's and early 1850's. The focus of land activities along Mad River during the early settlement period was to cut the trees, clear the land for farming and establish roads and railroad lines. As early as the mid-1850's, logging was occurring in the Arcata Bottom and Blue Lake valley but was still localized. The first major enterprise was the digging of a canal in 1854. Schimps (1986) provides a good description of the Mad River Canal and the events that revolved around its operation. The intent was to float logs down the river, capture them by a boom and transport them through the canal. From there, they were to be floated to the mills on Humboldt Bay. As will be seen in the flood accounts below, this enterprise never operated as it was intended, and the floating of logs down the river caused tremendous amounts of bank erosion (Haynes, 1986).

A few ferries were operating from the river mouth to the Valley West meander. Much of the historical descriptions of the area around Blue Lake could be found in the *Blue Lake Advocate* and writings of Susie Baker Fountain.

### The November 30-December 4, 1861 Flood Event

This flood event was the first major storm witnessed by the new settlers of the region The storm that generated it was probably the most severe that Norhern California has experienced since. The impact land use activities had on Mad River at the time were still quite localized and minor. Blue Lake valley was still largely undeveloped and few accounts have been found. It was this flood that allegedly formed the lake from which the town of Blue Lake was to be named (Fountain, 1955).

In December, 1861 there were 3 distinct freshets or storms in 10 days "during which time the whole country was inundated and a vast amount of damage done." (*Arcata Union*, Feb.1, 1888). The following account was published in the *Humboldt Times*:

> "The rain commenced November 30, 1861, and poured in torrents for 60 hours; by Wednesday noon the waters in Mad River were 18 inches higher than ever known before. The bottom lands north and west of Arcata were submerged; fences, bridges, across the little stream that runs through Arcata were washed away. The four bridges across the little stream that runs through Arcata (Janes Creek) were washed away and all communication cut off from the bottom, except by boat...The rain ceased on Tuesday night and by Thursday the river was again "confined to its bed," but on Thursday day the windows of heaven were again opened and the river, now truly Mad, rushed over its banks and submerged prairie. The water continued to rise

until dark Sunday at which time it was much higher than the "oldest inhabitant had ever before known." Up the river (near Blue Lake) it was 5 feet above the previous high water mark.

"At Cook's ranch, the water compelled him to leave, a huge log struck and demolished his house and nearly his whole place ruined. At Prigmore's, the water was several inches from the houses and other families down the river were obliged to leave for higher land. Mad River swept over the bottom to the bay with great force, carrying with it bridges, fences and other moveable objects with which it came in contact; the soil in many fields was washed off for several inches in depth. Near the house of Mr. Arment (Valley West) an eddy washed out a hole where the road formerly ran..." (SBF vol. 82, pg. 224).

More storms followed during that winter and the sites vulnerable to flooding became obvious to the settlers. The most susceptible site was just south of the Valley West meander. The following summer, this meander was cut off the local farmers (Haynes, 1986). This would be the first of many attempts to prevent Mad River from flowing southward through the Valley West area and into Humboldt Bay via McDaniel and Liscom Sloughs. Figure 4 shows the location of this diversion (Brk 1). Written 26 years later, the following is a description of this enterprise, which would be the first of many diversions on Mad River:

"During the following summer (1862), farmers on Arcata bottom began to consider the danger that threatened them each succeeding year, and to provide a remedy. It was found by a little simple engineering that the channel of Mad River could be turned, at a trifling expense, so as to run further north, and no time was lost in undertaking the enterprise. To old settlers here the result of that scheme is well known. By private enterprise a canal, or ditch, was cut, commencing near the crossing at the Shaw place (then the Prigmore Crossing), that diverted the water of the river from the old channel and made a new one, connecting with the old bed some miles below." (Arcata *Union*, Feb.4, 1888).

## 1863-1880

By 1866, farmers were busy working the rich terrace soils around Mad River. A ranch above the mouth of Warren Creek, called Skeedaddle Murphy Ranch was run by Mr. Anderson who raised potatoes. This ranch would be washed away in subsequent floods. The bed of the river at that time had a good supply of gravels and was quite shallow from there to Valley West, as evidenced by the following account:

> "The Mad River being so low in early December (1866) he was able to drive a team (of horses) down the river bar, fording the small riffles and coming out on Arcata Bottom there being no wagon road up Mad River at that time. (SBF vol. 82, pg 228).

The 1860's and 70's was a time of 'booming.' John Vance had timber land along the river along reach 3 and established a mill at Essex. The trees that were being cut along the floodplain and surrounding hills were dumped into the river where they were supposed to float down during high flows and boomed above the canal. Here they could be gathered and transported through the canal. In many of the large flood events of the 1870's and 1880's, the force of the current was so strong that the boom often failed and logs washed out along the beach (Schimps, 1986). These log brought down by the floods, resulted in tremendous bank erosion during and had major effects on reducing bank stability (Haynes, 1986).

## November, 1872 Flood Event

A 5-10 year flood event occurred in November, 1872. On November 16, 1872, the *Humboldt Times* reported:

> "Heavy rains of last Monday caused a raise of waters in Mad River to such an extent as to call into requisition all the ferries on the stream. We also hear that Mad River Jas. Brown who has been logging on the other side of the Mad River, near John Hannah's place, lost 100,000 feet of logs which were swept out to sea by his boom across the river near canal breaking (SBF vol. 82, pg. 230).

The logs mentioned in the above account were probably mostly logged from Essex Gulch, lower Fieldbrook Valley and lower Blue Lake valley.

John Vance realized the futility of the canal and boom and built his mill along the north bank of Mad River at Essex and laid out a railroad for hauling the cut lumber to the Arcata wharf. In 1875, a suspension bridge was built by the Pacific Bridge Company for John Vance on Mad River at a cost of about $6,000. It connected the railroad on both sides of the river,

and by this means logs and lumber could be transported from the mill to tide water on Humboldt Bay. (Humboldt *Times*, Mar. 7, 1879)

## The January-February, 1878 Flood Events

On February 2, 1878, a 10-15-year recurrence interval flood event occurred along with unusually high tides (Scalici, 1993). The headlines of the *West Coast Signal* read, "Lively times at the Mad River Boom." A log jam occurred at Vance's bridge, but they passed through eventually. "Piers at head of slough and south bank swept away, some 14 or 15 pine pilings broken off." (SBF vol. 82, pg.231). Two miles of Vance's railroad was washed out, and Hannah's ranch was again a repository for logs. (*Weekly Democratic Standard*, Feb. 2, 1878, in Haynes, 1986). The January 30th edition of the *West Coast Signal* filed this report:

> "The flood Sunday (January 27) made things unusually lively along Mad River and at the Boom. All the logs in the river and its tributaries and an immense amount of uprooted trees and drift accumulation came down in a solid body. For at time it was feared that Vance's railroad bridge would be carried away, but the jam loosened and went plunging and thundering on to the Boom just in time to save the bridge, which stood a terrible test. The scene at the Boom was exciting and grand, but the structure was equal to the emergency. It is most satisfactorily proven that the Boom can successfully withstand any pressure which a Mad river flood can bring, and the lumbermen on that stream rejoice equally with the Boom Co. Some of the piles at the head of the Slough on the south side of the river were broken, but logs were all secured. Some 5,000,000 feet of logs are now held in the Boom, sloughs and canal. (WCS, Jan.30, 1878).

Later reports disproved the boom's survival. In addition, a new channel was formed on the north side of the river downstream of today's 101 bridge. (Figure 5).

> "We learn from a gentleman who passed the Mad River Boom yesterday that the great body of water in the river has been turned into a new channel on the Dow's Prairie side (north side), and that it is cutting through Baker's field. Of course, at the present stage of the river there is some water on the canal side (south side) but how long there will be is a question. The canal is full of logs, the banks of the river are lined with them, and there are supposed to be from 150 to 200 on the beach at the mouth of the river." (WCS, Feb.6, 1878).

A letter dated February 5, at 9 p.m. stated that "at that hour the Mad River Boom was considered to be in a critical condition." The canal was full of logs, and there was "an immense lodgement of logs and driftwood pressing against the boom. The writer expressed fears of the destruction of the boom, and wrote:

"Should tonight's rain continue long enough to bring down the rest of the North Fork logs which are ready to come, nothing short of a miracle can save the boom." (WCS, Feb.6, 1878).

Another flood, this one not as great as the one mentioned above, occurred about 3 weeks later which further crippled the Boom. One of the upper piers of the boom was carried away by the flood and "some logs went to sea." (WCS, Feb.20, 1878).

The March 6 & 20, 1879 Flood Events

The March 6 flood was more severe than both the 1872 and '78 flood events. The river was "considerably higher" than at any time during the winter of 1877-8 (HT, Mar. 7, 1879), and was probably a 20-25 year event. The March 7th edition of the *Humboldt Times* reported that "without any exception, this was the most serious freshet that had ever been experienced in Humboldt County." The writer also stated that since the county had first been settled, there had been higher water, but it was at a time when it was sparsely populated and little improvements made. (HT, Mar. 7, 1879). It was apparent that the increase of people and land clearing around the river was already starting to affect the river's response to flooding.

Mell Grimmer, who operated a ferry at Vance's place, said Mad River was 8 inches higher than the 1878 flood and that "the Vance railroad bridge over Mad River was carried away." (HT, Mar. 7, 1879).

Other accounts estimated the volume of logs that were brought down by the flood. A March 8th account reads as follows,

"For the past two months the general cry has been for rain, only enough rain to cause a freshet and bring the logs down. Tuesday the logs in the main streams came down to tide water, and the rains of Tuesday night and yesterday morning caused the forks and tributaries to give up what they contained. The rivers yesterday were running bank full and loggers had all they could attend to. The number of feet of logs brought down by the freshet is estimated at forty-millions." (SBF, vol.82, pg.232).

"The rain of yesterday and the day before has caused the various rivers and streams to rise considerably. Mad River is booming, and logs were coming down lively. (SBF, vol.82, pg.232).

The March 20th flood was stated to be "the greatest rise known in that stream since the winter of 1861-62." (WCS, Mar. 21, 1879). The river's base flow was probably very high at the onset of this storm and the magnitude of this event was on the order of a 25-30-year flood (Scalici, 1993). The "rushing torrent" of this flood destroyed the remainder of Vance's railroad bridge (WCS, Mar. 21, 1879). It was estimated that 2,500 logs passed the boom and entered

Humboldt Bay. A party of loggers stated that they were a short distance up North Fork the day before and the logs had all come down as far as they went. The only reliable news obtained from upper Mad river on the 20th was contained in a dispatch from Mr. Ed Janssen to Mr. Wunderlich, sent at 4:30 p.m. It was to the effect that "some 60 logs had come out of the North Fork, and that the main river was rising rapidly." (WCS, Mar. 21, 1879).

## The January, 1881 Floods

In January, 1881, two years after the severe winter of 1879, another flood occurred. This event was probably only an 8-15 year event (Scalici, 1993) and was the first to attest to erosion in Blue Lake valley. An account describing storm-induced erosion near the confluence of the North Fork and the main Mad River appeared in the newspapers.

> "Foley's farm, near the mouth of North Fork, was washed away, except a small patch of land where his house stands. The families of James McDermott and Mr. Stebbins were rescued from their dangerous quarters by L. Puter, who conveyed there in a boat to places of safety." (SBF vol. 82, pg. 234).

Once again, Hannah's place was a deposition site for a large number of logs that floated down with the flood waters.* Again, this flood was compared to the 1861 flood. However, the fact that the water was higher does not mean that the flood was a greater magnitude as the previous floods. Since the river had been severely aggraded by the input of sediments eroded from reaches 2 and 3 in this and past floods, the bed level was higher thereby giving the illusion of a great flood.

> "John Hannah's place has more the appearance of a logging camp than a productive farm. A great many logs that came down with the flood have found a resting place in his fields." (SBF vol. 82, pg. 234).

> "More water fell during a shorter period that a larger amount of damage has been done no one can doubt. At Mad River, the water was higher than at any time since '61 and some go so far as to place it higher...Much damage was done to the farm lands adjacent to the river. About 60 feet of trestle on the north side of Vance's railroad bridge was washed away, but the bridge itself, the main structure is all safe and secure. The water stood 15 inches deep in James Sinclair's yard...In many places on the farms, the water cut out small channels and in other places piled up sediment and a great deal of fencing was destroyed." (SBF vol. 82, pg.237).

*NOTE: In recent years, this site has been downcutting, and is no longer a site where significant deposition occurs. This is important to realize in light of today's extraction activities occurring in this area.

The following winter, in 1882, deep holes were reported being cut in the river bed at Hannah's crossing. The breakwater, (Brk 2 in figure 5) constructed just upstream of the crossing to prevent the river from flowing southwest to the bay, was being undermined. These scour holes formed around the breakwater pilings as later accounts suggest.

> "The crossing had always been considered very good, but lately deep holes were cut in, making the ford deep and difficult. (SBF, vol.42, pg. 180, dated December 20, 1882).

## December 24-26, 1883 Rain-on-Snow Event

This flood was not very severe, probably a 2-5 year event. It was reported that "Mad River, Tuesday afternoon December 25, reached its highest mark, and in several places left its banks, covering fields, but "the current was not sufficient to create any wash or do much damage." From Vance's mill, it was reported that all bridges spanning Mad river were safe, and that the river was falling by the 26th. At the North Fork, the river had caused some little damage to the mill yard, "but nothing to speak of." Along the line of the road where "new earth had been piled in some injury had been occasioned by the water, and the track had settled in places." The current had made an eddy about the western abutment of the bridge, but prompt action had prevented trouble, and no more danger was anticipated. Every precaution (was) taken and every move made to keep the river in its channel and guide the drift on a straight course to the sea." (HT, Dec.27, 1883).

## Blue Lake in 1883-87

These were heady times in vicinity of Blue Lake. The lumbering was in full swing, the mills adding the latest machinery. Minor's mill on Hall Creek was considered "one of the most substantial and best arranged in the Mad river belt" and employed 120 men in both the mill and in the woods. The town of Blue Lake was growing rapidly. A man named Scott built a new hotel and in the vicinity Blue Lake, improvements were "too numerous to mention." Mr. Chartin, the enterprising proprietor of a large hotel, store and public hall had picnic ground adjoining his place in Blue Lake. He also surveyed and platted 15 blocks of land, lying between the railroad and Scott's place, which he was to "offer for sale for residences or business purposes." (AU, Sat. Aug.7, 1886). By December, Chartin was selling lots on Mad river where it was said "the soil cannot be excelled." (AU, Dec.18, 1886).

In March, 1887, a new mill on the North Fork was completed, and turning out lumber rapidly (AU, Mar.19, 1887). The timber boom was in full swing. Quite a town was springing