5.0 IMPACTS AND MITIGATION MEASURES

For the purposes of CEQA, impacts identified herein are either 'significant'(S), 'significant and unavoidable' (SU), 'less than significant' (LS), or 'potentially significant' (PS). No differentiation has been made as to the degree of significance or insignificance.

5.1 Channel Morphology/Gravel Recruitment

The County retained Humboldt State University's Institute for River Ecosystems, and M & M Consultants to gather and analyze information on the effects of historic gravel extraction on the geomorphic character of the project area. The reports are included herein by reference. Portions of the following section were adapted from the Institute report. See Appendix F for the complete Institute for River Ecosystems report, and Appendix C for the complete M & M Consultants report.

River bed morphology is constantly changing regardless of gravel extraction. A goal of the adaptive management plan is to maintain a degree of dynamic equilibrium in structure and diversity, while the channel adjusts to natural and man-induced changes in stream power and sediment supply. Another goal of the adaptive management plan is to establish a program to monitor gravel extraction, gravel recruitment, gravel replenishment, bed morphology, fish passage, fish habitat, vegetation, and other riverine resources, to see that a degree of dynamic equilibrium, and where needed, rehabilitation is established and maintained, while allowing appropriate amounts of gravel to be extracted from appropriate reaches.

If the Mad River channel continues to degrade, the surrounding water table will decline which will induce changes in the riparian plant community; which may, in turn, induce changes in channel morphology. However, plant communities and channel morphology are not static features and there will always be change taking place. The adaptive management plan and monitoring program is not established to prevent change in the riparian plant community and channel, but to assure that extraction-induced changes in channel morphology and vegetation do not create irreversible adverse impacts on the processes of channel development and community succession, nor eliminate representations of specific successional communities.

If gravel extraction is expanded to permitted levels, or sustained at levels that exceed net recruitment there will be little control regarding adverse channel changes induced by gravel extraction. The preferred adaptive management plan includes periodic and annual reviews of mining reclamation plans, extraction levels, recruitment levels, individual bar replenishment, other changes and trends in channel morphology, and changes and trends in related resource areas. Using the information obtained during the reclamation plan compliance reviews and during the monitoring program the SDRC will limit and guide the operators in establishing the appropriate quantity, location, and methods of extraction.

Aggregate recruitment is the transport of sand and gravel into the project reach from upstream by bedload transport. In the case of sand, some suspended load may also be recruited as the channel gradient decreases in the lower reaches, or as storm runoff declines. During high flows some bedload material is transported out of the project reach, i.e., it is recruited into a downstream reach. Net recruitment to the project reach would be the amount coming in minus the amount going out as bed load transport into lower reaches.

Replenishment is the amount of bedload material that is deposited in the project reach. During any given year and depending, in part, where the bar is located in the project reach, replenishment may be the result of material that was recently recruited; it may also be the result of redistributing material that was previously stored upstream in the project reach; or, it may be a combination of both new material and redistributed material.

Recruitment and replenishment are typically expressed in tons or cubic yards per year. For a given river reach, in general terms, if the average annual extraction rate is less than average annual net recruitment, then channel aggradation will occur. If this aggradaton is focused in site-specific areas where current degradation is a concern, then restoration of bed elevation or rehabilitation will occur. If this aggradation occurs where aggradation problems exist, then the aggradation problems will worsen. Both excessive channel aggradation and excessive channel degradation generally lead to a host of related environmental problems.

If the average annual extraction is more or less equal to average annual net recruitment, then a condition of sustained yield could exist. Under sustained yield deposition and scour will occur locally but in a spatially-averaged sense the channel may remain more or less in dynamic equilibrium.

If the average annual extraction rate exceeds net recruitment then the sand and gravel resource is being 'mined'. Long-term mining generally leads to excessive channel degradation and a host of related potential environmental problems.

In reference to channel equilibrium, it is important to recognize that changes in channel aggradation and degradation will naturally occur in the absence of gravel extraction. Such changes are driven by the availability of sediment and stream power. Stream power is the ability of a stream to do work and is a function of discharge, slope, and hydraulic geometry; and these factors are functions of precipitation, watershed condition, and channel morphology. Precipitation patterns vary continuously and produce obvious changes in runoff and sediment load. Watershed condition influences streamflow-precipitation-erosion relationships and the availability of sediment. Erosion rates and sediment availability are influenced by geology, precipitation, topography, vegetation, land use, earthquakes, streamflow, and channel morphology. Sediment scour and sediment deposition produce changes in channel morphology and channel gradient. These processes are all interrelated in a complex series of actions and reactions and it is difficult to precisely predict the effects of changing any of the interrelated factors.

Since European settlers moved into this region, there have been obvious changes in Mad River watershed conditions. Early logging, ranching, road building, and other human activities increased sediment availability and the channel aggraded significantly. Prior to the mid 1980's, almost every report written on the Mad River discussed problems associated with flooding and channel aggradation. According to the Department of Water Resources 1982 investigation on Mad River Erosion:

"Aggradation of the riverbed has caused historical changes in the channel, raising the height of peak stormflows and resulting in damage to roads, bridges, agricultural land, fisheries, and dam and diversion facilities." (DWR, 1982)

Sweasey Dam was constructed in 1938 to supply water for the city of Eureka. A sediment flushing valve was installed with the intended purpose of allowing sediment transport into downstream reaches. This valve became inoperable in 1941 and the dam reservoir capacity began to diminish rapidly as sediment began filling the reservoir. The reservoir was completely filled during the 1964 flood and thereafter sediment rolled over the dam spillway (Hollingworth, 1993). If 3000 acre-feet of sediment filled the reservoir between 1938 and 1964 the average annual bedload transport rate would have been approximately 186,000 cubic yards per year.

The destruction of Sweasey Dam in 1970 released nearly five million cubic yards of sediment into the upper project area which contributed to existing channel aggradation problems. Large landslides in the reach between Sweasey Dam and the fish hatchery contributed additional sediment. According to the River Institute report approximately 15.5 million cubic yards of gravel was extracted from the lower project area between 1952 and 1992. The gravel mining industry and those who view the growth of the County infrastructure as a positive factor benefitted from this erosion, aggradation, and extraction. Today, there is a great deal of concern over channel degradation.

The lower project area has since experienced channel degradation and this is one of the major concerns that generated this PEIR. Some of the sediment that was released into the upper reaches of the project area when Sweasey Dam was destroyed in 1970 may still be stored in the channel. But, some of that sediment wave has passed through or has been extracted from the lower reaches of the project area.

In recent years there have been improvements in timber harvesting and road building practices which should logically result in less erosion, less sediment, and more channel degradation. Hillslope disturbances, related erosion, and sediment production associated with past improvements of Highway 299 have decreased. In recent years the Mad River has experienced droughts and seen a reduction in high water. For example, the average annual runoff at Arcata during the last 10 years is half of the long-term recorded average annual runoff. Recent low-water years have produced less-than-average sediment transport and recruitment.

It is obvious, from the data presented herein, that gravel extraction has exceeded net recruitment in the project area. It is sometimes recommended that, in order to have sustained yield gravel extraction, average annual extraction should equal average annual net recruitment. Dr. Andre Lehre (Lehre, et al. 1993) has used a variety of methods to estimate long-term average annual Mad River gravel recruitment near the middle of the project area, in the vicinity of Blue Lake. Lehre, Klein, and others (Lehre, et al. 1993) have compared recruitment estimates with extraction estimates and with changes in channel storage in a budget-like analysis (Gravel Recruitment - Gravel Extraction = Change in Gravel Storage) and the estimates seem to balance fairly well. However, according to the Department of Conservation, Office of Governmental and Environmental Services, these measurements "... show that the bed was enlarged by a factor of only about one-half and about one-sixth of the offtake rate (minus the transport rate) in the hatchery to 299 reach and the 299 to 101 reach, respectively. The lack of a commensurate response of the bed dimensions to the mined volume seems to indicate that the volume deficit manifested downstream of 101. The enlargement of the Mad River estuary may be a result of this change" (from Mined-Land Reclamation Project staff of the Department of Conservation's Division of Mines and Geology, response to Draft PEIR, dated June 11, 1993).

Lehre recommends that a reasonable long term average gravel recruitment estimate for planning purposes is 150,000 to 200,000 cubic yards per year and these numbers agree well with the 186,000 cubic yards described above for the 1938-1964 period when Sweasey Dam reservoir filled with sediment.

According to the Mined-Land Reclamation Project staff of the Department of Conservation's Division of Mines and Geology (response to Draft PEIR, dated June 11, 1993) the "long term average bedload sediment yield, of 100,000 to 150,000 cubic yards of sand and gravel per year, is a useful parameter to plan extraction activities on the Mad River. A corroborative line of evidence is the in-filling rate for Sweasy [sic] dam. According to Brown (WRI 26-75, 1975), over 2,000 acre-feet of sediment was released from the impoundment at its debouchment in 1970. This yields an average capture rate of about 100,000 cubic yards per year. We have no more specific documentation that describes the extent of filling of Sweasy Dam. However, if the entire storage capacity of Sweasy Dam had been filled with sand and gravel (about 3,000 acre-feet), an average transport figure of 150,000 cubic yards would be demonstrated. These values are in close agreement to the high and low long term averages cited in the Draft PEIR."

Relative to these estimates, the industry and the community have been borrowing gravel from the river and now must consider paying back some of this debt. If, in the long run, gravel extraction equals replenishment in the vicinity of Blue Lake, then the river below Blue Lake will be starved for gravel and the community will remain in debt to the river. Consequently, extraction should be less than net recruitment and replenishment in the upper or middle project area in order to allow necessary sand and gravel to migrate downstream and provide recovery to threatened resources in the lower project area.

Under current conditions, the SDRC shall use their reasoned judgment and available monitoring data to maintain extraction below net recruitment. Mine reclamation, bedload transport, recruitment, and replenishment along with river resource conditions and trends will be monitored and evaluated annually to help guide the SDRC in establishing site specific allowable extraction levels. In addition to overall river resource conditions and trends and average annual net recruitment into the project area reach, site specific entitlement, current bar morphology and instream habitat needs are just some of the factors that must be evaluated before developing annual site specific extraction prescriptions. The SDRC must recognize that river conditions can change and that the potential exists for aggradation problems to reoccur in the future. If aggradation becomes a problem it may be necessary to temporarily raise extraction levels to equal or exceed net recruitment.

Impact Statements and Mitigation Measures

Impact

Morph-1: Gravel extraction, droughts, streambank levees, bridge piers, other instream structures, and other factors cumulatively contribute to channel degradation. The primary Mad River channel morphology concerns at this time are associated with channel degradation and the effects that cumulative channel degradation has had on certain structures. However, excessive channel aggradation has created a host of river management problems in the past and these problems could reoccur in the future. Extraction rates in excess of average net recruitment will encourage the riverbed to continue degrading. Bed degradation can expose or undermine bridge supports, pipe lines and other structures jeopardizing structural integrity. Caltrans has indicated that the Highway 299 bridge supports have been weakened by degradation and that modifications have been tentatively scheduled for 1995-96. Said changes should strengthen the integrity of the Highway 299 bridge supports and help reduce the significance of channel degradation at this location. See Section 5.12 for more information on public utilities and structures.

No extraction or extraction rates below average net recruitment can lead to channel aggradation and excessive channel aggradation can create significant localized adverse effects. However, channel aggradation at Caltrans bridge sites and at other specific sites is needed to reduce the cumulative effects of past degradation and would be beneficial. (S/S)

Mitigation Measures

Mit-1: Implementing the preferred alternative helps to alleviate past aggregate mining impacts and is mitigation number one. This mitigation regulates the Mad River gravel industry in order to substantially reduce or eliminate cumulative and future adverse impacts. The SDRC will review all input, from operators, as well as others and apply information gained to the annual review, planning, and reporting procedures. After reviewing all available data and evaluating river resource reclamation, conditions, and trends the Mad River SDRC will prescribe variable annual site-specific extraction locations, extraction volumes, and extraction methods. The Mad River gravel operators may then extract sand and gravel at these specified locations using these specified standards and volume limitations. Under present conditions the approximate total annual volume prescribed shall be below the approximate average annual net recruitment rate as determined by the Mad River SDRC. In time, this mitigation measure will substantially reduce or eliminate the present cumulative impacts of bed degradation. This mitigation measure may also help sustain a viable Mad River Sand and Gravel industry. Therefore, if localized or extensive channel aggradation becomes a problem in the future, it is possible that this mitigation measure may be able to help reduce the significance of the potential adverse impacts associated with excessive channel aggradation. The potential success of this mitigation measure is dependent upon the combined expertise of the Mad River SDRC, the ability of the SDRC to reasonably monitor, judge, and apply flexible mining strategies to a dynamic river system, and on future hydrologic and geologic processes. This mitigation, Mit-1, will reappear many times throughout this document and shall be used to reduce, minimize, or eliminate many of the actual or potential adverse impacts that are identified in this PEIR.

Monitoring

Monitoring shall be performed by the SDRC and others as described in more detail below and in the adaptive management plan and adaptive monitoring program.

Mit-2: In order for the SDRC to fully implement the preferred alternative monitoring, information will be needed from other concerned agencies. Caltrans, the California Department of Fish & Game, Humboldt County Public Works Department, the North Coast Railroad Authority, Humboldt Bay Municipal Water District, or any other agency responsible for the integrity of structures along the Mad River, shall monitor their facilities and advise the SDRC as to the structural integrity of said facilities and as to potential risks that may be created by changes in channel aggradation and degradation or any other changes in channel morphology. The SDRC will utilize this information while evaluating instream reclamation and while planning future extractions. See Section 5.12 for more information on structures and utilities in the Mad River project area.

Monitoring

Humboldt County/Scientific Design and Review Committee
California Department of Fish & Game
Humboldt County Public Works Department
Caltrans
North Coast Railroad Authority
Humboldt Bay Municipal Water District

Significance after Mitigation

Significant. After mitigation measures Mit-1 and Mit-2 are implemented, it is not known how long it will take for the river to aggrade sufficiently and restore structural integrity to the subject structures. Therefore, there is an unknown period during which the subject structures may be at risk due to bed degradation. Because of the time involved, the impacts of channel degradation will remain temporarily significant during mitigation.

Impact
Morph-2: Excessive channel aggradation and degradation produce various negative impacts on the aquatic habitat. Gravel extraction in excess of replenishment causes the bed to degrade at the extraction site and upstream and downstream of the extraction site, and can produce significant negative impacts on the aquatic habitat. Gravel replenishment is presently needed at some sites to restore degraded conditions. However, excessive gravel aggradation will lead to adverse impacts on the aquatic habitat. See Section 5.5 for additional information on the aquatic habitat. (PS/LS)

Mitigation Measure
Mit-1: In time this mitigation measure should reduce the cumulative impacts of bed degradation on the aquatic habitat to a level of insignificance. This mitigation measure will also reduce future potential adverse impacts of excessive channel aggradation to a level of insignificance. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Monitoring
Humboldt County/Scientific Design and Review Committee

Significance after Mitigation
Less than significant

Impact
Morph-3: Excessive channel aggradation and degradation produce various negative impacts on the groundwater regime which can lead to other impacts, both beneficial and adverse. Gravel extraction in excess of replenishment causes the bed to degrade at the extraction site and upstream and downstream of the extraction site, and can produce a significant lowering of the water table in the vicinity of the channel. Lowering the water table can improve drainage, reduce aquifer storage capacity, increase the depth to groundwater, and drain wet sites resulting in a change of riparian or wetland vegetation habitat. The changes in riparian or wetland vegetation habitat, could be significant and could lead to changes in channel morphology through bank erosion. See Section 5.4 for more information on groundwater. See Section 5.7 for more information on vegetation. (PS/LS)

Mitigation Measure
Mit-1: The regulation provided by this mitigation measure will reduce the cumulative impacts of bed degradation on the ground water, vegetation , and bank erosion regime to a level of insignificance. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Mit-3: The SDRC will monitor river banks in the project area and, where and when feasible will initiate bank-stabilizing revegetation practices at sites where bank erosion is excessive and where revegetation may reduce the erosion rate. This is one form of revegetation that will be used as mitigation for eroding streambanks and when extraction operations disturb significant plant communities.

Monitoring
Humboldt County/Scientific Design and Review Committee

Significance after Mitigation
Less than significant

Impact
Morph-4: Excessive channel aggradation and degradation produce various negative impacts on channel bank stability. Excessive aggradation creates a shallow, wide channel which can increase bank erosion and cause the channel to encroach on adjacent properties. Gravel extraction in excess of replenishment can reduce aggradation rates and cause the bed to degrade at the extraction site and upstream and downstream of the extraction site and reduce the adverse impacts of excessive aggradation. Rapid excess bed degradation can induce bank collapse and erosion by increasing the heights of banks, and by reducing the water table, which in turn reduces bank stabilizing vegetation. Bank erosion brought on by excessive channel aggradation and degradation has the potential to be significant. (PS/LS)

Mitigation Measure
Mit-1: The regulation provided by this mitigation measure will reduce the cumulative impacts of bed degradation on vegetation , and bank erosion to a level that is not excessive and therefore not significant. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Mit-3: The SDRC will monitor river banks in the project area and, where and when feasible will initiate bank-stabilizing revegetation practices at sites where bank erosion is excessive and where revegetation may reduce the erosion rate. This is one form of revegetation that will be used as mitigation for eroding streambanks and when extraction operations disturb significant plant communities.

Monitoring
Humboldt County/Scientific Design and Review Committee

Significance after Mitigation
Less than significant

Impact
Morph-5: Excessive channel aggradation produces negative impacts on channel flood carrying capacity. Channel aggradation reduces channel capacity and increases the risk of overbank flooding. Bed degradation, what ever the cause, has the potential of increasing the channel flood carrying capacity and reduces the risk of overbank flooding. Gravel extraction in excess of replenishment causes the bed to degrade at the extraction site and upstream and downstream of the extraction site. Increased flood capacity is a beneficial result of bed degradation, whatever the cause. Decreased flood capacity is an adverse effect of channel aggradation. Channel aggradation is not currently a problem. Therefore, impacts on flood carrying capacity are not currently significant. (LS/LS)

Mitigation Measure
Although no mitigation is required, implementation of the flexible management plan and Mit-1 requires the project to monitor these processes and adjust allowable extraction rates in an attempt to maintain a degree of dynamic equilibrium in channel morphology. This has the potential of reducing possible channel aggradation and the adverse impacts of moderate flooding. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Monitoring
Humboldt County/Scientific Design and Review Committee

Significance after Mitigation
Not Significant

Impact
Morph-6: Regardless of the rate of extraction, relative to bedload recruitment and replenishment, site-specific variables in extraction location and methodology can produce adverse impacts on channel morphology and related river resources. (PS/LS)

Mitigation Measure
Mit-1: The reasoned judgments and prescriptions of the SDRC will be used to reduce the site-specific cumulative impacts resulting from extraction methodology to a level of insignificance. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Monitoring
Humboldt County/Scientific Design and Review Committee
California Department of Fish & Game

Significance after Mitigation
Less than significant

5.2 Water Quality

Only those water quality parameters that are likely to be influenced by gravel extraction and related activity, are discussed here. The County retained Humboldt State University's Institute for River Ecosystems to gather and analyze information on the effects of historic gravel extraction on the water quality of the project area. Portions of the following section were adapted from the Institute report, see Appendix F for the complete Institute for River Ecosystems report.

Turbidity

Turbidity is an optical property of water. When sunlight enters a column of clear water most of it will be transmitted directly through the column, or depending on the solar angle, much of it will be reflected. But, if the water is turbid, meaning it contains suspended or colloidal organic and inorganic matter, then very little will be reflected; much of the light will be scattered and absorbed by the solids and less will be transmitted. During the winter months suspended sediment is the main cause of turbidity in the Mad River. The main source of this sediment is the youthful Franciscan topography in the middle reaches of the basin.

On occasion, turbidity has its advantages. For example, the Mad River Fish Hatchery waits for the water level and turbidity to rise before releasing young fish into the river. The turbid water helps hide the newly released and concentrated fish from predators.

However, high turbidity is usually considered a water quality problem. Turbidity increases the cost of water treatment and shortens the life of pumping facilities. Water clarity, the opposite of turbidity, is generally desirable.

Stream productivity will be increased if sunlight can be transmitted to the gravel substrate. This is where much of the photosynthetic primary productivity of a stream takes place. If the water is turbid, little light reaches the stream bottom, and productivity declines.

Salmonids feed by sight, excessive turbidity will interfere with their feeding. Abnormal levels of turbidity during the summer season will limit the growth of juvenile fish. Turbidity also limits sports fishing.

Turbidity may cause water temperature to increase because the solids causing the turbidity will absorb incoming solar radiation. In addition, turbidity causes the ambient water temperature to increase through conduction and long-wave radiation.

During low-flow periods the main source of turbidity in the Mad River is suspended phytoplankton. During the summer months unregulated gravel mining operations and other activities that disturb the live channel could cause an undesirable significant increase in low-flow turbidity. Brown (1973) reported occasional noticeable levels of turbidity in the project area during low flow portions of the 1969, 1970 and 1971 water years. Although he did not offer any evidence to support his interpretations, he stated that the turbidity was probably "related to gravel operations and other activities". In all cases, the increases in turbidity subsided within 24 hours. The potential for regulated modern gravel extraction techniques to produce significant levels of low-flow summer turbidity is greatly reduced when compared to extraction techniques of the late 1960's and early 1970's.

Two sets of water samples were collected by HCPD staff and analyzed for turbidity at the North Coast Laboratories Ltd. during the 1992-93 water year.

The first set of samples were collected following the 1992 extraction season, while the river was rising on October 28, 1992. One sample was collected above the Mad River Fish Hatchery and one sample was collected below U.S. 101. The results indicated practically no turbidity, with 0.050 NTU above the hatchery, and 0.052 NTU at the 101 bridge.

Samples were also collected on January 20, 1993 while the river was at high flow. The January 20th results were:

Above the Hatchery	780 NTU
Blue Lake Bridge	200 NTU
Highway 299 Bridge	540 NTU
Highway 101 Bridge	570 NTU

It is difficult to interpret these few samples because there is no indication of discharge in the main channel; nor is there any information on turbidity and discharge in the various tributaries that enter the river between sample stations. During the 1969-1971 period, Brown (1973) observed turbidity readings in excess of 1000 NTU's. So we can assume that the 1992-93 samples were not exceptionally high.

With the exception of installing and removing summer bridges, modern gravel extraction does not encroach on the live channel and is unlikely to cause any increase in low-flow turbidity due to suspended sediment. During summer bridge installation and removal there may be a short term unavoidable small increase in stream turbidity. When properly applied the CDFG 1603 process reduces this impact to an insignificant level.

When the river rises it will pick up available sediment until it reaches its sediment carrying capacity. Fine dust particles left on bar surfaces after extraction operations will eventually be picked up and carried downriver. When this occurs the water is already quite turbid and the addition of this extraction-related suspended sediment has no significant adverse effect on water quality.

During regulated trenching operations a wall, or buffer, of gravel separates the trench from the channel. Thus, trenching should not contribute to low-flow turbidity. Gravel will be temporarily stockpiled adjacent to trenches to allow water drainage. This also allows the drainage of fine sediments. If stockpiles are properly placed, the fine sediments remain on the gravel bar rather than draining towards the live channel. Dredging raises the turbidity of trench water and this fine sediment settles on the bottom of the trench. When high flows occur, the trench wall collapses and the trench water and fine sediment on the bar and in the trench is connected to the live channel. When this occurs the water is usually already quite turbid from other sources and the addition of this extraction-related sediment has no significant adverse effect on water quality.

Gravel processing yards generate a considerable amount of fine material from crushing and sorting operations. These fines are collected in sediment settling ponds. Sediment settling ponds are required by the Regional Water Quality Control Board, and as part of the surface mining reclamation plans. The use of settling ponds reduces water quality impacts from processing yard run-off to a level of insignificance.

<u>Temperature</u>

Water temperature in the lower Mad River is not a problem during the high flow winter months, when incoming solar radiation is limited. Warm water could become a problem in the summer months, particularly during low-flow years. During low-water summer months the available water is heated by incoming solar radiation. The potential for adverse effects of warm water may be greatest downstream from the HBMWD diversions where the volume of water has been significantly reduced. The water district is required to maintain the river above certain low flows levels. But, excessively low flows have been recorded below the district diversions during recent drought years.

The native fish of the Mad River are cold-water species. The optimum water temperatures for these fish vary between species and with age. Temperatures of 54° to 57°F tend to be preferred and fish will attempt to avoid water with temperatures in excess of 59°F. Non-optimum temperatures are not necessarily lethal. Salmonids will survive short durations in very cold (33°F) and very warm (75°F) water. Although salmonids prefer cool water, the swimming stamina of salmonids is reduced in cold water. Swimming stamina is greatest in temperatures of 65-75°F, and lowest at 32-40°F. Optimum swimming ability of juveniles is around 68°F.

As water temperature increases the metabolic activity and oxygen consumption of fish will rise. Unfortunately, the available dissolved oxygen level in water declines as the temperature rises.

Temperature increases can also favor the productivity of algae, and excessive algal production can create unfavorable habitat. Increased algal levels can increase oxygen levels through photosynthesis during the daylight, but respiration and decomposition dominates after the sun goes down and can be responsible for low levels of oxygen during the night.

The most crucial temperature dependent period for salmonids is while the embryo's are in the redds. During this period, cool water with a high concentration of dissolved oxygen is required. For the most part, nest sites are occupied during the high-flow cooler months, when water temperatures are relatively low in the lower Mad River.

Young juvenile fish using the lower Mad River for a nursery, are apt to encounter undesirable warm water. However, the enlarged estuary, which developed when the mouth of the Mad moved north, will help alleviate this potential problem. The enlarged tidal prism creates more volume and possibly more favorable summer habitat; adults and good-sized juveniles can usually migrate to more favorable sites when temperatures begin to rise.

Excavated instream ponds which occur on terraces away from the low flow channel, would not have any effect on the water temperature in the low-flow channel.

Trench mining would tend to provide cooler water at the channel bottom. This water is not available to fish until the barriers are removed at the end of gravel extraction season. Trench mining could also increase water surface area, thus causing a slight insignificant increase in water temperature.

The main potential effects on water temperature caused by gravel operations, result from changes in channel morphology Gravel skimming creates a less confined, wider channel. If the water level rises during the summer months it will spread out in a wide shallow channel instead of being confined in a relatively deep narrow channel. The greater water surface area absorbs more incoming short wave solar radiation, and the water temperature rises. Furthermore, the incoming summer solar radiation penetrates the relatively clear, shallow water and warms the gravel substrate. To the extent that the gravel substrate is warmed the maximum water temperature is reduced. However long-wave radiation from the warm gravel helps sustain warm temperatures into the evening hours. When skimming operations maintain a one-foot or greater vertical buffer above the low-flow water level the summer channel is more readily confined and the impacts on summer water temperature are reduced.

Dissolved Oxygen

Dissolved oxygen (DO) is necessary to support aquatic fauna. Aquatic species have varying dissolved oxygen requirements. Some require much greater levels of DO than others. Tolerance to low DO concentration also varies with stage of development. Salmonid eggs, in the nest, are particularly sensitive to low DO levels. The optimum level for DO in redds is about 7 - 9 mg/l. Severe losses in salmonid redds may occur when the DO concentration drops below 5 mg/l.

As water temperature increases, the solubility of DO decreases. Consequently, if all other factors are kept equal, there is less available DO when the water temperature is warm, than when it is cool. Furthermore algae tend to proliferate when temperature increases; and this proliferation can lower DO concentrations to critical levels, particularly at night when there is no photosynthetic activity.

The amount of dissolved oxygen in the water contributes to the swimming ability of salmonids. Changes in dissolved oxygen concentrations from 7 mg/l to 3 mg/l can reduce sustained swimming speeds by 500 percent.

Gravel extraction can cause the channel to become wide and shallow which causes the water temperature to rise and thereby reduce the DO concentration. Deoxygenated stream water regains oxygen through photosynthetic processes, and through gaseous exchange with the atmosphere. Rapid oxygen recovery can occur when the surface of the stream is turbulent. When extraction indirectly raises the water temperature, and reduces the presence of turbulent riffle flow, it will reduce the DO concentration. This reduction in DO could be significant in some reaches, particularly in low-flow years. The SDRC will monitor DO concentrations in the lower Mad River to determine current conditions.

Petroleum Products

The use of motorized vehicles on gravel bars introduces the possibility of contamination by petroleum products. The CDFG sometimes incorporates oil and grease clean up requirements in their 1603 agreement. Operators should remove all contaminated gravel from the river bar, so the petroleum products will not contaminate the water when the river rises.

Impact Statements and Mitigation Measures

Impact

H20Qlty-1: During extraction, mining equipment inadvertently pulverizes gravel bar surface materials and leaves a fine dust residue on some heavily disturbed gravel bars. When the river rises in the fall, the fine dust particles, along with other sediment are picked up by the river. Depending upon flow conditions this may, or may not, produce a short term measurable increase in turbidity. High flows on the Mad River are already quite turbid before they enter the project area and the added turbidity, when present, is not likely to be noticed and is considered less than significant. (LS/LS)

Mitigation Measures

Since no significant impact was identified, no mitigation is required.

Monitoring

None required.

Impact
H20Qlty-2: Placement and removal of summer bridges or other summer crossings can cause a short term increase in turbidity, at a time when the river is generally free of turbidity. Because the potential increase in turbidity is slight, short lived, and isolated the impact is insignificant. (LS/LS)

Mitigation Measures
Although no mitigation is required, implementation of the following permit measure(s) may be required

Mit-4: The SDRC shall consult with operators regarding the best design and placement of summer crossings. All summer bridges and other crossings shall be installed and removed in accordance with adopted regulations of the CDFG and, if required, the USACOE. This mitigation measure assures that installation and removal is executed under authorization of appropriate state and federal agency permits or agreements. These agencies have the capability of requiring conditions of approval on permits or agreements that will maintain water quality impacts, resulting from summer bridge installation and removal, at a level of insignificance.

Monitoring
Humboldt County/Scientific Design and Review Committee
California Department of Fish & Game, and possibly the
U.S. Army Corps of Engineers

Significance after Mitigation
Less than significant

Impact
H20Qlty-3: Skimming as an extraction method has the potential to create a broad, shallow channel increasing the surface area of the flowing river, and potentially increasing channel braiding and water temperatures. Generally the native fish species of the Mad River prefer cool water. Increased water temperatures could potentially have a significant adverse effect on these native fish species. (PS/LS)

Mitigation Measures
Mit-1: The SDRC will implement site-specific extraction prescriptions that will maintain this identified impact at a level of insignificance. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Monitoring
Humboldt County/Scientific Design and Review Committee

Significance after Mitigation
Less than significant

Impact
H20Qlty-4: During gravel extraction petroleum products may spill or leak on to the gravel bar. When the river rises these contaminants could adversely impact water quality. (PS/LS)

Mitigation Measures
Mit-5: The CDFG shall incorporate oil and grease clean up requirements in their 1603 agreement. Operators shall inspect their extraction sites daily when extracting and shall immediately remove all petroleum-contaminated gravel from the river bar. This mitigation measure will maintain the identified impact at a level of insignificance.

Monitoring
California Department of Fish and Game
Water Quality Control Board
Humboldt County/Scientific Design and Review Committee

Significance after Mitigation
Less than significant

5.3 Hydrology

The County retained Humboldt State University's Institute for River Ecosystems to gather and analyze information on the effects of historic gravel extraction on the hydrology of the project area. Portions of the following section were adapted from the Institute report. See Appendix F for the complete report.

The climate of the region is mediterranean. Winters are cool and wet with 75 percent of the annual precipitation occurring between November and March. Oceanic influences keep the coastal regions cool during the summer and these influences often move inland along the valley bottom. Hot, dry summers typify the upper inland reaches of the basin. Average annual precipitation varies from around 40 inches near the coast, to over 80 inches at the higher elevations with an overall basin average of about 64 inches (see Map 5.3-2).

For the purposes of this section 'hydrology' means the flow and flood characteristics of the Mad River. The Mad River streamflow has been constantly measured at the Arcata Station located 100 feet upstream from Highway 299 since August 1950 (for gage station locations, see Map 5.3-1). Streamflow was also measured at this site from 1910 through 1911. Water is diverted to the HBMWD at Essex, 0.1 mile upstream from the gaging station.

The long-term average daily discharge at Arcata is 1,478 cfs. The recorded instantaneous river flow at Mad River in Arcata varies from 0.1 cfs recorded on August 29, 1977 to 81,000 cfs on December 22, 1964.

The river has a 43-year (through 1990 water year) average annual flow of 1,071,000 acre feet which is equivalent to about 41 inches of runoff. The range in annual runoff varies from 109,000 acre feet (4 inches), recorded in the 1977 water year to 1,789,000 acre feet (69 inches) recorded in 1983. During the last 20 years (1971-1990) the average annual runoff was 951,000 acre feet (37 inches) and during the last 10 years (1981-1990) the average annual runoff has dropped to 527,000 acre feet (20 inches) which is about half of the long term average.

The HBMWD diverts about 55,000,000 gallons per day from the river, which is equivalent to about 85 cfs or 62,000 acre feet per year (USGS, 1990; DWR 1982). Other diversions, elsewhere on the river amount to about 4,000,000 gallons per day, which is equivalent to about 6 cfs or 4,500 acre feet per year.

Ruth reservoir, located about 68 miles upstream has been storing and distributing Mad River flow since July 1961. Ruth reservoir has a capacity of 48,030 acre feet. At Ruth Dam the required minimum flow released to the river is 5 cfs. Below Essex the HBMWD must maintain the natural flow or the flows outlined below -whichever is less.

Date	Discharge (cfs)
Oct 01 - Oct 10	30
Oct 16 - Oct 31	50
Nov 01 - Jne 30	75
Jul 01 - Jul 30	50
Aug 01 - Aug 30	40
Sep 01 - Sep 30	30

The erosion rates above Ruth reservoir are relatively low and the water district reports that very little sediment has been retained by the reservoir. Thus, Ruth is probably not preventing a significant amount of sediment from reaching the lower river. Depending upon storm patterns Ruth can have a significant impact in reducing early flood peaks. But, in normal years, the reservoir will fill after the first few storms and water will flow over the spillway for most of the remaining winter. During this spillway overflow period, Ruth would have less of an impact on flood peaks at Blue Lake or Arcata.

Flood frequency analyses use a variety of statistical methods (notably, the USGS method and the Log Pearson Type III method), and the results may differ somewhat. Furthermore, the data set changes with the completion of each new water year. Using the 32-year data set (through 1979) in DWR (1982) and the 44-year data set analyzed by students at Humboldt State University, the following generalizations on flood frequency can be stated. At Arcata maximum annual peak flows may exceed approximately 20,000 cfs every 1.5 years. Every other year the maximum annual peak flow may exceed approximately 26,000 cfs. Peak flows of the magnitude observed in 1964, about 80,000 cfs, may have approximately a 50-year return period. Statistically speaking, it is realistic to expect a 1964-sized event to occur during the next decade (Coughlan, 1984). When such an event does occur it will likely produce significant aggradation in the lower river and initiate a series of erosional features that will deposit significant quantities of sediment into the channel system.

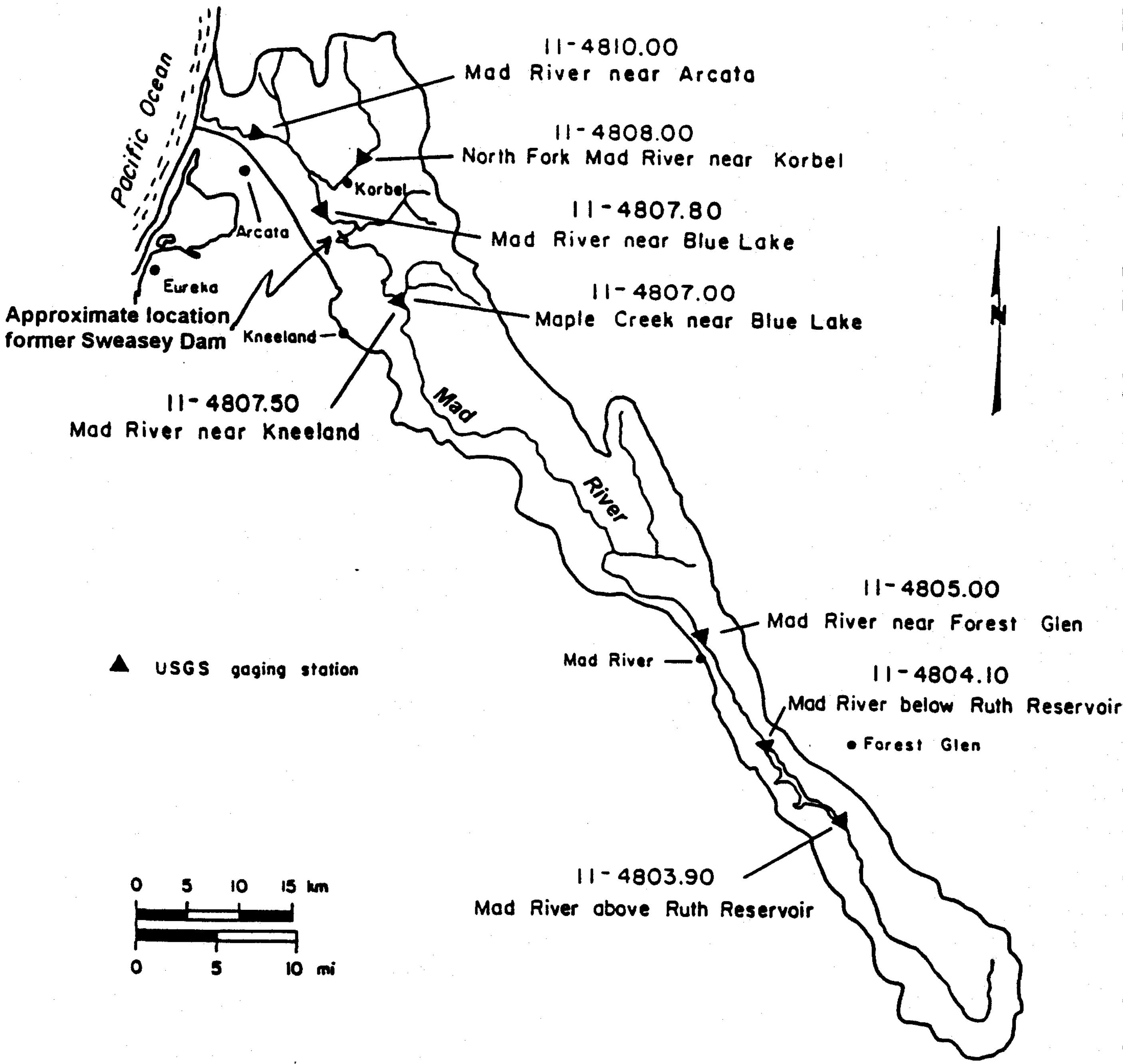
The Mad River will continue to flow, and flood, regardless of gravel extraction activity (for channel locations see Maps 5.3-3 and 5.3-4). Although gravel extraction, channel aggradation, and channel degradation do not directly influence flood frequency and drought frequency these processes can influence the impacts of flood waters and they can also influence the presence or absence of surface water during low-flow periods as well as the pattern of flow during low-flow periods.

While preparing this PEIR it became obvious that many people believe that channel degradation has a primarily negative impact on the environment. However, there are hydrologic situations where channel degradation can be more favorable than channel aggradation. And, there are also obvious situations where the opposite may be true. Some effects of aggradation and degradation on surface water hydrology are summarized below.
Although the processes of channel aggradation and degradation do not influence flood frequency or drought frequency, channel aggradation reduces channel capacity and can increase the damage caused by moderate floods. Along the same lines, channel degradation increases channel capacity and can reduce the damages caused by moderate floods.

In alluvial systems streamflow occurs as surface flow in the open channel above the channel bottom and as subsurface flow within the alluvium below the channel bottom . Runoff from the watershed includes the water found in both the surface and subsurface flow. For a given low-level of runoff, aggradation increases subsurface flow and reduces the presence of surface water. For the same level of runoff, degradation reduces the subsurface flow and increases the surface flow. Thus, during low-flow conditions much of the water in an aggraded stream may infiltrate into the alluvium producing a low volume of surface water. In fact, the aggraded channel may be dry in certain reaches. It is normal for aggraded channels to eventually degrade as the stream attempts to restore and maintain dynamic equilibrium. As an aggraded channel degrades, the proportion of the total runoff that appears as surface flow increases and the proportion that is subsurface flow decreases. Thus, a reach of channel that may have been "dry" while in an aggraded condition may be "wet" after the channel has degraded. From a fisheries standpoint, as well as from a variety of other viewpoints, a wet degraded reach is preferable to a dry aggraded reach.

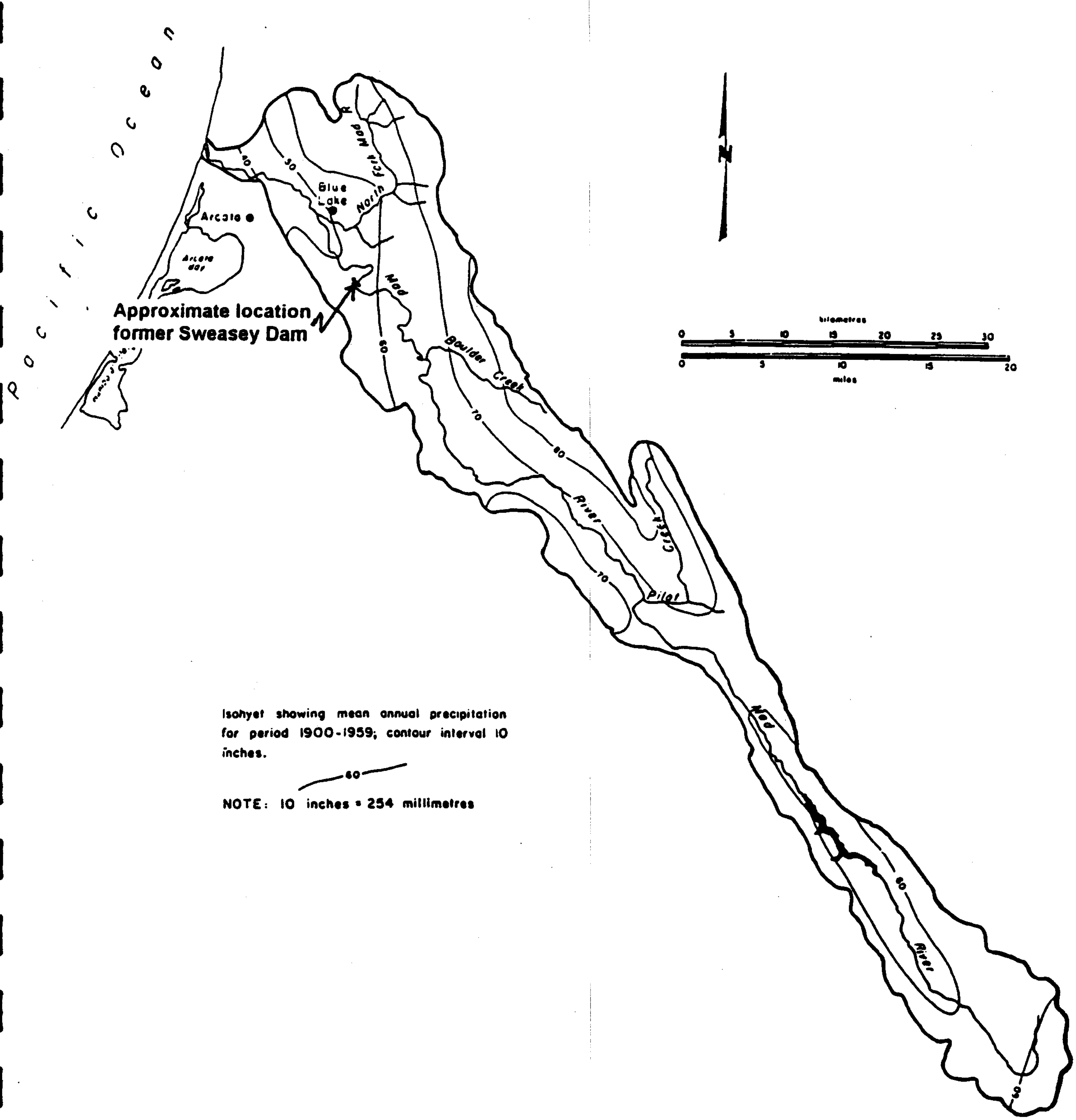
Generally speaking, during some moderately low-flow conditions an aggraded reach is likely to have a shallow braided condition which would be unfavorable from a water quality and fisheries viewpoint. Conversely, a similar degraded reach would be more likely to have a narrow well confined channel which could well be more favorable habitat.

On the basis of the above discussion, channel degradation resulting from gravel extraction or from any other cause does not result in any significant adverse impacts on the hydrology of the Mad River, therefore no impacts on hydrology are identified.



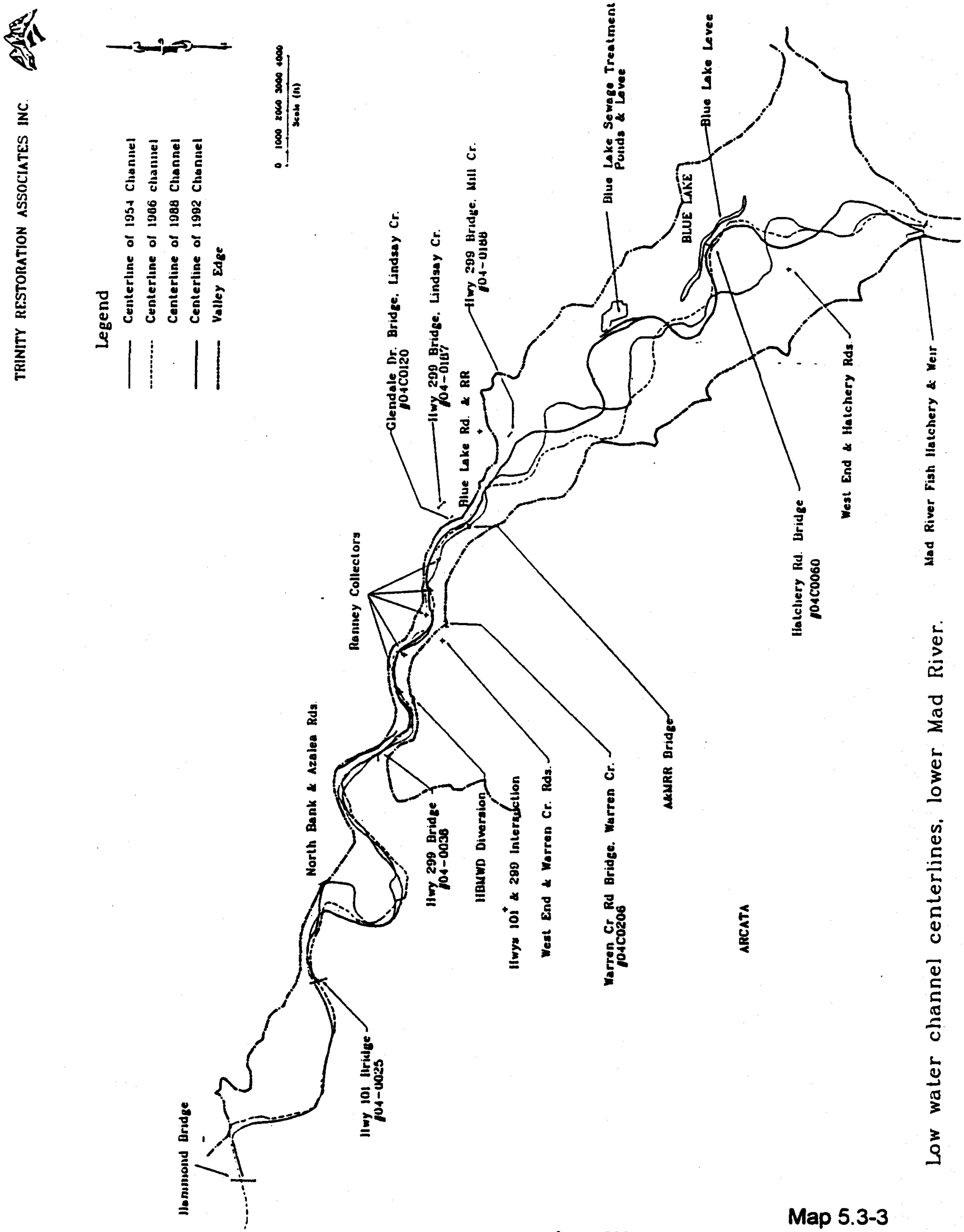
(adapted from: DWR, June 1982 "Mad River Watershed Erosion Investigation")

Map 5.3-1
Gage Station Locations
Mad River Basin



(adapted from: DWR, June 1982 "Mad River Watershed Erosion Investigation")

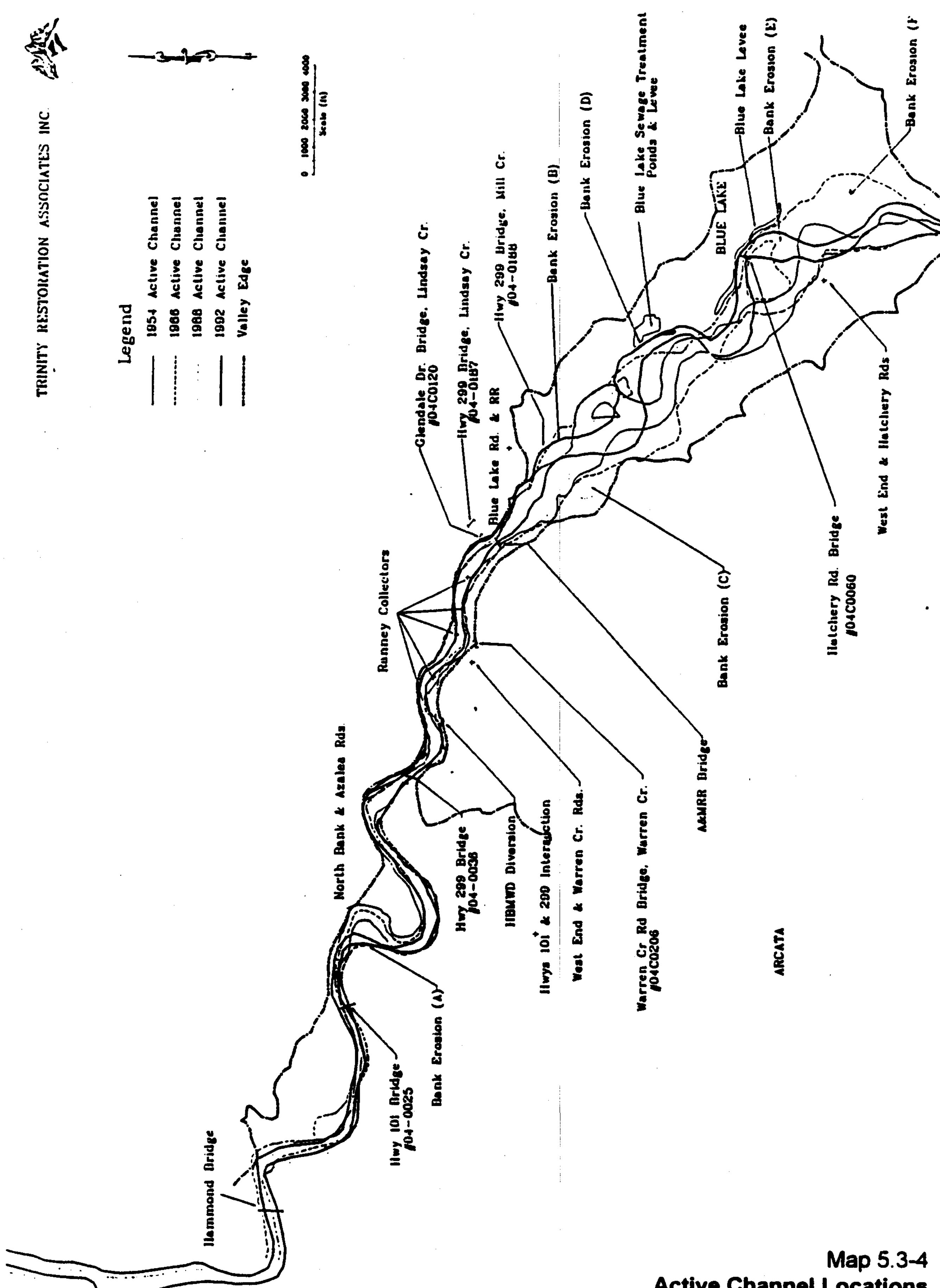
Map 5.3-2
Isohyetal Map
Mad River Basin



Low water channel centerlines, lower Mad River.

Map 5.3-3
Low Water Channel Centerlines
1954-1992

(adapted from: River Institute Consultants Report, Appendix F)



Limit of the active channel and locations of significant bank erosion, lower Mad River.

(adapted from: River Institute Consultants Report, Appendix F)

Map 5.3-4
Active Channel Locations
1954-1992

5.4 Groundwater Recharge and Water Supplies

The County retained Humboldt State University's Institute for River Ecosystems to gather and analyze information on the effects of historic gravel extraction on the geomorphic character, groundwater conditions, and fisheries habitat of the project area. Portions of the following section were adapted from the Institute report. See Appendix F for the complete report.

The project area has been divided into four geomorphic units for discussion of groundwater supplies. First, is the upper project area, which is termed the Mad River Gorge and is located between the Sweasey Dam site and the Mad River Hatchery. The Mad River Gorge is a relatively narrow bedrock gorge aggraded with gravel alluvium. Below the hatchery, the river flows through the Blue Lake Valley which is occupied by a deep, productive, unconfined alluvial aquifer, see Photos 5.4-1, 5.4-2, and 5.4-3.

This Blue Lake valley extends almost to the Arcata & Mad River Railroad Bridge. The third unit, the HBMWD Gorge, lies approximately between the Mad River Railroad bridge and the Highway 299 bridges, see Photo 5.4-4. Here the river again flows through a narrow bedrock gorge that is choked with alluvium. The fourth unit is the Mad River Floodplain located below the Highway 299 bridges.

Periodic changes in channel aggradation and degradation influence the water table in adjacent unconfined alluvial aquifers as well as the extent of the phreatophytic vegetation tapping the water of these aquifers. Other factors being equal, aggradation raises the water table and would allow an expansion of phreatophytic vegetation, riparian habitat, and wetland habitat into adjacent agricultural, residential and industrial areas. Channel degradation lifts river terraces above the river, lowers the water table and produces a corresponding migration of phreatophytic vegetation, riparian habitat, and wetland habitat towards the river thalweg.

The Mad River Gorge

The Mad River gorge is locally significant but is not an important water bearing aquifer. This narrow reach is aggraded with gravel alluvium and bounded by steep hillslopes. Periodic high flows keep the alluvium free of significant woody riparian vegetation and the steep hillslopes cause riparian vegetation to quickly give way to upland vegetation. Channel degradation in this reach is somewhat limited by the Mad River Hatchery weir which establishes an artificial control point in the river's longitudinal profile. As long as the integrity of the hatchery weir is maintained, gravel extraction and changes in channel morphology below the hatchery will not impact the limited groundwater regime in this upper gorge. On the other hand, channel aggradation in this reach reduces adjacent stream bank and hillslope stability which, in turn, increases the supply of sediments to the lower reaches of the project area.

Blue Lake Valley

The Blue Lake Valley is underlain by the Blue Lake aquifer which is a potentially significant source of water. It covers approximately 2,200 acres and has a saturated volume of 55,000 acre feet or more. With a specific yield of about 25 percent, it could yield about 14,000 acre feet (4,600,000,000 gallons) of water (Winzler and Kelly, 1962). The HBMWD has considered tapping this aquifer as a supplemental water supply; and one of their initial studies preliminarily concludes that with proper river management including conjunctive use this aquifer might supply up to 20 MGD (Willis and Chu, 1981).

At different river stages this aquifer is either being recharged with seepage from the Mad River or is supplying water to the river. When the water in the river is high, relative to the adjacent groundwater, river water will seep into the channel banks and recharge the aquifer. When the river is low, relative to the adjacent groundwater, the groundwater will seep into the channel and help sustain the flow of the river.

Seasonal changes in river stage produce short-term seasonal changes in the water table. Because this alluvium is relatively permeable, the impacts of these seasonal changes on the water table extend quite some distance from the channel banks. When aggradation causes the water table to rise, it can modify existing vegetation patterns, and have an adverse impact on septic tank leach fields and the Blue Lake Sewage Treatment percolation ponds. When degradation occurs, the water table will decline which can modify existing vegetation patterns, reduce the potential aquifer yield, and improves percolation opportunities for leach fields and percolation ponds.

Although this reach has been degrading, it still has many features of an aggraded channel. The summer low-flow channel meanders back and forth across a wide unstable high flow channel. Normally, frequent high flows remove most of the ephemeral in-channel vegetation. In many areas, the low-flow water surface has little adjacent vegetation and therefore little shade cover. Because of the ephemeral nature of this vegetation, minor changes in the water table, due to fluctuations in the water surface or channel profile, will have little impact on riparian vegetation in this exposed channel. Significant channel degradation can produce water table changes that would impact vegetation on adjacent upper level terraces and in adjacent riparian forests.

If extraction volume reaches permitted or proposed levels, or is sustained at recent levels, it is safe to assume that channel degradation will continue, the water table will fall, and significant changes will occur in dependent riparian plant communities. If extraction volumes are below the replenishment rate channel profile adjustments will occur, but significant rates of degradation in this reach would not be expected. Therefore, there would be little long-term change in the water table and no significant impact on adjacent vegetation.

HBMWD Gorge

The valley narrows dramatically below the Railroad Bridge as it passes into an alluvium-filled bedrock gorge. The restricted volume of alluvium reduces the groundwater storage capacity in the gorge. In 1962, the HBMWD installed three Ranney-type wells in this reach. Two additional Ranney wells were installed in 1965 as part of an overall system expansion. The wells tap subsurface flow and surface water that is pulled down into the riverbed alluvium by pumping. The relatively rapid increase in well-water turbidity during winter storms shows that this connection between surface water and groundwater is quite efficient. Some of these wells penetrate the river bed alluvium to depths of 90 feet and have perforated radial intake pipes located 50 to 80 feet below the riverbed. Channel scour and degradation has reduced the depth of overlying alluvium by 4 to 8 feet since the collectors were installed in 1962. See Section 5.12, Public Utilities and Structures for more information on this subject.

The general bed lowering throughout the HBMWD reach has adversely impacted the district. The water reaching the HBMWD intakes is naturally filtered by passing through the sands and gravels of the riverbed; all other things being equal, the greater the thickness of sand and gravel the water must travel through, the more filtration will occur. It is possible, that by reducing the vertical distance between the channel bottom and the well intake pipes, degradation has reduced the natural filtration effectiveness provided by the riverbed alluvium and increased the cost of water treatment which must be supplied by the water district.

If extraction occurs at permitted or proposed levels, or is sustained at recent levels, it is clear that continued bed lowering in this reach must eventually affect the quality of water pumped from the wells (if it has not already done so), leading to increased treatment costs, as well as increased costs for the maintenance of the pump stations.

If average extraction rates are below net recruitment, the bed should stabilize at or near its current elevation and no additional treatment or maintenance costs should be necessary.

Mad River Floodplain
When the river leaves the HBMWD Gorge it flows through the Mad River Floodplain and merges with the floodplain of the Arcata Bottoms before reaching the ocean-dune environment. The extensive alluvial deposits in this area make it a principal aquifer with an estimated summer storage capacity of 4,500 acre feet.

In the vicinity of the Highway 101 bridges, the river bed has degraded 17 feet since 1929 on the upstream span, and 8 feet since 1957 on the downstream span. Since 1972 there has been very little change at this site. Channel degradation in this reach has resulted in a lower water table in the adjacent aquifer. Because the alluvium in this aquifer is quite permeable, the extent of this effect should be widespread.

The bed elevation through the lower portions of this reach is near sea level and significant additional degradation is not expected, regardless of upstream gravel extraction rates. Given current gravel extraction regulations and standards, a small amount of additional degradation is possible, particularly near existing gravel extraction sites in the upper portion of this reach. Because the potential for degradation in the upper reach is small, the water table-related impacts on adjacent riparian vegetation and groundwater supplies would be minimal.


CDFG Fish Hatchery
Hatchery Road
To City of Blue Lake
Mad River
Site No. 10
Site No. 1
Photo 5.4-1
Blue Lake Valley
(looking upstream)

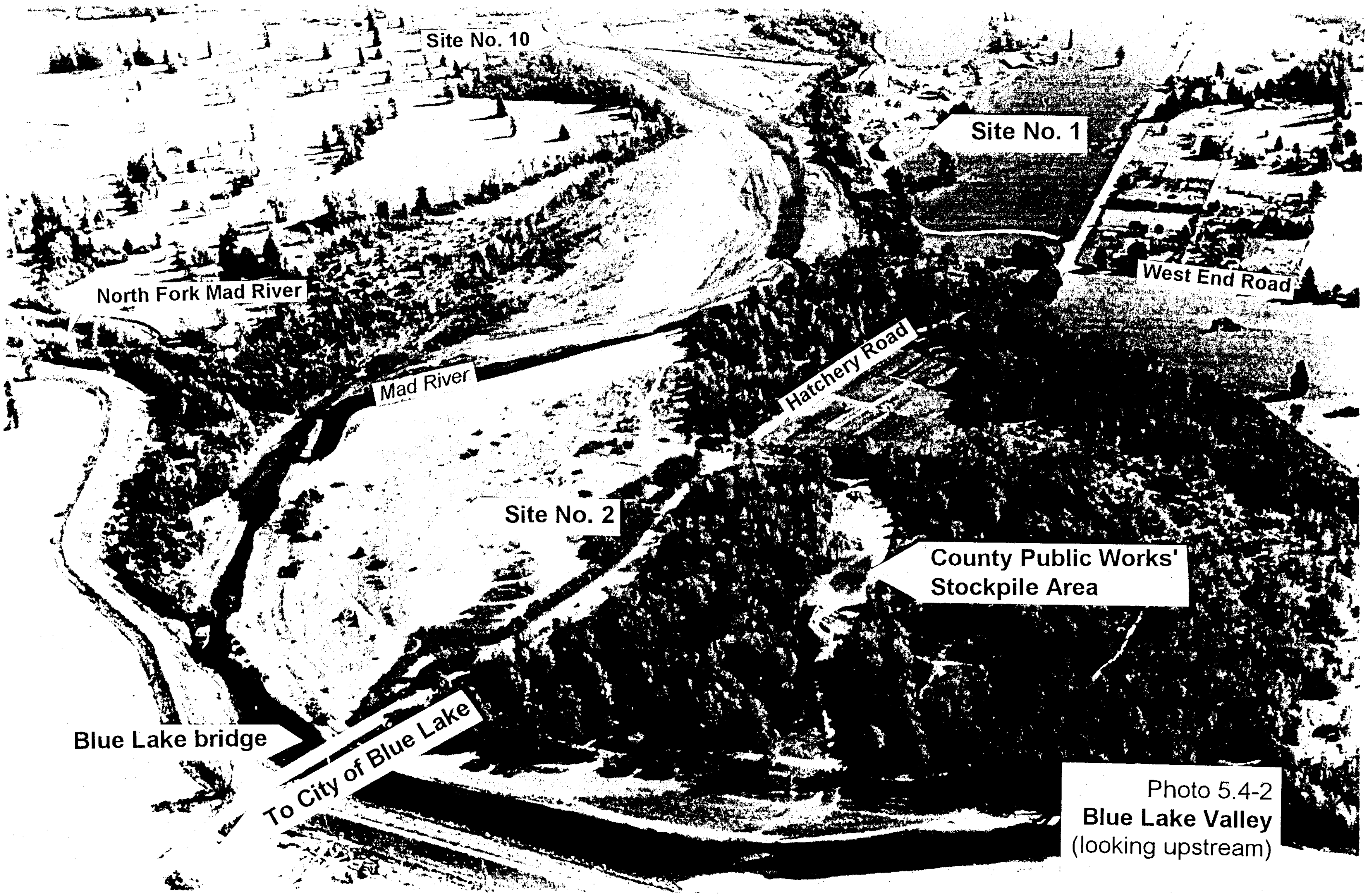


Photo 5.4-2
Blue Lake Valley
(looking upstream)

Photo 5.4-3
Blue Lake Valley
(looking upstream)

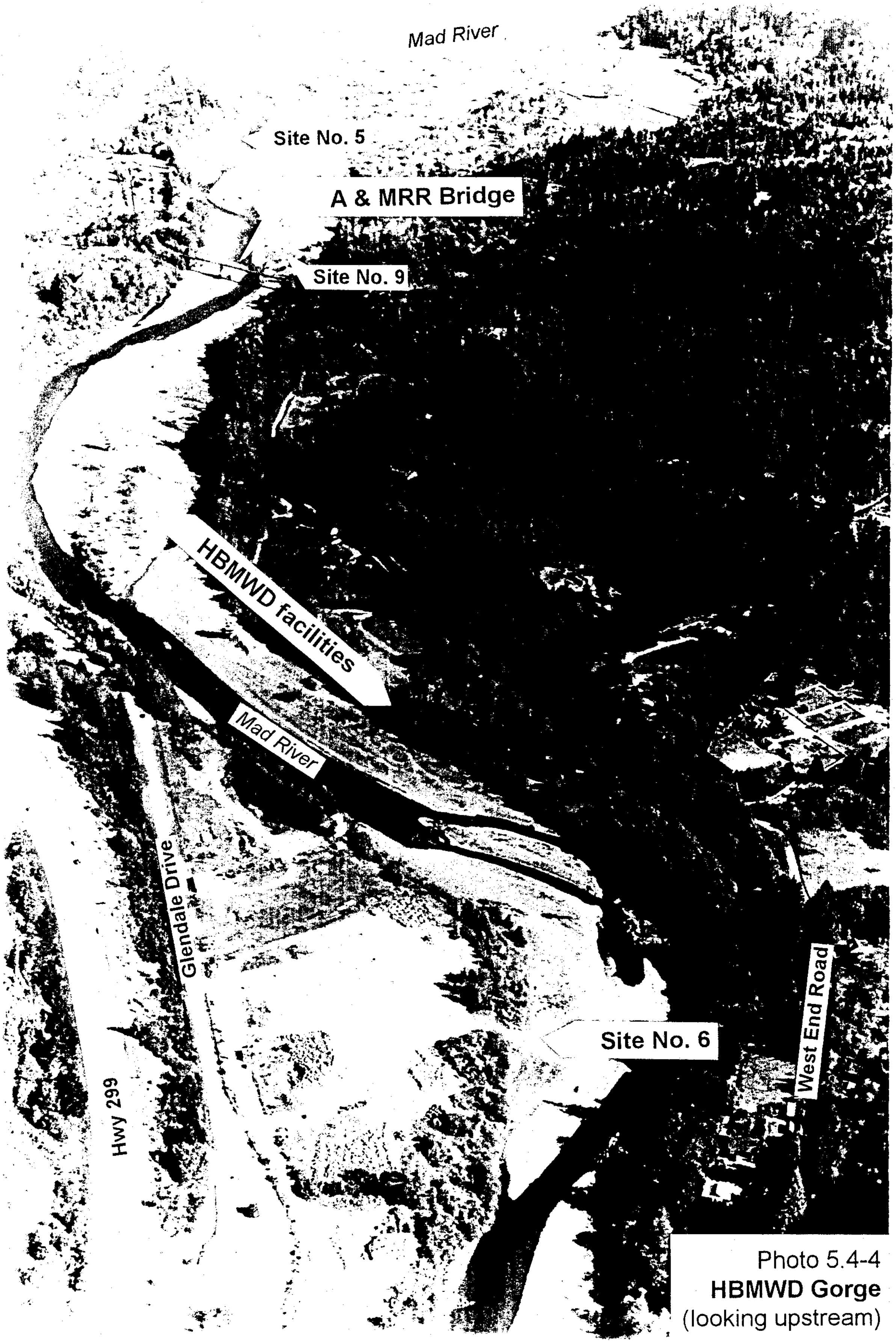


Photo 5.4-4
HBMWD Gorge
(looking upstream)

Impact Statements and Mitigation Measures

Impact
GndH2O-1: When extraction volumes are below net recruitment channel aggradation can occur. Aggradation raises the water table. A higher water table means less depth or opportunity for percolation of leach fields and percolation ponds. Aggradation has the potential to significantly impact the effectiveness of septic tank leach fields and the Blue Lake Sewage Treatment percolation ponds. (PS/LS)

Mitigation Measures
Mit-1: This mitigation measure will reduce the cumulative impacts of bed degradation and aggradation on water table fluctuations to a level of insignificance. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Monitoring
Humboldt County/Scientific Design and Review Committee
City of Blue Lake
Humboldt County Department of Environmental Health

Significance after Mitigation
Less than significant

Impact
GndH2O-2: If extraction volumes exceed the recruitment rate channel degradation could occur through the Blue Lake Valley reach. This, in turn, would cause the water table in the Blue Lake aquifer to drop, and produce changes in dependent riparian plant communities located on adjacent upper level terraces and in adjacent riparian forests, phreatophytic vegetation and wetland habitat. The drop in the water table has the potential to be a significant adverse environmental impact within the Blue Lake valley reach. See Section 5.7 for more discussion on vegetation. (PS/LS)

Mitigation Measures
Mit-1: This mitigation measure will reduce the cumulative impacts of bed degradation and aggradation on water table fluctuations to a level that is not excessive and therefore not significant. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Monitoring
Scientific Design and Review Committee

Significance after Mitigation
Less than significant

Impact
GndH2O-3: The water reaching the HBMWD intakes is naturally filtered by passing through the sand and gravel of the riverbed. Deeper sand and gravel means more filtration. If extraction volumes exceed net recruitment channel degradation will continue in the HBMWD Gorge. Channel bed degradation produces a concurrent reduction in natural filtration. In the absence of widespread channel degradation, localized scour around the mid-channel Ranney

wells will produce similar results. Reduced natural filtration forces the HBMWD to incur additional water treatment costs. This has a potentially significant economic impact. See Section 5.12 for more information on HBMWD water supplies. (PS/LS)

Mitigation Measures
Mit-1: In time, this mitigation measure will reduce the cumulative impacts of bed channel degradation to a level of insignificance. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Monitoring
Scientific Design and Review Committee
Humboldt Bay Municipal Water District

Significance after Mitigation
Less than significant

5.5 Fisheries and Habitat

The County retained the Humboldt State University Institute for River Ecosystems to gather and analyze information on the effects of historic gravel extraction on the geomorphic character and fisheries habitat of the project area. Portions of the following section were adapted from the Institute report. See Appendix F for the complete report.

The main fishery resources of the lower Mad River are the five runs of anadromous salmonid species: fall chinook salmon, coho salmon, winter steelhead, summer steelhead, and coastal cutthroat trout. According to the American Fisheries Society, the fall chinook race and the coastal cutthroat trout are threatened by a moderate risk of extinction and the summer steelhead is threatened by a high risk of extinction, (Nehlsen, et al., 1991). No other fish of special concern has been identified in the Mad River. Some of the common species found in the lower Mad River are listed in Table 5.5-1.

Table 5.5-1 Common fish species found in the lower Mad River.

Chinook salmon	Coho salmon
Steelhead/Rainbow trout	Coastal Cutthroat
Threespine stickleback	Riffle sculpin
Coastrange sculpin	Staghorn sculpin
Shiner surfperch	Sacramento sucker
Eulachon	Pacific lamprey

The fisheries aspect of this PEIR will concentrate on the anadromous fish populations because they appear to be the most sensitive to the riverine conditions which are influenced by gravel extraction. The PEIR considerations are influenced by the Mad River Fish Hatchery, the species involved, adult migratory needs, spawning habitat concerns, summer habitat needs, and juvenile migration patterns. Beyond gravel extraction, there are other factors influencing salmonids in the Mad River which may be beyond the scope of this PEIR. These include, but are not limited to fish-eating birds, concentrations of seals and sea lions at the mouth of the river, and poachers. Although we have no hard data we believe sea mammals and poachers take a significant portion of the adult anadromous fish resource, particularly in low flow years. Fish-eating birds devour large quantities of juvenile fish.

The Mad River Fish Hatchery is presently raising and releasing yearling chinook salmon, yearling coho salmon, and yearling steelhead trout. Occasionally they also release catchable trout. In the past chinook fingerlings were also released. In terms of releasing fish, the PEIR is only concerned with their Mad River releases. Releases of yearlings or catchables in other waters are beyond the scope of this PEIR.

The Mad River Hatchery releases fish at various times. Generally their yearling chinook are released in October through December, after the water level and turbidity have risen. Yearling steelhead and coho are released during springtime high water, generally March and April. In the past the hatchery has attempted to stock the upper Mad River, but that program created a variety of management problems. Today, the Mad River fish are released at the hatchery.

Sweasey Dam was constructed in 1938 to supply water for the city of Eureka. It was filled with water in November and a fish ladder was opened in December. Water would spill over the top of the structure onto a fish ladder which ran parallel to the dam face. A sediment flushing valve was installed with the intended purpose of allowing sediment transport into downstream reaches. This valve became inoperable in 1941 and the dam reservoir capacity began to diminish rapidly as sediment began filling the reservoir. The reservoir was completely filled during the 1964 flood and thereafter sediment and debris rolled over the dam spillway and crushed the fish ladder. The dam served as a complete barrier to anadromous fish runs from 1964 until its demolition in July of 1970 (Hollingworth, 1993).

Anadromous fish spawning takes place in the main channel and in several main tributaries. Downstream from the Mad River Hatchery, the main spawning tributaries are Warren Creek, Lindsay Creek, Mill Creek, and the North Fork of the Mad River. Lindsay Creek appears to be extremely important for both coastal cutthroat and coho salmon.

Fish encounter a variety of barriers during their migrations. In theory, each partial barrier encountered by migrating fish, whether they be flow barriers, water quality barriers or physical barriers causes delays and reduces the individual fish's energy reserves. Where the migratory path is long, these barriers cumulatively reduce the number of fish that are capable of completing the migration.

On the main stem a 25-foot waterfall near Bug Creek, about 24 miles above the former Sweasey Dam site was modified in 1980 by blasting and is no longer a migration barrier to steelhead. A steep cascade about five miles upstream on the North Fork of the Mad River prevents salmon migration and limits steelhead migration. A boulder cascade at the mouth of Mill Creek, installed to protect the Highway 299 bridge, may be creating a partial barrier to Mill Creek. A rock cascade beneath the Highway 299 bridge on the main stem is a low-flow barrier. The pool below this barrier is a holding area that is often fished illegally.

Continued channel degradation in the lower Mad River could adversely influence fish migration into and out of adjacent tributaries, particularly when flows are low to marginal. Normally fish migrate during the fall, winter, and spring when flows are higher. In drought years fish often attempt to migrate at less optimum flows.

Partial barriers such as these, located relatively close to the ocean, are important but are of less concern than barriers located far upstream, because the fish's energy reserves should remain relatively high during relatively short upstream migrations.

Some spawning takes place in the project area, mostly above Essex bar (Site No. 6), particularly during low-flow years when access to tributaries and the upper river is limited. According to CDFG (response to Draft PEIR, dated June 11, 1993) anecdotal information indicates spawning below the hatchery bridge every year. The magnitude and success of this spawning is unknown. The Mad River was surveyed in 1992 during drought conditions. Salmonids were observed spawning in tributaries and mainstem of Mad River in all areas surveyed from Canon Creek to Hatchery Bridge. On November 17th, 1993 the CDFG observed chinook salmon redds a short distance below Highway 299 and in the Essex reach. On November 23, 1993 the CDFG observed 14 redds between the railroad bridge and the hatchery road bridge. Consequently, portions of the project area have been used for both fish spawning and gravel extraction.

Gravel extraction has the potential to adversely alter the morphology of spawning sites and the composition of spawning gravel. However, when properly regulated gravel extraction should be able to continue without impacting the spawning habitat. A qualitative survey by Dr. Trush found that many pool tails on both mined and undisturbed reaches in the project area had sufficient water depth and a proper range of water velocities to support favorable spawning environment (Lehre, et al. 1993). No data were presented regarding the composition or quality of spawning gravel in mined and unmined reaches.

Spawning in the project reach is strongly influenced by hatchery management practices. When ocean escapement is high, more fish return to the hatchery than are needed for hatchery egg production. Excess fish are left in the river. Usually there are hundreds of excess fish and infrequently, the rejected or excess fish number in the thousands. Fisheries biologists, and others suspect that hatchery fish and the progeny of excess hatchery fish compete with, and adversely affect, desirable wild juvenile stock. While some of the hatchery excess fish will spawn downstream from the hatchery some may move upriver to spawn. The hatchery uses groundwater in its operations; and one of the reasons the fish tend to concentrate downriver may have to do with the scent of the groundwater released into the river at the hatchery.

There is debate over the quality of spawning habitat and the success of spawning below the hatchery. It has been suggested that spawning in this reach may have little chance of success due to the unstable nature of the alluvial river bed. Although more studies are needed, preliminary flow analysis indicates that, in this reach, the average daily flow in January is near 2,500 cfs and average daily flows of 3,000 cfs or more can occur, on about 30 to 60 days during the spawning season. Flows of that magnitude might effectively scour out, and severely limit salmonid redds in the unstable alluvium found in this reach. Furthermore, flows of that magnitude would introduce fine sediments to the redds which could infiltrate the redds and limit emergence of juveniles. Thus, spawning in this aggraded reach may be rather futile and the main beneficial fisheries use of the lower project area (below the hatchery) may be for adult migration up stream to more favorable spawning areas and juvenile migration downstream to the estuary and the ocean.

CDFG has stated (response to Draft PEIR, dated June 11, 1993) that they believe that most successful salmonid spawning occurs in the tributaries because of scour (in the main stem) during storm events. The following quote is from the same letter. "However, anecdotal information by anglers indicates that salmon spawn below the hatchery bridge. These mainstem spawners are at risk of egg loss, depending on the individual redd site. Many Central Valley rivers subject to annual scour produce large natural populations. It is difficult to dismiss any potential salmon or steelhead production area in light of the declining resources today. We believe that gravel extraction can continue without impacting spawning habitat."

This is a potential area of controversy. While some claim that this area is prime spawning ground and that gravel extraction should be limited or prohibited in this reach, others claim that spawning in this reach is abnormally high because of hatchery management practices. There is also the belief that spawning in this reach is generally unsuccessful due to the unstable nature of the channel bottom. If the spawning of excess hatchery fish is successful, the progeny would compete with preferred wild native fish at various juvenile stages during rearing and migration.

Information from CDFG (response to Draft PEIR, dated June 11, 1993) indicated that the Mad River Hatchery is scheduled to be without funding beyond fiscal year 1994-95. We are not aware of any environmental analysis on the possible effects of closing the hatchery. Obviously, after a few years, only naturally produced fish will return to spawn if the hatchery is closed. The closing of the hatchery may prove to be advantageous to the Mad River fisheries because wild fish populations are more apt to have or generate the genetic diversity needed to allow fish populations to survive droughts and other habitat disasters.

It is clear that the effects of gravel extraction on spawning habitat and spawning success in the lower Mad River are uncertain. Further study of channel scour and spawning success may be needed to resolve the issue. Regardless, The CDFG has stated that they believe that gravel extraction can continue without impacting spawning habitat.

Chinook salmon enter the river from late August through mid-February, but more typically from late October through mid-January. Naturally spawned chinook emerge from the gravel in late March through early May. Downstream migration begins in April, peaks in early to mid-June and tapers off in late July. Some late juveniles may remain in the river through mid-summer. Most downstream migration in the Mad River may take place at night. Normal summer-time gravel extraction operations, as mitigated in recent years, would not impact these juveniles. However these juveniles could be at risk when heavy equipment enters the stream during the installation of summer bridges.

Most native coho migrate upstream during the daylight and the activity usually peaks in December. The peak migration period for introduced coho stock is earlier and may be more apt to be limited by low flows. The life cycle of Mad River coho is probably similar to coho in other northcoast streams. After residing in fresh water for a year, juvenile coho migrate seaward during the spring. The migration may extend into July. As with chinook, most downward migration takes place during the hours of darkness.

Normally, steelhead spawn further upriver and further up tributaries than salmon. Winter steelhead migrate upstream over a lengthy period, from late fall through March. Summer steelhead enter the river from April through late June and generally hold up in the lower river until fall rains cause the river to rise. Young steelhead spend one to four years in fresh water before migrating to the ocean in the spring.

Because coho and steelhead juveniles reside in the river during the summer, the quality of the low-flow season summer habitat is important for these two species. Coho generally migrate out after one year while steelhead may spend one to several years in the river before migrating to the ocean. If summer habitat is adequate, the two species will generally segregate with the coho preferring deep, dark pools, with woody debris and the steelhead preferring riffles. When habitat is limiting, the larger more aggressive steelhead tend to dominate at the expense of the juvenile coho and younger steelhead fish.

Early reports indicate that Lindsay Creek is an important coastal cutthroat trout stream. There is little direct information on Mad River coastal cutthroat trout. Consequently, most of the information has been derived from generalized discussions in Meehan ed. (1991). The project area is near the southern extremity of the species range and the American Fisheries Society has indicated that the species is facing a moderate risk of extinction in California coastal streams. The general reasons for their decline seem to be competition from introduced species, habitat degradation, and over-fishing. Cutthroat trout spawn in the late spring or summer and their progeny emerge in late summer. Juveniles tend to remain in their natal stream, or its vicinity, for two or more years before migrating to the ocean in the spring. In the ocean, the adults do not travel far. They remain in the ocean only for the summer before migrating back in the late summer or winter. They overwinter in the stream before spawning in the summer or returning to the ocean without spawning. Like steelhead, cutthroat trout have the potential to spawn in subsequent years.

It is apparent that there is some anadromous fish use the project area throughout the year, with the least amount of activity coinciding with the low-flow summer period. This is one of the reasons that CDFG generally prefers to restrict gravel extraction to the period from June 1 through September 30. To start earlier may place unnecessary risk on downstream migrating smolts. To extend the season beyond the normal closure date increases the risk of high water closing an operation before the gravel bar is bedded down for the winter. In certain site specific cases and with appropriate mitigation, the CDFG has extended the operating window beyond the normal season.

Downstream from the project area, changes at the mouth of the river may be improving anadromous fish habitat. In recent years, the mouth of the Mad River has migrated to the north, significantly enlarging the estuary. This additional estuary habitat enhances conditions for early arriving adults that hold up in the river and wait for rising water. It also provides more habitat in which juvenile fish could reside while making the transition to an ocean environment. However, there is apparently no information avaialble to indicate the degree to which this enlarged estuary is being utilized by fish populations.

Unregulated gravel extraction can damage fish habitat and other riverine resources and thus interupt recognized beneficial uses of the Mad River channel. It is the responsibility of Humboldt County, the CDFG, and other agencies to advise and regulate the industry to minimize the potential risks to these resources, while allowing the operators to remove a safe volume of gravel from appropriate locations by appropriate methods.

The National Marine Fisheries Service is responsible for preserving and enhancing marine, estuarine, and anadromous fish resources and the habitats that support these resources. They have listed the following potential effects of gravel extraction that are of concern to them. Most of these concerns are described and discussed in Collins and Dunne (1990). These concerns are addressed more specifically in Section 5.1 of this PEIR, Channel Morphology/Gravel Recruitment.

1. Extraction of bed material in excess of replenishment by transport from upstream causes the bed to degrade upstream and downstream of the extraction site.
2. Degradation can deplete the entire depth of gravelly bed material, exposing other substrates that may underlie the gravel, which could in turn affect the quality of aquatic habitat. One example would be the loss of benthic macro invertebrate habitat if gravel beds eroded down to underlying bedrock. On the other hand aggradation of fine sediment (sand) can produce the same effect.
3. Rapid bed degradation may induce bank collapse and erosion by increasing the heights of banks.
4. Degradation may change the morphology of the riverbed, which constitutes one aspect of the aquatic habitat.
5. Lowering of the water table can change the riparian plant community.
6. The reduction in size or height of bars can cause adjacent banks to erode more rapidly or to stabilize, depending on how much gravel is removed, the distribution of removal, and on the geometry of the particular site.
7. Removal of gravel from bars may cause downstream bars to erode if they subsequently receive less bed material than they contribute to downstream transport.

In summary, if extraction volumes are expanded to permitted levels, or sustained at recent levels channel degradation will continue more or less at its present rate; and there will be little control regarding the adverse channel degradation changes which are induced by gravel extraction.

If average extraction levels are below the net recruitment rate, aggradation will occur. After some adjustment the present river grade line would be raised slightly in some places and more or less maintained in others.

River bed morphology is constantly changing regardless of gravel extraction. The goal is to maintain some sort of equilibrium in structure and diversity while the channel adjusts to changes in stream power, sediment supply, and sediment export. The recommended management plan with its annual review will monitor gravel extraction, gravel recruitment, bed morphology, fish passage, fish habitat, and other riverine resources to see that a degree of dynamic equilibrium is established and maintained in the aquatic habitat resources while allowing appropriate amounts of gravel to be extracted from appropriate reaches. These monitoring measures will help guide the SDRC and operators in establishing the appropriate quantity, location, and methods of extraction.

Impact Statements and Mitigation Measures

Impact
Fish-1: Certain extraction methods and standards have the potential to create a broad, shallow channel. If the channel is too shallow, adult and juvenile fish migration through the excavated area may be adversely impacted during semi-low flows (PS/LS)

Mitigation Measures
Mit-1: This mitigation measure will assure that future extraction operations are planned and executed in a manner that will not significantly impact fish migration. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Monitoring
Humboldt County/Scientific Design and Review Committee
California Department of Fish & Game

Significance after Mitigation
Less than significant

Impact
Fish-2: Channel degradation has the potential to create physical topographic barriers at the mouths of tributaries and adversely influence fish migration into and out of these tributaries, particularly when flows are low to marginal. Barriers to anadromous fish migration into and out of tributaries could be a significant impact. (PS/LS)

Mitigation Measures
Mit-1: This mitigation measure will monitor, limit, and regulate gravel extraction to minimize the risk that extraction-induced bed degradation will inhibit fish migration at the adjacent tributaries. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Monitoring
Scientific Design and Review Committee
California Department of Fish & Game

Significance after Mitigation

Less than significant

Impact
Fish-3: Gravel extraction has the potential to adversely alter the morphology of spawning sites and the composition of spawning gravel in the Mad River extraction area. There is debate on this issue and it could be a significant impact. However, the CDFG has stated that they believe that gravel extraction can continue without impacting spawning habitat. (PS/LS)

Mitigation Measures
Mit-1: This mitigation measure will monitor and regulate gravel extraction to minimize the risk that extraction-induced changes in gravel composition and channel morphology will inhibit fish spawning. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Mit-6: The Scientific Design and Review Committee and the California Department of Fish & Game will monitor fish spawning activity in the Mad River extraction area in an attempt to determine the significance and success of spawning activity and how that activity might be influenced by gravel extraction. The Scientific Design and Review Committee will meet and confer with the California Department of Fish & Game and with additional experts to develop annual mining prescriptions that will allow extraction to continue without impacting spawning habitat.

Monitoring
Scientific Design and Review Committee
California Department of Fish & Game

Significance after Mitigation
Less than significant. There is evidence that extraction methodology and amounts can be limited to allow extraction to continue without significantly impacting spawning habitat.

Impact
Fish-4: The installation and removal of summer bridges or other summer crossings has the potential to significantly impact juvenile fish migration. (PS/LS)

Mitigation Measures
Mit-4: The SDRC shall consult with operators regarding the best design and placement of summer crossings. All summer crossings shall be installed and removed in accordance with adopted regulations of the CDFG and, if required, the USACOE. This mitigation measure assures that installation and removal is executed under authorization of appropriate state and federal agency permits or agreements. These agencies have the capability of requiring conditions of approval on permits or agreements that will reduce impacts resulting from summer bridge installation and removal, to a level of insignificance.

Monitoring
Scientific Design and Review Committee
California Department of Fish & Game, and possibly the
U.S. Army Corps of Engineers

Significance after Mitigation
Less than significant

Impact
Fish-5: Trenches can be strategically located in a variety of sites. Trenches can also be deep or shallow, wide or narrow, and short or long. The effects of trenches can vary. Trenching has the potential for improving fish passage in aggraded reaches. This is a beneficial impact of trenching. Trenching also has the potential to reduce or eliminate riffles which are important for rearing juvenile steelhead and as habitat for benthic macroinvertebrates. This loss or reduction of riffles has a potential to be significant. (PS/LS)

Mitigation Measures
Mit-1: This mitigation measure will monitor and regulate gravel extraction methods. The regulation will protect the river from significant extraction-induced changes in riffle habitat. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Monitoring
Scientific Design and Review Committee
California Department of Fish & Game

Significance after Mitigation
Less than significant

Impact
Fish-6: Gravel mining can reduce aquatic habitat diversity and the retention of large woody debris, both of which are necessary in order to maintain quality summer rearing habitat and holding areas for migrating adult and juvenile fish. The loss of habitat diversity and woody debris can be a significant impact. (PS/LS)

Mitigation Measures
Mit-1: The implementation of this mitigation measure will include monitoring aquatic habitat diversity, condition, and trend as well as the presence and significance of large woody debris. Information gained during this monitoring will be used while developing site-specific extraction prescriptions that will minimize adverse impacts on these factors and, where possible, enhance these river resource conditions. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Monitoring
Scientific Design and Review Committee
California Department of Fish & Game

Significance after Mitigation
Less than significant

5.6 Wildlife and Habitat

The County retained the Mad River Biologists to gather and analyze information on the effects of historic gravel extraction on the wildlife and wildlife habitat of the project area. A preliminary report dated March 10, 1993 is included as Appendix D. The final report, dated September 2, 1993 is included as Attachment 3. Portions of the following section were adapted from these Mad River Biologists' reports which are incorporated herein by this reference.

Introduction

This section describes the wildlife habitats of the study area and the wildlife species that are expected in each habitat. The potential significant effects of instream mining on the non-fish, vertebrate wildlife species, i.e. amphibians, reptiles, birds and mammals, are also discussed, as are corresponding mitigation measures.

Special attention is given to those species considered endangered, threatened, or of special concern by the U.S. Fish and Wildlife Service and the California Department of Fish and Game.

Habitats

Refer to "Vegetation" Sections 4.3 and 5.7 for additional discussion on riparian scrub, developing riparian forests and mature riparian forests.

Riparian

Riparian habitat as a whole, in all of its successional stages (riparian scrub, developing riparian forest, and mature riparian forest) is a significant resource. Significant stands of developing and well-developed riparian vegetation exist along the Mad River in the study area. The riparian forest provides habitat for nearly all of the reptiles, amphibians, birds and mammals listed in Table 5.6-1. Even those that do not use this habitat for feeding, nesting or cover, depend, to some extent, on the productivity of this habitat. Furthermore, the aquatic habitats (both riverine and pond) adjacent to the riparian forests receive organic matter (in the form of plant and animal material) from the riparian forest and owe much of their physical structure to the influence of the riparian forests.

Gravel mining operations have three potential effects on wildlife and riparian habitat. The first is the actual removal of riparian habitat, due to the construction of roads, stock piles, or processing sites. At this time, there are no new roads, stock piles or processing sites proposed in the riparian habitat adjacent to gravel operations on the Mad River.

The second potential effect, is the direct effect of noise and dust from the mechanical operations. The noise and movement of equipment have an immediate effect on wildlife. While many species can become acclimatized to predictable and/or constant noise, others will be displaced.

The consequences of dust coating riparian vegetation is also of concern, as a layer of dust can inhibit both plant growth and insect use of plants, both of which consequently affect wildlife use of the habitat, by either directly or indirectly affecting food availability.

The third potential effect of gravel mining would result from changes in the river channel dimensions and location as a result of mining activity. These changes could alter the health and distribution of the riparian habitats. In particular, the early successional stages could be altered on a regular basis, reducing the extent of later successional stages.

Riverine

The river itself is an important habitat to the fish and aquatic invertebrates of the Mad River system. The health of the river affects species that depend on the fish and aquatic invertebrates for food, such as Double-crested Cormorant, Bald Eagle, Osprey, Common Merganser, and Dipper. See the "Fisheries and Habitat" section for a more complete discussion of gravel mining's effect on fish habitat. In addition, water quality concerns, such as spilled petroleum products, waste water, and other by-products of the mining operation, could have consequences for wildlife. See the "Water Quality" section.

Gravel Bars

The gravel bar is the habitat most directly affected by mining operations. Gravel bars provide feeding habitat for birds such as the Spotted Sandpiper and Killdeer, other shorebirds, and various larger birds such as the Bald Eagle and Turkey Vulture. Gravel bars also provide roosting sites for gulls and mergansers.

The earliest successional stages of the riparian forests begin on the gravel bars, where they are subject to high water. Mining methods and the amount of gravel extracted from a gravel bar play a large role in determining the impact of mining operations on the wildlife habitat value of gravel bars.

Temporary Pools and Backwaters

Temporary pools and backwaters include the seasonal and temporary quiet waters that develop along the river's course which can include the shallow ponds that are flooded at high water and then disappear as the season progresses, or backwaters and low sites within the river bed that stay wet all year long because of available groundwater. These ponds are considered temporary because their structure and distribution can change dramatically during high flow events. During the past few drought years, many of these ponds have developed healthy stands of emergent aquatic vegetation and have become the breeding site for amphibians. Ponds are one of the most important habitats for the Red-legged Frog and the Western Pond Turtle. In addition, Foothill Yellow-legged Frog, Bullfrog and other amphibians can use this habitat extensively.

Freshwater Marshes and Ponds (including pits)

Various freshwater marsh and pond habitats occur adjacent to the river channel. These are distinguished from the above classification by their more-or-less permanent nature. As a consequence of their permanent nature, the aquatic vegetation is often well-developed, resulting in a more complex habitat structure that provides homes for a variety of wildlife.

These ponds are maintained, in part, because they intercept the water table. Channel degradation can cause the water table to lower and reduce pond storage volume. Some of these ponds are natural, while others have come about as a consequence of mining activity. There is potential for creating wildlife habitat using these ponds.

Species Accounts

Table 5.6-1 Species of Special Concern

Northern Red-legged Frog	*Rana aurora aurora*	CA2, SC
Foothill Yellow-legged Frog	*Rana boylii*	CA2, SC
Bullfrog	*Rana catesbeiana*	I, HA
Northwestern Pond Turtle	*Clemmys marmorata marmorata*	CA2, SC
Double-crested Cormorant	*Phalacrocorax auritus*	SC
Bald Eagle	*Haliaeetus leucocephalus*	CE, FE, CP
Northern Spotted Owl	*Strix occidentalis caurina*	FT
Sharp-shinned Hawk	*Accipiter striatus*	SC
Cooper's Hawk	*Accipiter cooperi*	SC
Merlin	*Falco columbarius*	SC
American Peregrine Falcon	*Falco peregrinus anatum*	CE, FE, CP
Marbled Murrelet	*Brachyramphus marmoratus*	CE, FT
Willow Flycatcher	*Empidonax traillii*	CE
Black-capped Chickadee	*Parus atricapillus*	SC
California Yellow Warbler	*Dendroica petechia brewsteri*	SC
Yellow-breasted Chat	*Icteria virens*	
White-footed Vole	*Arborimus albipes*	CA2, SC

FT	Federally Threatened Species
FE	Listed as Endangered by the Federal Government
SC	California Species of Special Concern
CE	Listed as Endangered by the State of California
CP	California Protected Species
CT	Listed as Threatened by the State of California
CA2	Category 2 Candidate for listing by the Federal Government (existing information indicates listing may be warranted, but necessary biological data are lacking)
I	Introduced
HA	Harvested Species

Northern Red-legged Frog (*Rana aurora aurora*)
The Northern Red-legged Frog is typically found in ponded areas along the coast and cascade ranges from northern California to southern British Columbia. Here on the north coast of California, it is widespread in ponds and along rivers where there is quiet water and emergent aquatic vegetation providing cover. When not breeding, this species wanders widely in damp woods, including riparian and coniferous forests. Breeding takes place in late winter and early spring. Red-legged frogs have a weak voice and are vocally inconspicuous. Egg masses consisting of up to 2-3,000 eggs are deposited in water up to 6" deep. Most young are completely transformed into adults by mid-summer, or earlier. The diet of Red-legged Frogs consists primarily of insects captured near water.

The Northern Red-legged Frog is considered a Species of Special Concern in California and is a Category 2 Candidate for Federal Listing. The main reasons for concern in California are the declining habitat and predation by the introduced Bullfrog.

Red-legged Frogs have been found in freshwater marshes and ponds outside the Mad River project area. One adult was found in a pond at the Blue Lake Bar during the Spring 1993 survey. Locally, the Red-legged Frog is not as common along the rivers as the Foothill Yellow-legged Frog. Along the Eel River, Red-legged Frogs were found in temporary pools and backwaters where emergent aquatic vegetation had developed to provide sufficient cover. This emergent vegetation has probably developed more extensively during the last few drought years.

Foothill Yellow-legged Frog (*Rana boylii*)
The Foothill Yellow-legged Frog is found in coastal and foothill habitats throughout northern California. Its preferred habitat is along streams and rivers, especially where riffles are present. When disturbed, the Yellow-legged Frog escapes into the water and hides in vegetation, or in the nooks and crannies on the bottom of the water body. The Foothill Yellow-legged Frog is less likely to use the riparian forests and other adjacent habitats than other frogs. Breeding takes place later in the spring, when high water flows have subsided. Up to 1,000 eggs, laid in a mass, are attached to rocks in shallow, flowing water. During the summer, the larvae transform into frogs .

The Foothill Yellow-legged Frog is considered a Species of Special Concern in California and is a Category 2 Candidate for Federal Listing. The main reasons for concern in California are declining habitat and predation by the introduced Bullfrog.

Along the north coast, Yellow-legged Frogs are found in most rivers and large streams. This species seems to prefer more sunny areas than the Red-legged Frog. It has been found downstream to the Water District park to the edge of the coastal fog zone. In inland portions of the Eel River, the Yellow-legged Frog has been replaced by the introduced Bullfrog.

During field surveys, Yellow-legged Frogs were found in small ponds, edgewaters, and larger ponds adjacent to the river. No Yellow-legged Frogs were found in the river.

Bullfrog (*Rana catesbeiana*)
The Bullfrog has been introduced in California and is found in almost all aquatic habitats, except the high mountains and deserts. It prefers permanent waters, especially with well-developed vegetation and muddy bottoms. It is highly aquatic and rarely ventures from water. The breeding season depends on the particular site and varies from February to July. Anywhere from 10-20,000 eggs are laid in a mass. Larvae may not transform into adults until the second year of life. The Bullfrog has a varied diet that includes insects and other invertebrates, fish, small reptiles, birds, small mammals and other amphibians. Its habit of eating other frogs has caused a decline in both Red-legged and Yellow-legged Frogs in the west and its presence is a significant part of the reason that the latter two species are of special concern.

The Bullfrog is a Harvest Species in California that is managed by California Fish and Game.

Bullfrogs are widespread and becoming more common along the north coast. The Bullfrog was not detected in the study area during the spring 1993 field season.

Northwestern Pond Turtle (*Clemmys marmorata marmorata*)
The Northwestern Pond Turtle is California's only native aquatic turtle and is widely distributed west of the Sierra-Cascade Mountains. Pond Turtles are found in and near water, especially slow moving or quiet waters, such as ponds, small lakes, reservoirs, quiet streams and rivers. They can be found basking on rocks, logs or on the bank along aquatic vegetation. Places to bask seem to be an important component of their habitat needs. Females lay a clutch of 5-11 eggs between April and August in a small hole in a dirt bank, sometimes at a distance from her home water. The diet of Pond Turtles consists of aquatic plants, fish, invertebrates and carrion.

The Northwestern Pond Turtle is considered a Species of Special Concern in California and is a Category 2 Candidate for Federal Listing.

Along the north coast of California, the Pond Turtle is sparsely distributed, mainly at ponds in the interior. It is found downstream at least to the Blue Lake bridge. This species, like the Yellow-legged Frog, seems to prefer sunny areas, and so it may avoid the coastal fog belt.

Double-crested Cormorant (*Phalacrocorax auritus*)
The Double-crested Cormorant is a widely distributed species throughout North America. It is the only cormorant to occur regularly in freshwater habitats. Breeding takes place in colonies on islands (especially in ocean environments) or in stands of large trees, often in riparian areas. The Cormorant's diet consists mainly of fish and invertebrates, especially crustaceans.

The Double-crested Cormorant is a Species of Special Concern in California.
In the study area, Double-crested Cormorants are common along the Mad River throughout the year. There are no known nesting areas in the study area; the nearest nesting sites are on the abandoned Arcata Wharf in Humboldt Bay and along sea stacks in and around Trinidad Harbor, north of the Mad River mouth.

Bald Eagle (*Haliaeetus leucocephalus*)
The Bald Eagle is found throughout North America and California. Concentrations of Bald Eagles are found where their preferred food is concentrated, i.e. in major waterfowl wintering areas, and along major salmon streams and rivers with adjacent snags for perching. Nesting takes place in large stick nests, often high in a tree, living or dead. Eggs can be laid as early as January, incubation is 30-45 days, and the young take their first flight approximately two and one-half months after hatching. Their food consists largely of fish, either caught themselves or stolen from Ospreys. Bald Eagles also feed upon a wide variety of small mammals, aquatic birds and carrion.

The Bald Eagle is listed as endangered both in California and the United States. It is a California Protected Species.

Bald Eagles are rare in Humboldt County. Three nests are known in the county, one is above Korbel near the project area. Scattered sightings of Bald Eagles along the coastal portion of the Humboldt Bay area may refer to this pair and its offspring, or an occasional outside visitor. At present, there are no gravel operations in the immediate vicinity (within 1.25 miles) of the known Bald Eagle nest. However, the entire Mad River extraction area is habitat for the eagles located near Korbel.

Northern Spotted Owl (*Strix occidentalis caurina*)
The Northern Spotted Owl is an uncommon and reportedly declining species found in old growth forests in the Pacific Northwest. Its habitat is in old-growth or older second growth forests.

The Northern Spotted Owl is a Federally Threatened Species.

Near the study area, Spotted Owls are common in suitable habitat. None are known in habitat adjacent to the present gravel operations.

None of the present gravel mining operations would impact Spotted Owls as suitable habitat is lacking within 0.25 miles of the operations.

Sharp-shinned Hawk (*Accipiter striatus*)
The Sharp-shinned Hawk is found throughout North America in a wide variety of forest and scrub habitats, where it preys primarily on small birds. Populations in North America have declined due to pesticide residues, habitat destruction and the general decline of songbird populations, its major prey.

The Sharp-shinned Hawk is a Species of Special Concern in California. Locally, the Sharp-shinned Hawk is an uncommon winter resident and rare summer breeder. No Sharp-shinned Hawks were observed in the project area during these surveys, but they are regularly encountered during the wintertime.

Cooper's Hawk (*Accipiter cooperi*)
The Cooper's Hawk is found throughout North America in a wide variety of forested and scrub habitats, where it preys primarily on song birds. Populations in North America have declined due to pesticide residues, habitat destruction and the general decline of songbird populations, its major pry.

The Cooper's Hawk is a Species of Special Concern in California. Locally, the Cooper's Hawk is an uncommon winter resident and rare summer breeder. No Cooper's Hawks were observed during the spring and summer 1993 surveys.

Merlin (*Falco columbarius*)
The Merlin is found throughout North America in a wide variety of open habitats, where it preys primarily on shorebirds and song birds. Populations in North America have declined due to pesticide residues and habitat destruction.

The Merlin is a Species of Special Concern in California.

Locally, the Merlin is an uncommon winter resident that occasionally hunts along the lower stretches of the Mad River, where it preys on Pine Siskins and other small birds.

American Peregrine Falcon (*Falco peregrinus anatum*)
The Peregrine Falcon is found throughout North American aquatic habitats, where it preys primarily on shorebirds and ducks. Populations in North America have declined due to pesticide residues, nest disturbances (including the illegal removal of chicks for falconry) and habitat destruction. There seems to be some recent recovery of the species.

The Peregrine Falcon is an Endangered Species in California and the United States and is a California Protected Species.

Locally, the Peregrine Falcon is an uncommon winter resident and rare summer breeder. It is fairly common in the lower reaches of the Mad River, below the 299 bridge, where it hunts for shorebirds along the river and in the adjacent fields.

Marbled Murrelet (*Brachyramphus marmoratus*)
The Marbled Murrelet is an uncommon and reportedly declining marine bird that depends on old growth forests for their nesting sites.

The Marbled Murrelet is a California Endangered and Federal Threatened species. There are no records of Marbled Murrelets in the study area or anywhere along the mad River drainage

(Paton and Ralph, 1990). Suitable habitat does not occur within 0.25 miles of any present operation.

Willow Flycatcher (*Empidonax trailii*)
The Willow Flycatcher is found throughout the northern half of the continental United States. Its preferred habitat is wet meadow and montane riparian habitats dominated by willow thickets. The Willow Flycatcher breeds almost exclusively in dense willow thickets, using the lower branches for feeding and singing perches. This species' nests are parasitized by the Brown-headed Cowbird, a significant part of the reason for its California listing.

The Willow Flycatcher is a California Endangered Species.

The Willow Flycatcher is not yet known to nest in Humboldt County, although singing males exhibiting territorial behavior have been noted along the Eel River, near Dyerville.
Intensive searching showed no Willow Flycatchers in the project area during the 1993 surveys.

Black-capped Chickadee (*Parus atricapillus*)
The Black-capped Chickadee is possibly the most abundant and best-known chickadee in North America. In California, it is found almost exclusively in willow/cottonwood habitats along the north coast south to the vicinity of Ferndale.

The Black-capped Chickadee is a Species of Special Concern in California

It has become fairly common in suitable habitat along the Mad River, from the Mad River County Park upstream to at least the Blue Lake bridge.

California Yellow Warbler (*Dendroica petechia brewsteri*)
Found throughout North America, the Yellow Warbler has been declining as a breeding bird in California due to habitat destruction and parasitization by the Brown-headed Cowbird. Its breeding habitat is in riparian deciduous forests of almost any size.

The Yellow Warbler is a Species of Special Concern in California.

In Humboldt County the Yellow Warbler is a fairly common breeder in riparian habitats including the riparian forests downstream from the Blue Lake bridge.

Yellow-breasted Chat (*Icteria virens*)
This bird is found throughout North America but has been declining as a breeding bird in California due to habitat destruction. Its breeding habitat is in riparian deciduous forests of moderate or larger size.

The Yellow-breasted Chat is a Species of Special Concern in California. In Humboldt County it is an uncommon breeder in riparian habitats including the Mad River riparian forests downstream to at least below Azalea Park.

White-footed Vole (*Arborimus albipes*)
The White-footed Vole is found along the coastal regions of Oregon and extreme northern California. Its preferred habitat is humid coastal forests of Redwood, Douglas-fir and riparian

species. White-footed Voles feed principally on the leaves of green plants; red alder seems to be preferred in some areas.

The White-footed Vole is a Species of Special Concern in California and is a Category 2 Candidate for Federal Listing.

Locally, this species is not well known, but seems to prefer riparian vegetation along small streams within the coastal coniferous forests, but it is not expected to be found in the Cottonwood/willow type of riparian forests of the study area.

.Impact Statements and Mitigation Measures

Impact

Wild-1: Gravel extraction, aggregate stockpile and processing sites, industrial development, agricultural development, residential develoment, highway development and, streambank levees have cumulatively reduced the Mad River riparian corridor wildlife habitat to a fraction of what it once was. Gravel extraction operations and gravel stockpiles can significantly reduce or modify the habitat of certain wildlife species. These potential changes could be significant adverse impacts. The preferred alternative will not increase this loss of wildlife habitat. On the contrary certain vegetation mitigation measures may actually increase the avaiability of significant wildlife habitat. Regardless, the cumulative adverse impacts on wildlife habitat will remain significant. (S/S)

Mitigation Measures

Mit-7: For at least the first five years of this project wildlife monitoring surveys similar to those conducted in the project area and at site specific extraction operations during 1993 will be continued. The SDRC will consider comments from the California Department of Fish and Game, the wildlife surveys, and impacts to wildlife when developing annual mining stratagies at affected sites. The need for continuing wildlife surveys after the first five years will will be considered during the five-year comprehensive review.

Mit-1: Wildlife survey and other monitoring information will be used to limit and design gravel extraction to minimize the risk producing significant gravel extraction-induced changes in wildlife habitat. Significance as related to impacts regarding wildlife will be determined by the SDRC, during annual wildlife surveys and in consultation with the CDFG and other experts. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Mit-8: No new haul roads shall be constructed through established riparian forest under this project. Abandoned haul roads, trails, will be revegetated.

Mit-9: Gravel stockpiles shall be maintained in historic locations in a manner to assure no encroachment into significant wildlife habitat. No new stock pile locations shall be established in riparian forests under this project. Abandoned stockpile sites will be revegetated.

Monitoring

Scientific Design and Review Committee
Humboldt County Planning Department
California Department of Fish & Game

Significance after Mitigation

Significant. The cumulative adverse wildlife habitat impacts will remain significant.

Impact
Wild-2: Wildlife can be affected by excessive noise resulting from mechanical equipment. Operational noise can be reduced if the exhaust systems of all internal combustion engines owned or maintained by the operators are kept in good repair and as manufactured. While many species can become acclimatized to predictable and/or constant noise, others will be displaced, at least temporarily. When operations cease, the wildlife can return. This may be considered a short term effect and less than significant. However, if rare or threatened species are displaced by excessive noise the effect would be significant. Monitoring for noise-reduction compliance and for the presence of rare, threatened, or endangered species subject to noise disturbance is needed. For more information on noise see Section 5.11. (PS/PS)

Mitigation Measures
Mit-10: The exhaust systems of all internal combustion engines owned or maintained by the operators shall be kept in good repair and as manufactured.

Mit-7: Annual pre-extraction wildlife surveys will occur. If rare or threatened species are observed near extraction areas, extraction prescriptions will be modified to accomaodate the noted individuals. The SDRC will consider comments from the California Department of Fish and Game, the wildlife surveys, and impacts to wildlife when developing annual mining stratagies at affected sites. The need for continuing wildlife surveys after the first five years will will be considered during the five-year comprehensive review.

Mit-1: Monitoring information will be used to design and regulate gravel extraction to minimize the risk of producing significant gravel extraction-induced impacts to wildlife habitat. Significance as related to impacts regarding wildlife will be determined by the SDRC, during annual wildlife surveys and in consultation with the CDFG and other experts. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Monitoring
Humboldt County/Scientific Design and Review Committee
California Department of Fish and Game

Significance after Mitigation
Less than significant

Impact
Wild-3: Dust resulting from the project can coat riparian vegetation inhibiting both plant growth and insect use of plants, both of which consequently affect wildlife use of the habitat. This has a potential of being a significant impact. (PS/LS)

Mitigation Measures
Mit-11: All non-paved haul roads will be watered at least twice a day when being used during the extraction season. In addition all extraction and processing areas shall be watered as required by the NCUAQMD or as necessary to reduce the level of fugitive dust to acceptable air quality standards.

Mit-12: All operational traffic shall observe a maximum speed limit on unpaved roads of 20 m.p.h. This will reduce dust by approximately 65-80% (RSE, 1993).

Mit-7: Annual pre-extraction wildlife surveys will occur. If rare or threatened species are observed near extraction areas, extraction prescriptions will be modified to accomaodate the noted individuals. The SDRC will consider comments from the California Department of Fish and Game, the wildlife surveys, and impacts to wildlife when developing annual mining stratagies at affected sites. The need for continuing wildlife surveys after the first five years will will be considered during the five-year comprehensive review.

Mit-1: Monitoring information will be used to limit and design gravel extraction to minimize the risk producing significant gravel extraction-induced impacts to wildlife habitat. Significance as related to impacts regarding wildlife will be determined by the SDRC, during annual wildlife surveys and in consultation with the CDFG and other experts. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Monitoring
Humboldt County/Scientific Design and Review Committee
NCUAQMD.

Significance after Mitigation
Less than significant

Impact
Wild-4: Gravel extraction operations could impact the habitat of various bird and mammal Species of Special Concern, Threatened species, or Endangered species. These impacts could be significant. (PS/LS)

Mitigation Measures
Mit-7: Annual pre-extraction wildlife surveys will occur. If rare or threatened species are observed near extraction areas, extraction prescriptions will be modified to accomaodate the noted individuals. The SDRC will consider comments from the California Department of Fish and Game, the wildlife surveys, and impacts to wildlife when developing annual mining stratagies at affected sites. The need for continuing wildlife surveys after the first five years will will be considered during the five-year comprehensive review.

Mit-1: Monitoring information will be used to limit and design gravel extraction to minimize the risk of producing significant gravel extraction-induced changes in wildlife habitat. Significance as related to impacts regarding wildlife will be determined by the SDRC, during annual wildlife surveys and in consultation with the CDFG and other experts. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Monitoring
Humboldt County/Scientific Design and Review Committee
California Department of Fish & Game

Significance after Mitigation
Less than significant

Impact
Wild-5: Gravel extraction operations could impact the Northern Red-legged Frog, a Species of Special Concern in California and a Category 2 Candidate for Federal Listing. Disturbance of breeding or habitat areas could be significant. (PS/LS)

Mitigation Measures
Mit-7: Annual pre-extraction wildlife surveys will occur. If rare or threatened species are observed near extraction areas, extraction prescriptions will be modified to accomaodate the noted individuals. The SDRC will consider comments from the California Department of Fish and Game, the wildlife surveys, and impacts to wildlife when developing annual mining stratagies at affected sites. The need for continuing wildlife surveys after the first five years will will be considered during the five-year comprehensive review.

Mit-1: Monitoring information will be used to limit and design gravel extraction to minimize the risk of producing potential impacts on Northern Red-legged Frog breeding ponds to a level of insignificance. Significance as related to impacts regarding wildlife will be determined by the SDRC, during annual wildlife surveys and in consultation with the CDFG and other experts. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Monitoring
Humboldt County/Scientific Design and Review Committee
California Department of Fish & Game

Significance after Mitigation
Less than significant

Impact
Wild-6: Gravel extraction operations could impact the Foothill Yellow-legged Frog, a Species of Special Concern in California and a Category 2 Candidate for Federal Listing. Disturbance of breeding or habitat areas could be significant. (PS/LS)

Mitigation Measures
Mit-7: Annual pre-extraction wildlife surveys will occur. If rare or threatened species are observed near extraction areas, extraction prescriptions will be modified to accomaodate the noted individuals. The SDRC will consider comments from the California Department of Fish and Game, the wildlife surveys, and impacts to wildlife when developing annual mining stratagies at affected sites. The need for continuing wildlife surveys after the first five years will will be considered during the five-year comprehensive review.

Mit-1: Monitoring information will be used to limit and design gravel extraction to minimize the risk of producing gravel extraction-induced impacts on Yellow-legged Frog habitat to a level of insignificance. Significance as related to impacts regarding wildlife will be determined by the SDRC, during annual wildlife surveys and in consultation with the CDFG and other experts. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Monitoring
Humboldt County/Scientific Design and Review Committee
California Department of Fish & Game

Significance after Mitigation
Less than significant

Impact

Wild-7: Northwestern Pond Turtles were not observed in the project areas during the 1993 wildlife survey. However, gravel extraction operations could impact the Northwestern Pond Turtle, a Species of Special Concern in California and a Category 2 Candidate for Federal Listing. Disturbance of breeding or habitat areas could be significant. (PS/LS)

Mitigation Measures
Mit-7: Annual pre-extraction wildlife surveys will occur. If rare or threatened species are observed near extraction areas, extraction prescriptions will be modified to accomaodate the noted individuals. The SDRC will consider comments from the California Department of Fish and Game, the wildlife surveys, and impacts to wildlife when developing annual mining stratagies at affected sites. The need for continuing wildlife surveys after the first five years will will be considered during the five-year comprehensive review.

Mit-1: Monitoring information will be used to limit and design gravel extraction to minimize the risk of producing adverse impacts on Northwestern Pond Turtles. Significance as related to impacts regarding wildlife will be determined by the SDRC, during annual wildlife surveys and in consultation with the CDFG and other experts. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Monitoring
Humboldt County/Scientific Design and Review Committee
California Department of Fish & Game

Significance after Mitigation
Less than significant

5.7 Vegetation

The County retained Karen Theiss and Associates to gather and analyze information on the effects of historic gravel extraction on the vegetation of the project area. Portions of the following section were adapted from Karen Theiss' report. See Appendix H for the complete report.

<u>Overview</u>
Where gravel extraction affects botanical habitats, the direct impact is the removal of vegetation resulting in an overall decline in botanical presence and diversity. A reduction in vegetative cover will result in a decrease in wildlife habitat value with an expected decline in the numbers of individuals and species present. With respect to current conditions and values, the removal of gravel bar habitat would result in the least overall degree of direct impact, while the removal of riparian forest would result in the greatest overall degree of impact on both botanical and wildlife values. See Section 4.3 for more information on vegetation.

Removal of isolated patches of moderate to late stage scrub vegetation and young forest stands from the gravel bar, and early scrub habitats would preclude the development and expansion of these vegetation units over time. These "islands" of more developed vegetation serve to enhance habitat values for wildlife; their removal would result in an overall decline in habitat value. These islands of vegetation may act as traps to 'grab' sand and gravel as it is transported downstream. Over time, the cycle of capturing of more material and the growth of additional vegetation causes the islands to develop as distinct habitat areas. A side effect of the development of vegetation islands is a braided river channel.

Continued excavation in any one area precludes the natural evolution of terraces and subsequent development of riparian vegetation. The low-lying herbaceous and early scrub habitats would be the most affected. The localized long-term effects would include: A) the loss of early stage scrub; B) the maturation of the later stage scrub and forest; C) a decline in vegetative diversity; D) a decline in wildlife habitat values; and E) a likely decline in wildlife diversity.

Other factors adversely affect the development of a natural meandering pattern and the evolution of point bars into river terraces. These include Highway 299 with its bank protection, certain bridges, and levees and RSP all of which limit the natural tendency of the river to meander across its floodplain.

Revegetation techniques can be used to mitigate for habitat that is disturbed by gravel extraction. Salvage of existing woody plant material may be possible. Salvaged material needs to be properly stored and maintained (e.g., adequate water supply, protection from desiccation). While it may not always be possible to salvage plant material, plant material that is lost may be replaced in strategic locations by using cuttings and seedlings. Reclamation also offers an opportunity for habitat diversification, if desired. An example would be the creation of small ponds which allow for the establishment and support of particular species such as the California Red-legged Frog and the Northern Yellow-legged Frog.

Avoidance can be employed in those areas of continuous, well established vegetation, from moderate scrub to mature forest. At any one particular site, at least some of the early successional scrub should be avoided in order to allow for diversity of age class and attendant habitat value. Isolated stands of moderate age scrub and young forest within the gravel bar habitat should be considered on a case by case basis to evaluate their contribution to the overall habitat value. Those patches with a high probability for surviving the forces of high water flows should be avoided.

A natural riverine system is highly dynamic and routinely experiences changes in the location of the channel and the area of wetted surface over time. Depending on the nature and extent of relocation, bank erosion may occur on either side of the stream bed. Bank erosion, whether on low terraces vegetated with riparian scrub or on high terraces with mature riparian forest, results in loss of vegetation, habitat diversity, and a decline in overall habitat value. In a natural system, erosion on one side of a meander is generally accompanied by deposition on the opposite side, with development of vegetation over time. The natural replenishment of the riparian vegetation is thus closely correlated with hydrologic processes. The alteration of natural hydraulic forces by instream gravel extraction can affect riparian vegetation by accelerating the rate of erosion and/or precluding the deposition of materials (and subsequent establishment of vegetation) over time. These changes can occur both upstream and downstream of active mining areas, as well as directly at the extraction sites.

Instream gravel extraction, in excess of net recruitment and replenishment will cause stream bed degradation which, in turn, results in a lowering of the water table. Many riparian species thrive where they do because of their specific water requirements. A significant lowering of the water table will alter the density and diversity of plant species growing in any specific location. Young shoots of arroyo willow, for instance, tend to colonize close to the water's edge in order to take advantage of the proximity of the water table. A lowering of the water table due to degradation of the low-water wetted channel changes the location where new colonization of these species will occur and stresses existing young stands.

Methodology

The use of aerial photography and field investigations conducted by Karen Theiss in February, 1993, indicate the presence of four distinct habitat types: gravel bar, riparian scrub, mature riparian forest, and ponds and backwaters. Ponds and backwaters are infrequent within the scrub and forest vegetation types. The investigative work of Mad River Biologists adds an additional habitat type: developing riparian forest.

Arbitrary cover class designations are used within the report as follow:

sparse .... <10% cover
low.............. 10%-30% cover
moderate..... 30%-70% cover
dense .... 70%-90% cover
very dense......... >90% cover

Starting at the gravels alongside the channel, a cross section of riparian vegetation correlates to terrace elevation and depth of sediment deposits: from sparse herbaceous vegetation at the lowest elevations; to low-density woody vegetation (early successional scrub) on the lower terraces; to dense woody vegetation (late successional scrub) on the moderate-elevation terraces; to riparian forest on the higher terraces. Of importance to the development of vegetation in terrace evolution is the deposition of silt and fines, which provide a medium for vegetation development. As early vegetation establishes, additional sediment is trapped and nutrients are added to the developing soil. This process continues as the terrace evolves, allowing for the establishment of woody scrub species and, eventually, tree species.

Remnant channels and backwaters occur throughout the study area, and interrupt the vegetative progression. These create linear stands of differing ages of scrub vegetation and, occasionally, young forest vegetation. Some backwaters and ponds persist long enough to allow for the development of emergent wetland vegetation, which provides a small but notable component of the riparian vegetation complex.

Riparian vegetation provides a high degree of potential wildlife habitat value The dynamic nature of riverine systems results in the establishment of different zones of vegetation, each with its own special characteristics. Even within a single habitat type, early successional stages offer different habitat values than do later, more mature stages.

<u>Gravel Bar</u>

The gravel bar habitat encompasses an area that is seasonally inundated and scoured by normal winter flows. The substrate is comprised of varying amounts of cobbles, pebbles, and gravel, with minor amounts of silt and sand. Large woody debris (tree trunks and root wads) has accumulated at a number of spots within this habitat type.

Gravel bars support annual forbs and grasses during spring and summer months. During the winter months this ephemeral vegetation is washed away and these areas are generally devoid of perennial woody vegetation. In some areas, large woody debris provides localized protection for vegetative growth. The diversity and density of this vegetation is variable and depends on site-specific characteristics, including period and length of inundation, availability of moisture during summer months, insolation, substrate qualities, scour, deposition, and mechanical disturbance.

Drought conditions, such as in the recent past, lead to reduced winter flows and a lowering of the water table which may allow sparse woody vegetation, primarily arroyo willow (*Salix lasiolepis*) or coyote brush (*Baccharis pilularis* var. *consanguinea*), to establish in some areas which might not otherwise support these species. These areas of young woody vegetation are often linear patches running parallel to the direction of high winter flow. As these patches mature, they trap sediment and debris, resulting in the formation of hummocks of differing vegetation within the gravel bar habitat.

Riparian Scrub

Riparian scrub extends transversely from the lowest terraces bordering the gravel bar to the uppermost terraces, supporting riparian forest. The substrate is comprised of coarse fragments (cobbles, pebbles, and gravel) overlain with fine deposits (sand and silt) which increase in depth from the lower to upper terraces. Woody debris has accumulated in some of the lower areas, and appears to be generally smaller than that found on the gravel bars. This debris is often trapped against existing vegetative stands.

Vegetation varies within the habitat, in terms of diversity, density, and spatial distribution. The greatest vegetative diversity is found within the early successional stages on the lower terraces, which are characterized by extensive herbaceous cover and sparse young woody vegetation (coyote brush and/or arroyo willow). Late successional vegetation is located at slightly higher elevations and is generally underlain with a deeper layer of fine deposits and a more developed soil. The later stages are characterized by a decrease in herbaceous cover, an increase in shrub density and cover, a deepening of fine deposits, and an increase in elevation. Young red alder (*Alnus rubra*) and black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) may be found sparingly at the upper edges of mature scrub vegetation.

It appears that the combined influences of the recent drought, along with channel degradation, may have allowed the early stages of the riparian scrub to encroach further onto the gravel bar than would occur during "normal" hydrologic years. Recent low winter flows have deposited fine sediments at lower elevations in areas that are usually subject to annual scouring. The accumulation of these sediments has, in turn, allowed for encroachment of herbaceous and woody species, and expanded the spatial extent of the scrub habitat and its associated potential wildlife value.

Riparian Forest

This habitat is located on higher terraces and is usually the farthest from the river channel. On alluvial terraces, the substrate is characterized by deep silt and sand deposits overlying coarse material. River-borne woody debris is sparse to absent within this habitat. On native slopes (e.g., between Glendale and Essex, and upriver of the fish hatchery), the substrate is comprised of native material, with occasional rocky outcrops.

Depending on historic river channel locations, flood activity, and land use practices, single-aged or mixed-aged stands of vegetation may exist within the riparian forest. Within the study area, the riparian forest is typified by moderately dense to dense canopy cover with black cottonwood, red alder, and yellow willow (*Salix lasiandra*) being dominant. In more mesic areas, associated canopy species include California bay (*Umbellaria californica*) and cascara sagrada (*Rhamnus purshiana*), with occasional Sitka spruce (*Picea sitchensis*) and coast redwood (*Sequoia sempervirens*). By virtue of its spatial location, the riparian forest is protected from frequent periodic inundation, which, in turn, has allowed the canopy species to develop and mature.

The shrub layer is present in low to moderate cover classes. Characteristic species include coyote brush, salmonberry (*Rubus spectabilis*), and red elderberry (*Sambucus racemosa* ssp. *pubens* var. *arborescens*), with California blackberry (*Rubus vitifolius*) and Himalaya berry (*Rubus discolor*) being more evident along the edges and in disturbed areas. The herb layer generally exhibits low cover values, with sword fern (*Polystichum munitum*) and bracken fern (*Pteridium aquilinum* var. *pubescens*) being typical.

The relative species composition of the riparian forest varies within the study area. In some stands, cottonwood is the dominant species, with red alder being a moderate to very minor component. Other stands are dominated by red alder, with cottonwood being a minor to absent component. Yellow willow was noted primarily in the vicinity of Graham Bar, associated with both cottonwood and red alder. The age class of forest vegetation also varies within the study area. The young forest complex adjacent to Graham Bar has developed within the last 25 years. Examples of older stands include those just downstream of Hatchery Bridge, as well as those adjacent to agricultural fields in the Blue Lake area. Isolated mature cottonwood in adjacent agricultural fields are most likely remnants from a more extensive forest which existed prior to clearing for agriculture.

Ponds and Backwaters

Isolated backwaters and ponds within the scrub habitat are subject to inundation and accumulate silt deposits. A number of these ponds and backwaters persist for a period sufficient to support a different flora, with the vegetation characterized by hydrophytic species. Slough sedge (*Carex obnupta*), broadleaf cattail (*Typha latifolia*), and horsetail (*Equisetum laevigatum*) are the most common. Adjacent vegetation is variable, from sparse to very dense shrubs and young trees. The location of these backwaters and ponds change periodically, depending on the annual flow characteristics of the river.

Sensitive Plant Species and Plant Communities

An inquiry was made to the Natural Diversity Data Base with regard to the presence of rare, threatened and/or endangered plant species within the project area. There are no records of any such species within the study area. Additionally, a review of the 'Inventory of Rare and Endangered Vascular Plant Species' (CNPS, 1988) and the California Department of Fish and Game's Special Plant List (CDFG, 1991) did not reveal any species which would be expected within the habitats found in the study area. As of this writing, no rare, threatened and/or endangered plant species have been found in or near the project area. However, the North Coast Chapter of the California Native Plant Society has expressed an interest in having the North Coast Black Cottonwood Riparian Forest listed with the California Natural Diversity Data Base as an endangered habitat type (Keeler-Wolf, 1993) and remnants of this plant community are found in the Mad River riparian corridor

Wildlife Habitat Value

The wildlife habitat value of the gravel bar is low in comparison with the remaining riparian habitats due to the relative absence of cover and scarcity of food. Scattered patches of woody vegetation, which have developed within the gravel bar habitat, act to locally enhance wildlife values by providing cover and a food source for species which may not usually be found here.

The riparian scrub provides habitat for a wide variety of small and moderate-size mammals and birds. In general, the potential wildlife habitat value increases with an increase in the vegetative density, with the denser stands supporting a greater diversity of species and number of individuals.

The riparian forest provides a high degree of wildlife habitat value, due to well-developed vertical structure, extent of cover, and food availability. This habitat is utilized by a wide variety and large numbers of insects, birds, and mammals.

Persistent ponds and backwaters with emergent vegetation provide habitat for several wildlife species of concern, including the California Red-legged frog, the Northern Yellow-legged frog, and the Western Pond Turtle. The potential value of this habitat lies not so much in the diversity of species, but in the particular special species which it supports. These ponds and backwater areas likely meet the wetlands criteria of both the California Department of Fish and Game and the US Army Corps of Engineers.

Table 5.7-1 Compiled Vegetation Species List

CANOPY SPECIES

Alnus rubra	red alder
Ilex aquifolium	English holly
Picea sitchensis	Sitka spruce
Populus balsamifera ssp. *trichocarpa*	black cottonwood
Rhamnus purshiana	cascara sagrada
Salix lasiolepis	arroyo willow
Salix lasiandra	yellow willow
Sequoia sempervirens	coast redwood
Umbellaria californica	California laurel

SHRUB AND VINE SPECIES

Baccharis pilularis ssp. *consanguinea*	coyote brush
Rubus discolor	Himalaya berry
Rubus spectabilis var. *spectabilis*	salmon berry
Rubus vitifolius	California blackberry
Sambucus racemosa ssp. *pubens* var. *arborescens*	red elderberry

HERB AND FERN SPECIES

Anaphalis margaritacea	pearly everlasting
Bellis perenne	English daisy
Bromus sp.	brome
Carex obnupta	slough sedge
Cirsium vulgare	bull thistle
Cortaderia selloana	pampas grass
Daucus carota	Queen Anne's lace
Dipsacus fullonum	teasle
Equisetum laevigatum	horsetail
Festuca sp.	fescue
Foeniculum vulgare	fennel
Hedera helix	English ivy
Holcus lanatus	velvet grass
Hypochoeris radicata	perennial cat's ear
Melilotus alba	sweet white clover
Plantago lanceolata	English plantain
Poa sp. bluegrass	
Polystichum munitum	sword fern
Pteridium aquilinum var. *pubescens*	bracken fern
Raphanus sativa	wild radish
Scrophularia californica	California beeplant
Stachys sp.	hedge nettle
Trifolium sp.	clover
Typha latifolia	broadleaf cattail
Verbascum thapsus	wooly mullein
Vinca major	periwinkle

Site Specific Vegetation Characteristics

Guynup Bar (Site No. 1):

The Mad River Sand and Gravel - Guynup Bar (Site No. 1) includes a processing yard located on the uppermost terrace, as well as the bar itself. There is a remnant stand of riparian forest on the southeasterly side of the processing yard, which extends down slope to meet with a mature scrub stand at the bottom. The forest supports a mix of cottonwood and red alder, with some mature arroyo willow. There was standing water several feet deep along the base of this slope, with vegetation on both sides, at the time of field review, by Theiss in the winter 1992-93. This was either a remnant channel or a backwater area with potential habitat value for amphibians. A mix of forest and mature scrub continues northerly along the bank. The remainder of the area is comprised of gravel bar habitat and early to mid-successional scrub habitat.

Emmerson Bar (Site No. 2):

The Redwood Empire Aggregates - Emmerson Bar (Site No. 2) is characterized primarily by gravel bar and early successional riparian scrub. There are a few isolated patches of woody vegetation, including several stands of 20-foot arroyo willow in the gravel bar, and a patch of young cottonwood (to 25-30 feet), arroyo willow, and coyote brush in the lower reach of the riparian scrub. These patches have been able to mature sufficiently in recent years, to attain some height and begin accumulating silt and other debris at the base. The patches likely enhance the habitat value of the bar and lower terrace by providing cover and some food for wildlife.

This bar has a pond with emergent vegetation (primarily cattail) located at the northerly end of the bar, at the base of the slope. It is surrounded by a moderately dense stand of arroyo willow and red alder. This pond potentially has high habitat value for amphibians, due to its persistence and the presence of good vegetative cover. This area likely meets the wetland criteria of both the California Department of Fish and Game and the US Army Corps of Engineers.

Blue Lake bar (Site No. 3):

Much of the Redwood Empire Aggregates - Blue Lake bar (Site No. 3) is typified by gravel bar bordered with early successional riparian scrub, with patches of later successional scrub (dense arroyo willow thickets) concentrated in the northerly portion. There is a small stand of cottonwood (riparian forest) on the slope from the processing/storage yard down to the pond. In addition, there is a large patch of transitional scrub/forest to the south of the pond; this area has an approximate 20% cover by coyote brush and clumps of arroyo willow and small diameter cottonwood, 15 and 25 feet in height, respectively.

Due to the lack of riparian forest on this site, this area, particularly the woody clumps, should be avoided during extraction so as to allow for the maturation of the cottonwood and development of riparian forest. Development of riparian forest at this site, would not only diversify the on-site habitat and increase the value to wildlife, but would assist in providing a corridor for wildlife migration between forest patches upstream and downstream of this bar.

Christie Bar (Site No. 4):

Nearly all of the Eureka Sand and Gravel - Christie Bar (Site No. 4) supports the gravel bar and very early successional riparian scrub habitat types. A few patches of arroyo willow exist toward the established scrub habitat. In addition, there is a small population of mixed riparian forest and scrub on a terrace remnant toward the easterly (upstream) end of the bar. This terrace remnant is rapidly eroding. Two ponds have been excavated on the bar, one toward the upstream side (1989) and one toward the downstream side (1992). There is a broad stand of mature scrub and patches of forest vegetation between the processing yard and the gravel bar, much of which has evolved over the last few decades.

The continued use of the existing roads between the processing and extraction areas is in order to preclude disruption of this stand. Revegetation in and around the ponds could be incorporated for mitigation should these areas not revegetate naturally.

Johnson Bar (Site No. 5):
Most of the Redwood Empire Aggregates - Johnson Bar (Site No. 5), is comprised of gravel bar habitat. There was a small linear stand of scrub willow (to 10 feet in height) noted by Karen Theiss, as well as patches of early successional scrub. There is a broad terrace above this bar to the south, which is dominated by early and mid-successional scrub vegetation, with strips of mature scrub. There were a few older backwater channels, which may persist long enough for amphibian breeding. If so, these areas should be avoided during excavation. Planting around these backwater channels for mitigation of impacts on other areas of the bar would enhance the potential wildlife value.

Essex Bar (Site No. 6):
The upper terrace of the Mercer Fraser - Essex Bar (Site No. 6) is utilized for the storage of materials from this and other bars. Vegetation in this area is quite sparse, with ruderal (weedy) herbaceous species and a few coyote brush being noted in areas not recently disturbed. There is a narrow band of mixed scrub and forest vegetation between the storage terrace and the riverside gravel bar, characterized by arroyo willow and red alder with sparse cottonwood. The gravel bar is devoid of vegetation.

Johnson-Spini bar (Site No. 7):
The Arcata ReadiMix - Johnson-Spini bar (Site No. 7) is characterized by two large gravel bars just downstream of the US Highway 299 bridge, and a very small strip of gravel bar along the southerly bank. Moderate amounts of sediment have been deposited unevenly on the bars during the past winter. There is no vegetation on either bar; the northerly bank of the this stretch of river has been lined with rip rap, and supports a moderately dense cover of arroyo willow (scrub). The southerly edge of the study area is lined with a mature forest supporting a mix of cottonwood and red alder.

Arcata ReadiMix bar (Site No. 7):
This Arcata ReadiMix - Arcata ReadiMix bar (Site No. 7) is comprised primarily of the processing plant and storage yard. There is a mature stand of mixed scrub-forest vegetation along the easterly half of the slope descending from the upper terrace to the river. At the time of field investigation by Karen Theiss, the entire area below this band of vegetation had been covered with up to several feet of sediment; no exposed gravels were noted.

Graham bar (Site No. 8):
This Redwood Empire Aggregates - Graham bar (Site No. 8) includes the Redwood Empire Aggregates processing yard and narrow bar on the south side of the river, a long narrow bar on the northerly bend on the river, and another bar on the westerly side of the downstream bend. The southerly side of the river supports a band of fairly mature forest, dominated by red alder with yellow willow and cottonwood present in lesser amounts. There is a pocket of mature scrub vegetation on the downstream bend, and sparse early scrub vegetation on the bar itself.

The northerly bar, across from the processing plant, is at the edge of a moderately- aged stand of mixed forest vegetation, which has developed within the last twenty-five years. Several low-lying areas within the forest are wet enough to support emergent vegetation. There are no stands of forest vegetation of equal or greater size downstream.

Simpson-Zabel bar (Site No. 9):
The Simpson-Zabel bar (Site No. 9) is bound by native slopes on both sides of the river, rather than alluvial terraces. The current channel is on the northerly side of the canyon. This site supports an open gravel bar habitat with early scrub vegetation being extremely sparse to absent. The banks on both sides of the river support mature arroyo willow on the lower slope and a mature red alder forest on the upper slope. At the top of both banks, the deciduous riparian forest grades into a mixed forest with cottonwood, alder, and sparse California bay (*Umbellaria californica*) and Sitka spruce (*Picea sitchensis*).

Bank erosion in this area would result in the loss of mature riparian scrub and forest habitat, and could undermine the upland forest on top of the bank. Due to the current position of the low-water wetted channel, the northerly bank is probably more exposed to erosion than is the southerly bank.

Upper Simpson bar (Site No. 10):
This Simpson Timber bar - Simpson bar (Site No. 10) is located at the upstream end of the Blue Lake Valley. It is characterized by a mid-stream gravel bar, gravel bar and early to mid-aged scrub on the easterly side, and mixed young and moderate age scrub on the westerly side. Portions of the westerly bank are being actively eroded. While mature scrub and riparian forest were not observed within the active area defined by the county, they are located adjacent to and westerly from the site.

Impact Statements and Mitigation Measures

Impact
Veg-1 Consultants to this project have stated time and again that protecting all stages of riparian forests is the single most important element in ensuring good wildlife populations in the project area. Much of the natural riparian habitat originally present in the Mad River corridor has already been destroyed by agricultural conversion, the construction of levees, the development of roads, highways residential areas, and industrial areas and other causes. This loss of riparian habitat is cumulative and has been significant. Any further removal of significant riparian habitat, whether for gravel extraction or other purposes, has the potential to produce additional significant adverse impacts, primarily due to the potential loss of wildlife habitat, and must be mitigated. (S/S)

Mitigation
Mit-1: The implementation of Mit-1 includes site specific and project area monitoring of riparian habitat characteristics and disturbances. See Table 1.4-2 for preliminary information regarding the percentages of the project-area river reaches that are subject to direct impact disturbance through excavation and the percentages that are not subject to direct excavation disturbance. These "open areas" plus areas avoided within the ownerships of extraction sites help support botanical and wildlife habitat diversity. Information obtained by monitoring disturbances and vegetation presence and diversity throughout the entire project area will be used by the SDRC while selecting specific extraction sites, while determining quantities to extract, while designing extraction methodologies, and while considering site specific mitigation

measures. Avoidance, offsite revegetation, and the devlopment of new stands of riparian habitat in conjunction with high-terrace shallow-pit minimg are just three of the alternatives that the SDRC can consider when they find significant stands of vegetation are threatened. During the monitoring and planning phases of this project the SDRC will look for opportunities to mitigate for past losses in riparina habitat. Onsite and offsite revegetation and the devlopment of new stands of riparian habitat in conjunction with high-terrace shallow-pit minimg are some of the alternatives that the SDRC will consider when changes in river morphology or other factors produce opportunities for additional vegetation mitigation. These safeguards will help reduce past cumulative effects and assure that future gravel extraction-induced disturbances to riparian vegetation will be less than significant. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Mit-8: No new haul roads shall be constructed through established riparian forest under this project. Abandoned haul roads and trails will replanted.

Mit-9: Gravel stockpiles shall be maintained in historic locations in a manner to assure no encroachment into significant wildlife habitat. No new stock pile locations shall be established in riparian forests under this project. Abandoned stockpile sites will be replanted.

Monitoring
Humboldt County/Scientific Design and Review Committee

Significance After Mitigation
Although the cumulative losses will remain significant, future losses due to gravel extraction will be less than significant

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Impact

Veg-2 The indiscriminate removal of riparian vegetation, whether for gravel extraction or other purposes has the potential to produce significant adverse impacts due to the loss of bank stability. Loss of bank stability has both favorable and unfavorable impacts. If banks are unstable the river may tend to meander. When a river meanders it recruits sediment from terraces and produces less downcutting. (PS/LS)

Mitigation
Mit-1: This mitigation measure should reduce the rate of bed degradation and the cumulative impacts of bed degradation on bank stability and erosion to a level of insignificance. This mitigation measure also has the potential to reduce the cumulative adverse impacts of excessive channel aggradation on bank erosion. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

Mit-3: The Mad River is a dynamic ecosystem that is constantly being influenced by the forces of man and nature causing bank eroson problems to occur periodically. The SDRC shall monitor river banks in the project area and shall attempt to gain access and permission to initiate bank-stabilizing revegetation practices at sites where bank erosion is considered excessive, where revegetation may reduce the erosion rate, and especially where revegetaion can be used to mitigate for current or cumulative losses in riparian habitat. No specific sites are reccomended for this treatment now. Monitoring will help identify the sites and the success of this tecnique will depend, in part, on the cooperation of land owners and the availability of funds.

Mit-8: No new haul roads shall be constructed through established riparian forest under this project. Haul roads and other access routes that are abandoned will be replanted.

Mit-9: Gravel stockpiles shall be maintained in historic locations in a manner to assure no encroachment into significant wildlife habitat. No new stock pile locations shall be established in riparian forests under this project. Abandoned stockpile sites will be replanted.

Monitoring
Humboldt County/Scientific Design and Review Committee

Significance after Mitigation
Less than significant

Impact
Veg-3: The repeated removal of gravel in certain locations will alter the successional development of gravel bars, terraces, and vegetation at those locations. Continued excavation in any one area precludes the natural evolution of terraces and subsequent development of riparian vegetation. The low-lying herbaceous and early scrub habitats would be the most affected. The localized long-term effects would include: A) the loss of early stage scrub; B) the maturation of the later stage scrub and forest; C) a decline in vegetative diversity; D) a decline in wildlife habitat values; and E) a likely decline in wildlife diversity. These impacts are cumulative and significant. (S/S)

Mitigation
Mit-1: Mit-1 will provide the SDRC with the monitoring data needed to effectively limit gravel extraction to the point where this potential impact will be less than significant. Avoidance and offsite revegetation are just two of the more site specific mitigation alternatives that the SDRC will consider and implement when they find significant terraces or stands of vegetation are threatened by repeated excavation at any one site. Refer to Section 2.3 or 5.1 for the complete text of Mit-1.

See Table 1.4-2 for preliminary information regarding the percentages of the project-area river reaches that are subject to direct impact disturbance through excavation and the percentages that are not subject to direct excavation disturbance. These "open areas" plus areas avoided within the ownerships of extraction sites may help support terrace successional processes and habitat diversity. Information obtained by monitoring disturbances, vegetation presence, and terrace development and diversity on gravel bars located throughout the entire project area will be used by the SDRC while selecting specific extraction sites, while determining quantities to extract, while designing extraction methodologies, and while considering site specific alternatives. Avoidance is an alternative to disturbance that the SDRC can consider while evaluating site-specific extraction plans. This safeguard may help limit overall gravel extraction-induced impacts gravel bar and terrace development to a point that will be less than significant.

Monitoring
Scientific Design and Review Committee

Significance after Mitigation
Although future gravel extraction related losses will be insignificant, the cumulative impacts will remain significant

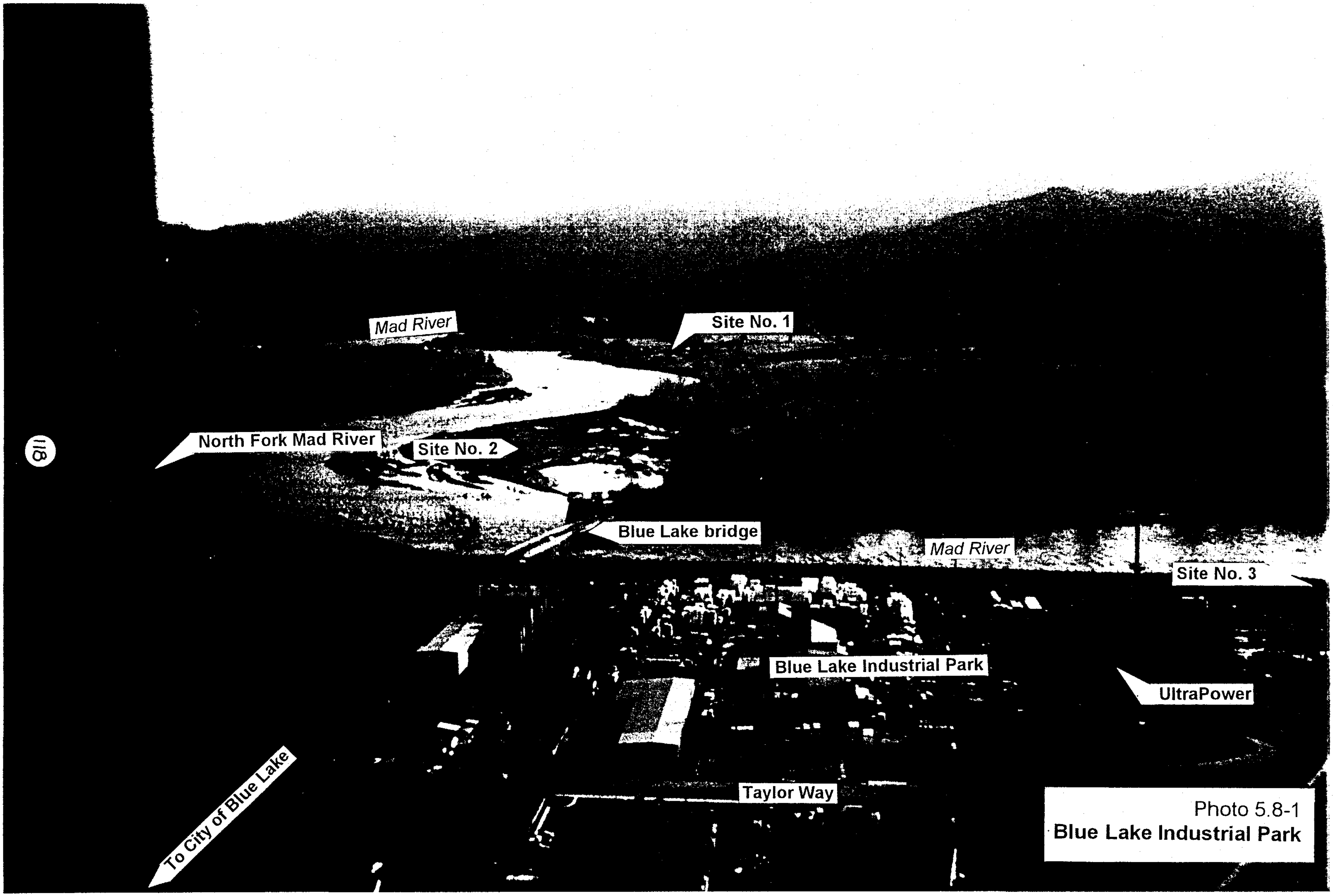

Photo 5.8-1
Blue Lake Industrial Park

5.8 Air Quality

Federal and State Regulations

The 1970 Clean Air Act gave the U.S. Environmental Protection Agency (EPA) the authority to set federal ambient air quality standards. The Act indicated the need for primary standards to protect public health, and secondary standards to protect public welfare from effects such as reduced visibility, soiling and nuisance (Sonoma County ARMP & EIR).

State ambient air quality standards were established in California in 1969, pursuant to the Mulford-Carrell Act. California air quality standards are administered by the California Air Resources Board (CARB). CARB predominantly regulates "tailpipe" emissions from vehicular sources, but has delegated authority to regulate stationary sources to the local Air Quality Management District (AQMD) and Air Pollution Control District (APCD) (Sonoma County ARMP & EIR).

Northcoast Regulations

Air pollution monitoring first began in the North Coast Air Basin (Del Norte, Humboldt, Mendocino and Trinity Counties, and part of Sonoma) in 1956 with particulate sampling in Crescent City. Air monitoring provides important data for regulating and controlling air pollution. Monitoring efforts on the North Coast have been focused on "criteria pollutants," defined as the major air pollutants from which federal and state agencies have set ambient air quality standards (Table 5.8-1). Ambient air quality standards are set limits for each criteria pollutant in the outside air, based on predicted health effects (NCUAQMD).

Table 5.8-1 Criteria Air Pollutants and Ambient Air Quality Standards

Pollutant	State Standard	Federal Standard
Ozone	0.09 ppm/hour	0.12 ppm/hour
Carbon Monoxide	20 ppm/hour average	35 ppm/hour average
Nitrogen Dioxide	0.25 ppm/hour	0.053 ppm/hour average
Sulfur Dioxide	0.25 ppm/hour	0.14 ppm/24-hour
Suspended Particulate Matter		
(PM_{10})	50 μg/m^3/24-hour average	150 μg/m^3/24-hour average
Sulfate	25 μg/m^3/24-hour average	none
Lead	1.5 μg/m^3/30-day average	1.5 μg/m^3/90-day average
Hydrogen Sulfide	0.030 ppm/hour	none
Vinyl Chloride	0.010 ppm/24-hour average	none

Units: ppm = parts per million
μg/m^3 = micrograms per cubic meter

Data adopted from: NCUAQMD., Summary of Air Monitoring Data In The North Coast Unified Air Quality Management District, March, 1993.

The North Coast Unified Air Quality Management District (NCUAQMD) is responsible for monitoring and regulating both federal and state air quality standards for Humboldt County. The NCUAQMD operates a sophisticated air monitor at the County's Public Health Department at 6th and I Streets, Eureka, CA. Single suspended particulate matter levels are measured during a 24-hour period about 60 times per year and from those readings a yearly average is calculated. (NCUAQMD).

Suspended particulate matter is less than 10 microns or one-millionth of a meter in diameter, and thus termed PM10. Particulates are solid matter from smoke, dust, fly ash or liquid droplets from condensing vapors which can be suspended in the air for long periods of time. PM10 has the potential to affect breathing functions, causing increased respiratory disease, lung damage and premature death. It can also damage paint, soil clothing and reduce visibility. The major sources of this pollutant include industrial processes, automobiles, wood smoke, dust from paved and unpaved roads, construction and agricultural practices (NCUAQMD).

Ambient air quality standards are levels set for air pollutants in outside air which should not be exceeded and are based on the predicted health effects of those pollutants. Exceeding state or federal air quality standards is termed "non-attainment." According to NCUAQMD, about seven readings per year exceed the state standard.

Project Area

The Mad River transects highway 101 at river mile 5.6, and highway 299 at river mile 7.8, highway 299 also parallels the river up to Blue Lake. Aside from the minor influences of vehicular emissions on air quality, the lower reach of the project area from Hammond Bridge up through the Blue Lake valley, can be affected by Louisiana-Pacific's Particleboard plant emissions.

Air quality of the Mad River basin is also affected by the emissions of UltraPower, Inc. and Calgon Carbon Corp., both located in Blue Lake's industrial zone and within 200 feet of the Mad River (see Photo 5.8-1). Similarly, Blue Lake Forest Products, located on Glendale Drive approximately one-half mile from the project area, may affect air quality during its summer operations.

This lower reach region is also periodically affected by slash burning following timber harvests on nearby Simpson land in Fieldbrook, McKinleyville, Korbel and/or Blue Lake, as well as wood stove and general domestic burning.

Regional effects of emissions are accentuated by northerly and/or westerly wind conditions. Meteorological inversion and still conditions will prevent the normal rising or flushing of surface air, thus exacerbating the above listed air quality impacts.

The particulate emissions of Louisiana-Pacific, Simpson, UltraPower, Calgon Corp. and Blue Lake Forest Products all fall under the regulations and enforcement of the North Coast Unified Air Quality Management District. Further up the project reach, towards the former Sweasey Dam, air quality improves as human-induced impacts decrease.

Ambient air quality along the flood plain is also affected by dust raised by high winds. As the active channel recedes in late spring, exposing sediment deposited along the river at high flow, dry weather and wind mobilize the fine silt. The airborne fines can limit visibility and create dusty conditions.

Air Quality Impacts

Air-suspended particulates from the use of vehicles, aggregate crushing, sorting and extraction operations required in many gravel mining operations have the potential to affect air quality.

Vehicle and site equipment exhaust emissions are generated by a variety of gasoline and/or diesel-powered equipment. Exhaust emissions include those associated with the transport of workers, machinery, and supplies to and from a site, as well as those produced on-site by the operation of the equipment. The transporting of heavy equipment and gravel from the site to the processing yard over unpaved roads also generates dust, as do the unloading and conveying of aggregates.

Skimming operations can temporarily raise dust levels at the extraction site. Following the removal of the top layer of sediment, often referred to as the "pavement layer," the underlying fines have an increased susceptibility to becoming airborne by high wind currents. Pit mining above the water table can also have temporary air quality impacts similar to those of skimming.

Particulate emissions from concrete batch plants consist primarily of cement dust, but some sand and aggregate dust emissions do occur during operations. Batch plant operations, as well as crushing and sorting dust emissions fall under the enforcement of the North Coast Unified Air Quality Management District (see Photo 5.8-2). Sprayers for dust suppression are required for some crushing operations. The dust is then washed into sediment settling ponds, which are regulated by RWQCB.

Emissions from aggregate processing include the release of nitrogen, oxygen and carbon dioxide, which are within acceptable limits and are an insignificant impact to air quality.

Any dust that might contribute to a nuisance problem generally settles out of the atmosphere within 300 feet of the site (EPA, 1978). Particles of less than 30 microns in size stay airborne for a fairly long period of time, while particles larger than 100 microns tend to settle out of the air within 30 feet of the source.

Generally, industry standards indicate that watering the road twice a day reduces dust associated with truck traffic by 50 percent, and reducing speed limits to 15-20 m.p.h. reduces dust 65-80 percent. Furthermore, the NCUAQMD Regulation 1, Rule 430 allows enforcement of excessive amounts of fugitive dust generated in open areas such as roads, stockpiles or the extraction site.

Impact Statements and Mitigation Measures

Impact
Air-1: Gravel extraction operations involve the use of gasoline or diesel-powered equipment that emit exhaust emissions. The air emissions are regulated by the NCUAQMD. There is no evidence that exhaust emission resulting from the project cause significant impacts. (LS/LS)

Mitigation Measures
Since no significant impact was identified, no mitigation is required.

Monitoring
North Coast Unified Air Quality Management District

Impact
Air-2: The project may involve the generation of dust. Dust emissions are regulated by the NCUAQMD. Some operations coupled with dry weather and heavy winds can emit fugitive dust in excess of adopted standards. This would be a significant impact. (PS/LS)

Mitigation Measures

Mit-11: Implement mitigation measure Mit-11 (watering roads and processing areas). This will reduce dust by approximately 50% (RSE, 1993).

Mit-12: All operational traffic shall observe a maximum speed limit on unpaved roads of 20 m.p.h. This will reduce dust by approximately 65-80% (RSE, 1993).

Monitoring

Scientific Design and Review Committee
North Coast Unified Air Quality Management District

Significance after Mitigation

Less than significant. The combined measures will significantly reduce fugitive dust.

Photo 5.8-2
Processing Facilities

5.9 Viewshed

The County retained Rising Sun Enterprises to gather and analyze information on viewsheds, recreation, noise, and traffic in the project area with particular reference to gravel extraction operations; and to analyze the effect of historic gravel extraction operations on the recreational use of the project area. Portions of the following section were adapted from the Rising Sun report. See Appendix E for the complete report.

General Setting

The area between the former Sweasey Dam and the Mad River Fish Hatchery is characterized by steep forested slopes on either side of a narrow confined river channel. This area is privately owned and has restricted public access. Below the Mad River Fish Hatchery, the river flows through a valley characterized by wide river meanders, steep cut river banks and corridors of established riparian vegetation. The Mad River valley between the Mad River Fish Hatchery and the Highway 101 bridge is developed with several communities that include residential, agricultural, commercial, and industrial activities. Below the Highway 101 bridge, land use is predominantly agricultural grazing land.

Blue Lake Viewshed:

Because of streamside vegetation along Dave Powers Creek, access to and views of the river are very limited within the City of Blue Lake. Gravel bars can be seen while crossing the Hatchery Road bridge and from the top of the flood control levee, north of the river. The primary access to the river at Blue Lake is via the Hatchery Road bridge and levee. The Emmerson bar (Site No. 2) and Blue Lake bar (Site No. 3) extraction areas are both visible from the bridge and levee. No other views of the river are available along Hatchery Road. An embankment of dirt and concrete blocks which runs parallel to Hatchery Road has been constructed in an attempt to limit vehicle access to Emmerson river bar. Further south along Hatchery Road, the Mad River Sand & Gravel processing site (Site No. 1) can be seen in the distance, approximately 650 feet off the road.

The Old Meander, where the Mad River flowed until 1964, has become vegetated and portions of the adjacent land are utilized for Potters Produce vegetable growing. From Hatchery Road, an attentive eye can spot signs of the old river channel and the former bridge. Refer to the Public Utilities and Structures section for more information on this bridge and site.

From Blue Lake to Arcata along West End Road, views are mostly screened by dense stands of riparian vegetation. Blue Lake bar and Christie bar (Site No. 3 and 4) stockpiles and extraction activity can be seen along a limited stretch of the road directly opposite the operations. Warren Creek Road, off of West End Road, has views of the river from the park adjacent to Pump Station #4 to Pump Station #5. Warren Creek Road ends as a private road, with neither views nor public access to the river.

Arcata Viewshed

West End Road closely parallels the river. When the summer foliage has fallen from the trees, Essex bar (Site No. 6) can be viewed. Further west at the recreational park located adjacent to the Humboldt Bay Water District facilities, views of the river can be obtained by a walk through the park. Along West End Road, between the Water District buildings and Highway 299, the river can be viewed through the trees.

No views of the river are available from Giuntoli Lane, although Redwood Empire Aggregates (Site No. 8) and Arcata ReadiMix processing plants and stockpiles (Site No. 7B) are visible.

Highway 299 Viewshed

While driving westbound on 299 down the Lord Ellis Summit, there are distant views of the Mad River, and the Blue Lake, Christie and Johnson bars (Site No.s 3, 4 and 5).

Eureka Sand & Gravel's (Site No. 4) processing and stockpile yard is highly visible from Highway 299. Some evergreen plantings exist within the CalTrans right-of-way, but most of the processing and stockpile yard is exposed.

The Glendale Road underpass offers a view of the upstream end of Johnson bar (Site No. 5) and the Eureka Sand & Gravel's Christie bar (Site No. 4).

Eastbound Highway 299 passes several pump stations, the Water District buildings and utility yard, and Mercer Fraser's Essex bar, processing and stockpile yard (Site No. 6) are visible. Only short glimpses of the river are possible along this stretch. The streambank is lined with cottonwoods, willows and alders with conifer trees planted both within the CalTrans right-of-way and growing naturally on adjacent land. Adjacent to the Essex Lane underpass, the railroad bridge and the river can be seen. The river is then hidden by the adjacent streambank and dense vegetation.

The only other view of the river is from the Highway 299 bridge. The Water District buildings or the Johnson-Spini bar (Site No. 7A) can be seen from the bridge, depending on the direction one is driving. Gravel extraction is visible from westbound 299 when it occurs on the Johnson-Spini bar (Site No. 7A).

Northbank Road Viewshed
Northbank Road runs along the north bank of the Mad River and links Highway 299 with northbound Highway 101. Views from North Bank Road consist primarily of grazing land and streambank riparian vegetation, with only occasional glimpses of the river.

As Northbank Road passes the Johnson-Spini and Arcata ReadiMix bars, and the Graham bar (Site No. 7A, 7B and 8), the gravel extraction operations are hardly noticeable because of the curvature and narrowness of North Bank Road. The Johnson-Spini bar (Site No. 7A) and Highway 299 bridge are visible from pull-offs along Northbank Road.

Highway 101 Bridge Viewshed
There are currently no views of mining operations from the Highway 101 bridge. Historical or future views would be minimal.

River Viewshed
The viewshed from the Mad River is affected by gravel extraction and processing activities in the area between the Mad River Fish Hatchery and Highway 101. Gravel extraction and processing activity can be viewed from the river itself or from limited roads that lie close to the processing plants.

Consider floating down the river from the hatchery weir to the County boat ramp (a distance of 11.3 miles). During 6.1 miles (54 percent of the reach) one or both of the banks would be connected to one of the ten sites where gravel extraction is permitted or proposed. During the rest of the trip (5.2 miles or 46 percent of the reach) neither bank would be connected to an existing or proposed extraction site. If you subtracted out the two unauthorized sites the open reach would total 5.9 miles (52 percent of the float trip) and the extraction reaches would total 5.4 miles (48 percent of the trip).

Refer to Table 1.4-2 for more details on open river reaches and river reaches connected to extraction sites. River alignment, river banks, and vegetation will influence the actual view while in each reach. Part of the time, while in an open reach and approaching an extraction reach extraction areas and processing areas may be visible. And, part of the time while in an extraction reach no extraction areas or processing sites would be visible. Other factors such as highways, bridges, levees, and water district facilities would influence the view as well.

During the winter months there would be less vegetative screening due to the deciduous nature of much of the riparian vegetation. Also during the winter months there would no extraction activity on the bars and there would be no summer bridges across the river. Noise from the turbulent water would likely mask most sounds from adjacent highways and processing sites. Finally, boaters would likely be moving faster and concentrating on the water more so than during the summer months.

A trip in the summer would be different. The trip would be slower and there would be more time to look around. There would also be more of a tendency to pause and relax at selected sites. There would be more vegetative screening as the deciduous trees would be leafed out. Summer bridges may be present and extraction equipment may be present at some locations in the extraction reaches. Although the river will be quieter it will still mask much of the noise from adjacent highways and processing sites.

Each operator is unique in the way they extract their gravel resource and two examples are discussed below to expand the reader's perspective. In terms of extraction equipment consider the Christie Bar and assume 35,000 cubic yards were to be extracted in a single season. These operators sometimes prefer to operate a single scraper and remove about 700 cubic yards per 8-hour day. Thus, they would operate on the bar about 50 days during a single extraction season which is usually no longer than 120 days. You would also have to further recognize that the scraper would spend half of its time traveling back and forth between the extraction site and the processing and storage site. Thus during any 8-hour day the scraper would be on the bar and most visible from the river for about four hours per day or 200 hours for the entire 50 days.

A single operator has most of the rights at both the Emmerson Bar and the Blue Lake Bar. This operator would typically prefer to operate on one bar at a time. Accordingly, the visual impact and other impacts associated with extraction would be spatially spread out.

As a side note several consultants on this project have commented that the use of motorcycles and off-road vehicles on the Blue Lake Bar and in the adjacent riparian forest during a typical summer weekend have a great impact from a noise and visual perspective and that these impacts far outweigh those that are associated with gravel extraction anywhere along the river.

<u>Overview</u>

The Mad River viewshed is affected by gravel extraction and processing activities found in the reach between the Mad River Fish Hatchery and Highway 101. Gravel extraction and processing activity can be viewed from the river itself or from limited roads that lie close to the processing plants. For the most part, views of the extraction sites afforded from public roads are screened during the extraction season by dense streamside vegetation and steep streambanks.

Project viewshed impacts readily seen by river users include extraction operations, summer bridge crossings, haul roads and some stockpiles. Processing sites and stockpiles are less visible to river users.

Although processing sites and stockpiles are less visible to river users they are highly visible from public roads. The two sites that are most visible outside of urban areas are the Essex (Site No. 6) and Eureka Sand & Gravel (Site No. 4) operations. The Redwood Empire Aggregate (Site No. 8) and Arcata ReadiMix (Site No. 7) adjacent to Giuntoli Lane are within an industrial and commercial area and are highly visible. The Mad River Sand & Gravel (Site No. 1) processing plant is visible but not close to local traffic or residences on Hatchery Road.

Introduction to the Analysis

The California Environmental Quality Act (CEQA) Guidelines state that the significant effects on the environment include substantial, or potentially substantial, adverse changes in scenic quality or in objects having aesthetic significance. Under CEQA Guidelines Section 15382, a project will normally have a significant effect on the environment if it will have a "substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project..."

Analysis of aesthetic impacts, according to the CEQA Guidelines, requires identification of important public views of the project site and evaluation of two types of potential adverse effects:

1. the effects of the proposed project on the availability of the important public views;

2. the effects of the proposed project on the scenic quality of the project site or on objects having aesthetic significance.

The first type of adverse effect consists of obstruction of important views, and the second type of adverse effect consists of impairment of important public views. Impairment of important public views can result from: 1) the introduction into an existing view of a visual feature that is "aesthetically offensive" in itself; 2) the degradation of a visual feature that has aesthetic significance; or 3) the introduction into an existing view, objects or activities which exhibit a high degree of visual contrast in comparison with the existing objects and activities of the site.

Important public views of the project are available from fixed vantage points (viewsheds) and in sequences of views along roadways (visual corridors). The major viewsheds and visual corridors within the project area are identified above.

Visual elements of the project were evaluated in relation to the past and existing visual characteristics of individual sites and of the project extraction and processing area as a whole. It should be noted that the visual impacts resulting from extraction, processing and stockpile areas are existing and have been present for many years. Although visual impacts resulting from extraction operations have occurred for many decades, each year the specific amount of extraction as well as the design and location of extraction may vary. As such their may be slight annual variations in certain perceived impacts. The visual impacts of stockpile areas will change with time as stock piles grow during the summer months and shrink during the post extraction season.

Many of these visual impacts are offensive to some individuals. However, the preferred alternative will cause no significant change in the gravel extraction and processing induced visual impacts. Although there will be no significant change in these impacts as a result of the project they will remain offensive to some and not so to others.

Impact Statements and Mitigation Measures

Impact
View-1: In the vicinity of Hatchery Road Bridge there are a variety of industial-type land uses that may be perceived as adverse visual impacts. The primary access to the river at Blue Lake is via the Hatchery Road bridge and levee. Both the Emmerson bar (Site No. 2) and Blue Lake bar (Site No. 3) extraction areas are visible from the bridge and levee. No other views of the river are available along Hatchery Road. Further south along Hatchery Road, the Mad River Sand & Gravel processing site (Site No. 1) can be seen in the distance, approximately 650 feet off the road. With the exception of the stockpiles and processing site this is primarily a rural agricultural setting and some people may feel that the processing site is in conflict with the setting. The reclamation plan and use permit allow for additional processing facilities at this site. With the exception of the processing plant and site the visual impacts resulting from the project in this view setting will be less than significant. However, the cumulative visual impact of this procesing site, in combination with other aggregate processing sites and other industrial uses in the Mad River corridor is a significant adverse impact (S/S)

Mitigation Measures
Mit-24: The visual impact of this processing site can be signifcantly reduced by planting a vegetatin screen between the site and Hatchery Road. The amended reclamation plan at this site will incorporate successful vegetation plans for this mitigation. Planting will take place during the winter of 1994-95. However, the cumulative visual impacts in this view setting will remain significant.

Monitoring
Humboldt County and the SDRC will confirm the planting and monitor for survival, growth, and eventual visual screening.

Impact
View-2: From Blue Lake to Arcata along West End Road, views are mostly screened by dense stands of riparian vegetation. Blue Lake and Christie bar (Site No. 3 and 4) stockpiles and extraction activity can be seen along a limited stretch of the road directly opposite the operations.

West End Road closely parallels the river. When the summer foliage has fallen from the trees, Essex bar (Site No. 6) can be viewed. Along West End Road, between the Water District buildings and Highway 299 the river can be viewed through the trees. These visual impacts are consided less than significant.

The project will create no significant change in visual effects at this view location. Therefore these visual impacts will remain less than significant. (LS/LS)

Mitigation Measures
Since no significant impact was identified, no mitigation is necessary.

Monitoring
None required

Impact

View-3: No views of the river are available from Giuntoli Lane. However, the Redwood Empire Aggregates processing site (Site No. 8) is highly visible from both Giuntoli Lane and Highway 101. The Arcata ReadiMix processing plant and stockpiles (Site No. 7B) are visible from Giuntoli Lane, Boyd Road, and Highway 299. These sites, along with other industrial uses in the area are considered individually and cumulatively significant adverse visual impacts. These two aggregate processing sites are zoned and planned for industrial use and visual effects are existing. The project will create no additional adverse visual effects at this view location. However, the cumulative visual impact of these procesing sites, in combination with other industrial uses in the Mad River corridor is a significant adverse impact. Therefore the visual impacts resulting will remain significant. (S/S)

Mitigation Measures

Mit-24: The visual impacts of these processing sites can be signifcantly reduced by planting vegetation screens between the sites and roadways. The amended reclamation plans at these sites will incorporate successful vegetation plans for this mitigation. Planting will take place during the winter of 1994-95. However, the cumulative visual impacts in this view setting will remain significant.

Monitoring

Humboldt County and the SDRC will confirm the planting and monitor for survival, growth, and eventual visual screening.

Impact

View-4: While driving westbound on Highway 299 down the Lord Ellis Summit there are distant views of the Mad River and the Blue Lake, Christie and Johnson bars (Site No. 3, 4 and 5).

Further west along Highway 299, Eureka Sand & Gravel's (Site No. 4) processing and stockpile yard is highly visible. Some evergreen plantings occur within the Caltrans right-of-way, but most of the processing and stockpile yard is exposed.

The Glendale Road underpass offers a view of the upstream end of Johnson bar (Site No. 5) and the Eureka Sand & Gravel's Christie bar (Site No. 4).

Eastbound Highway 299 passes several pump stations, the Water District buildings and utility yard, and Mercer Fraser's Essex bar, processing and stockpile yard (Site No. 6) are visible. Only short glimpses of the river are possible along this stretch. The streambank is lined with cottonwoods, willows and alders with conifer trees planted both within the Caltrans right-of-way and growing naturally on adjacent land. Adjacent to the Essex Lane underpass, the railroad bridge and the river can be seen. The river is then hidden by the adjacent streambank and dense vegetation.

The only other view of the river is from the Highway 299 bridge. The Water District buildings or the Johnson-Spini bar (Site No. 7A) can be seen from the bridge, depending on the direction one is driving. Gravel extraction is visible from westbound 299 when it occurs on the Johnson-Spini bar (Site No. 7A).

Along the length of Hwy 299 views from the highway are diverse, and range from natural landscapes to heavy industrial use. Hwy 299 also passes through the Cities of Arcata and Redding. Diverse views are normal and expected. Visual effects of gravel operations in this description are existing and vary from slight to highly visible and offensive to some individuals.

The Eureka Readimix processing site is highly visible from Highway 299 and contributes to the cumulative adverse visual impacts of this project. The project will create no additional adverse visual effects in this view shed. However, the cumulative visual impact of this procesing site, in combination with other industrial uses in the Mad River corridor is a significant adverse impact. Therefore the visual impacts resulting from the project will remain significant. (S/S)

Mitigation Measures
Mit-24: The visual impacts of this processing site can be signifcantly reduced by planting vegetation screens between the sites and roadways. Such a planting may encroach on the Caltrans right-of-way and if so, permission from Caltrans would be required. The amended reclamation plan at this site will address this issue and incorporate successful vegetation plans for this mitigation, if possible. If planting is possible, it will take place during the winter of 1994-95. However, the cumulative visual impacts in this view setting will remain significant.

Monitoring
Humboldt County and the SDRC will confirm the planting and monitor for survival, growth, and eventual visual screening.

Impact
View-5: As Northbank Road passes the Johnson-Spini and Arcata ReadiMix bars, and the Graham bar (Site No.s 7A, 7B and 8), the gravel extraction operations are hardly noticeable because of the curvature and narrowness of North Bank Road. The Johnson-Spini bar (Site No. 7A) and Highway 299 bridge are visible from pull-offs along Northbank Road

The visual effects in this description are existing and would likely be considered as minor by most individuals. The project will create no significant change in the visual effects described here. Therefore the visual impacts will less than significant. (LS/LS)

Mitigation Measures
Since no significant impact was identified, no mitigation is necessary.

Monitoring
None required

Impact
View-6: Gravel extraction and processing activity can be viewed from the river and river bars. The cumulative viewshed impacts resulting from extraction include extraction sites, summer bridge crossings, haul roads, processing sites and stockpiles. These impacts will vary with the season and throughout the river. Some of these cumulative visual impacts may be considered significant and unavoidable. . (SU/SU)

Mitigation Measures
Mit-13: In order to improve visual qualities for recreational river users operators will minimize the amount of time that idle equipment is stored on gravel bars during the extraction season.

Mit-24: The revised reclamation plans will recognize the need to mitigate for barren bars. The SDRC will strive to locate reasonable sites where revegetation or other forms of mitigation

mitigation can be used to compensate for visual, vegetation, and terrace forming qualities that have been lost due to extraction-induced barren bars. Such mitigation can be in the form of revegetation or improved site protection obtainable by restricting inapproprite river bar access.

Monitoring
Humboldt County/Scientific Design and Review Committee

Significance after Mitigation
Significant