

**COUNTY OF HUMBOLDT EXTRACTION REVIEW TEAM (CHERT)
2002 POST-EXTRACTION REPORT**

DISCUSSION DRAFT

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For the

Humboldt County Board of Supervisors

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This version represents the Final 2002 CHERT Post Extraction Report.**

EXECUTIVE SUMMARY

This report represents the compilation and analysis of information on gravel extractions in the 2002 mining season in Humboldt County. Site-specific recommendations by CHERT to extraction designs submitted by the operators' consultants as well as operator performance in achieving approved designs and specifications are briefly summarized. In 2002, CHERT reviewed 52 extraction areas distributed among 25 mining sites in Humboldt County (many sites had more than one extraction area). The total volume of gravel approved for extraction in 2002 was about 1,060,700 cubic yards (cy). The total volume actually extracted was about 738,500 cy, or about 70% of that approved for extraction.

As background, the concept of sustained yield extraction relative to mean annual recruitment (or 'MAR', an estimate of the long-term average annual supply of gravel to a specific reach of a river) is explained because of its importance to avoiding over-extraction and resultant cumulative effects on aquatic and riparian habitat and infrastructure (bridges, etc.). Also discussed are site-specific measures recommended by CHERT to reduce local effects of mining on riparian and aquatic habitat. These were included to assist the reader in understanding the complexities of managing gravel mining to minimize both localized and cumulative effects arising from instream mining and how CHERT uses these criteria on an annual and multi-year basis to meet management objectives.

I. INTRODUCTION

Following is the 2002 annual post-extraction report of the County of Humboldt Extraction Review Team (CHERT). This report summarizes CHERT recommendations and agency approvals for gravel extraction operations for the 2002 season, as well as descriptions of any substantial deviations from approved mining plans.

The Humboldt County instream gravel mining program is conducted pursuant to the California Surface Mining and Reclamation Act (SMARA). Instream mining is also governed by the US Army Corps of Engineers (COE) Letter of Permission (LOP) adopted on August 19, 1996 and the California Department of Fish and Game through Streambed Alteration Agreements.. CHERT review of instream gravel mining is authorized by SMARA (Public Resources Code, Division 2, Chapter 9, Section 2774 (b), the Interim Monitoring Program for the Lower Eel and Van Duzen Rivers adopted by the Humboldt County Board of Supervisors on July 2, 1996. and the 1992 Memorandum of Agreement (MOA) and Programmatic Environmental Impact Report on Gravel Removal from the Lower Mad River certified by the Humboldt County Board of Supervisors on May 31, 1994. As of this writing, an updated LOP (2003) is being prepared by the Corps of Engineers for implementation in the 2003 extraction season.

II. SUSTAINED YIELD MANAGEMENT

Management strategies for gravel extraction on the lower Mad River and the lower Eel and Van Duzen rivers are guided by environmental impact reports (EIRs) specific to each area. Both EIRs require, among other things, that gravel mining volumes be constrained so that channel bed degradation (net lowering) does not result from gravel mining. Channel bed degradation is but one of many negative effects linked to gravel mining in environmental documents (EIRs, EISs, etc.) and published scientific literature from case studies from many areas across the globe. Other effects include channel widening through increased bank erosion, braiding (establishment of multiple flow channels across a bar), loss of confinement of flows within the low flow channel, and loss of channel habitat "infrastructure" (low flow channel and bar morphology, riparian vegetation). They increase in geographical extent and severity as the volume of gravel mined in a river reach approaches (or exceeds) the volume of gravel supplied to the reach by fluvial (streamflow) transport during winter storms.

The concept of “sustained yield”, simply stated, requires that mining methods and volumes be constrained to allow river processes and conditions (and by extension, habitat) to continue relatively unaffected by gravel extraction. Infrastructure protection and habitat maintenance and recovery require a sustainable aggregate extraction strategy; one that only harvests less than recruitment when averaged over several years or longer. A sustainable extraction strategy limits average annual extraction to a volume less than mean annual recruitment in such a manner as to maintain or recover a complex channel morphology and aquatic habitat within the immediate area of mining, as well as to prevent or reverse mining-induced cumulative effects upstream and downstream.

While the volume of gravel transported (“recruited”) to a mining reach can vary tremendously from year-to-year, the long-term annual average volume provides an essential tool for managing cumulative effects from gravel extraction. We call this value the “mean annual recruitment”, or MAR. It is the cornerstone of sustained yield management and can be estimated by several techniques that vary in accuracy.

Using MAR as a basis for determining sustainable extraction volumes is a robust method for ensuring or evaluating sustainability. Although different terms are used to describe this recruitment-based approach, it has been used to develop sustainable extraction strategies in a number of locations in the western US (Collins and Dunne, 1990; Collins, 1992; Lehre, 1993). It applies the basic concept of the river continuum in avoiding cumulative effects by ensuring that extraction volumes remain low enough to leave sufficient gravel in the river to maintain channel alluvial structure (gravel bars, channel bends, floodplains, riparian tree stands). Risk (to bridges, salmonid habitat, and other issues dependent on alluvial structure) will generally increase with an increasing percentage of MAR extracted.

In Humboldt County at present, MAR has only been estimated with reasonable confidence for the Mad and Van Duzen Rivers. Recent activities to reopen the railroad between the Eureka area and Mendocino County include mention of supporting railroad operations with additional gravel mining from the Eel River. There will likely be increasing demand for aggregate when or if the rail line connecting Humboldt County to markets to the south is once again functional. We believe an objective analysis of MAR on the Eel River, especially one that includes contemporary bedload transport data and assesses the potential impacts on aquatic habitat and existing mining operations, is critically needed prior to any development activity that depends on increasing mining volumes in the Eel River. This analysis should be performed at the earliest possible time.

III. MINING DESIGN CRITERIA FOR MINIMIZING LOCALIZED IMPACTS

With few exceptions, 2002 gravel extractions in Humboldt County were designed as skims on unvegetated or sparsely vegetated bar surfaces. Skim configurations were of two general forms: a bench skim located near the edge of the low flow channel (most common) and a planar skim of the crown of a bar (crown skim). Horizontal limits of skims were laid out to conform to the overall shape of the bar, typically in a crescent shape. On large-amplitude meander bends, the upstream end of the bar was left undisturbed to discourage meander cutoff and bar destabilization. Where significant clumps of vegetation (mostly willows) occurred near the edge of a proposed skim, the boundaries of the skim were realigned to avoid them. Where such vegetation was located in the interior of a skim, these clumps were left as undisturbed “islands” within the skim boundaries.

In most extraction areas, designs included a vertical offset of about 2 feet above the low water surface to confine the low flow channel. Commonly, this offset was referenced to a light colored “silt band” found along the edge of the channel. This silt band provided a relatively consistent criterion for recommending appropriate vertical offset for individual bars and between the numerous bars extracted along the river. Drainage of receding river flows was provided by designing extraction surfaces which slope either directly

toward (perpendicular to) the low flow channel or in a downstream direction and avoiding closed depressions that could strand salmon.

There exists a large body of scientific literature on gravel mining that describes the spectrum of observed effects on channel geomorphology, aquatic and riparian plant and animal communities, and infrastructure. While some of the literature provides general recommendations for impact reversal or avoidance, it stops short of providing specific mining plan design criteria for minimizing localized impacts. In Humboldt County's mining program, several criteria are employed to minimize geomorphic and/or habitat impacts at mining sites. They are described below.

- 1) Skim boundaries are typically laid out as curvilinear benches along the outside of point bars as this usually provides a good replenishment configuration without preventing riparian colonization or encouraging braiding;
- 2) Skim widths are constrained to avoid braiding (divided flow) by being no wider than about half the unvegetated bar width;
- 3) Skim floors are sloped to provide for drainage following inundation (either directly toward the low flow channel, in a downstream direction, or somewhere in between) to reduce salmonid stranding potential;
- 4) A vertical offset of the skim floor above the low water surface (typically about 2 feet) is provided to retain sufficient low flow channel confinement;
- 5) The upper one-third of a bar is usually left undisturbed to preserve sufficient high flow confinement of flows entering the bend and discourage braiding.
- 6) In low recruitment years, bar skimming may be forgone in favor of wetland pits outside the active channel, but on surfaces no higher than the 5-year floodplain;
- 7) Gentle (10:1) side slopes are provided around the outer edges of wetland pits, with deeper areas in the interior to increase volumes;
- 8) Wetland pit boundaries are laid out to limit disturbance to existing riparian vegetation by conforming to existing openings in perennial riparian vegetation;
- 9) Wetland pits are avoided near the upstream ends of bars to prevent elevating the risk of meander cutoff;
- 10) Total pit area on a bar should not exceed about 10% of the bar's surface area to avoid elevating the risk of meander cutoff.

These criteria are intended to be flexible (i.e., adaptive) and are recommended by CHERT as needed during mining plan review in an effort to avoid localized geomorphic and/or habitat impacts (avoidance is always preferable to attempting to reverse observed impacts). They appear to be reasonably successful in avoiding impacts associated with historical mining methods. Consultants for the operators incorporate these criteria in mining plan preparation. CHERT reviews proposed mining plans for conformance to these criteria and applicable SMARA reclamation standards (California Code of Regulations, Title 14, Division 2, Chapter 8, Subchapter 1, Article 9).

A recent analysis by the local NOAA-Fisheries office may provide a more objective means to set appropriate minimum skim floor elevations. Using both hydraulic modeling and field checking, they determined that the water surface elevation at the 35% exceedence flow (that flow rate equaled or exceeded 35% of the time, commonly attained in early spring as winter flows recede) provides a minimum skim floor elevation that preserves low flow channel confinement and helps to minimize several potential negative effects associated with skimming operation near the river channel, specifically: 1) shallowing of water depth at riffles (potentially impacts spawning migration), 2) reductions in spawning area (less spawnable area), and 3) increases in fine sediment deposition in redds (potential decreases in egg and fry survival).

Based on spatially and seasonally consistent hydrologic and hydraulic criteria, it avoids some of the uncertainty and risk arising from earlier criteria such as the Corps' minimum elevation criteria of one foot above the low water surface (the water surface elevation gradually declines over the course of the mining planning and implementation season, thus it is a 'moving target').

Preliminary observations at several sites indicate that the 35% flow exceedence corresponds relatively closely to the top of the silt band CHERT has used for the past several years at many sites as a minimum skim floor elevation (M. Tauzer, pers. comm. Jan. 2003). Because the silt band may vary in elevation from year to year and may not always be present or easily identified at all sites, the 35% flow exceedence may be a more reliable criterion. However, it requires field demarcation in the spring at the time this flow is occurring, and thus presents some logistical challenges. It has been included in the NOAA Fisheries biological opinion on Humboldt County mining operations and may be incorporated into the Corps' forthcoming LOP 2003 for use beginning with the 2003 extraction season. Whether it may be incorporated as a regulatory standard or as a guideline is not known at this time.

IV. MONITORING AND ADAPTIVE MANAGEMENT

Detailed descriptions of methods and standards for instream gravel extraction monitoring data collection and presentation for the project area can be found in: 1) the California Department of Fish and Game's (CDFG) Humboldt County monitoring guidelines (contained in a May 9, 1995, memo from Richard Elliot, Regional Manager, Region 1), 2) the 1996 Letter of Permission (LOP 96-1) issued by the Army Corps, and 3) the 1996 Interim Monitoring and Adaptive Management Program issued by the Humboldt County Department of Public Works. These documents either require or recommend physical and/or biological monitoring methods to be implemented by all gravel operators within their respective geographic scopes.

Adaptive management strategies can be divided into two general categories: 1) those that are aimed at avoiding or reducing cumulative effects (accumulating in space and/or time), and 2) those that are geared towards localized, site-specific effects. In reality, the distinction is somewhat arbitrary: pervasive localized effects of mining (for example, excessively low bar skimming on a concentration of mined bars within a mining reach) may also precipitate cumulative effects (e.g., reach-wide depletion of gravel, braiding, loss of low flow channel confinement, habitat loss). Adaptive management for localized effects is a goal of the Mad River and lower Eel and Van Duzen rivers EIRs, the IMP, and the LOP and is reasonably well-accommodated by annual CHERT review and comment on mining plans. However, a periodic (once every five years or so) quantitative analysis using cross sections, air photos, and other information to assess effects of mining occurring over larger geographic areas and/or longer time periods is needed to ensure cumulative effects are being adequately minimized. Such an analysis is not presently incorporated into the County's gravel mining program.

V. 2002 GRAVEL EXTRACTION OPERATIONS

As shown in Table 1, a total of 1,060,692 cubic yards (cy) was approved for Class A (annual extraction greater than 5,000 cy) operations in Humboldt County in the 2002 extraction season. Of this, 738,521 cy (or about 70% of the approved volume) was actually extracted, as documented in post-extraction submittals from the operators. Tables 2-6 list information on individual 2002 gravel extractions, grouped by river reach. Approved and actual extraction volumes (in cubic yards) are listed along with percent of approved volumes extracted at each mining area, the general type of extraction, and a comment that relates to the success of meeting approved mining plans. The presentation of the latter two pieces of information tabular form represents a departure from earlier formats of the post-extraction report. This was undertaken for the sake of efficiency.

Table 1. Gravel extraction totals for Humboldt County rivers, 2002.

River Reach	Approved Volume (cy)	Extracted Volume (cy)	Percent Extracted
Mad River	204,991	171,937	84%
Lower Eel River	520,110	331,702	64%
South Fork Eel River	58,163	48,122	83%
Van Duzen River	239,283	167,366	70%
Trinity River	38,145	19,394	51%
Humboldt County Total =	1,060,692	738,521	70%

CHERT recommendations and other communications from the operators, their consultants, and agencies were compiled in numerous electronic mailings generated throughout the mining season. While this expedited the process of information exchange and approval of mining plans, no single report containing all recommendations was compiled. Consequently, this post-extraction report is the only document summarizing all CHERT recommendations for the 2002 extraction season.

In addition to comparing the recommended/approved and extracted volumes, operator success in meeting approved mining plans was also evaluated by comparing approved mining plans with actual post-extraction information such as the horizontal limits of skimmed areas (delineated on air photos and plotted on cross sections), and elevations of extraction surfaces (plotted on cross sections). Where approved plans were relatively closely met, the comment 'OK' is shown in Tables 2-6. In instances where some aspect of the post-extraction condition deviated from approved plans, the nature of the deviation is briefly described. Should agencies want from CHERT more detailed descriptions of deviations from approved plans for compliance or other purposes, these can be requested on a case-by-case basis.

VI. DISCUSSION

As in previous years, approved mining plans and specifications were well met at the majority of extraction sites in Humboldt County. However, several issues should be addressed to promote adherence to approved designs at all sites and to achieve better coordination between CHERT and regulatory agencies.

As indicated in Tables 2-6 in the previous section, approved horizontal and/or vertical (elevational) extraction limits were exceeded at several sites to a degree considered to be beyond an acceptable margin of error. In particular, a portion of the extraction area at one site was completely beyond the limits agreed to beforehand. Whether these deviations resulted from poor field delineation, lack of care during gravel extraction, or some other explanation, more attention needs to be placed by those operators on meeting approved plans and specifications.

On the lower Van Duzen River delta, a fish migration trench was designed by local NOAA-Fisheries staff and excavated by the operator outside of the CHERT review process and the Humboldt County mining program. Although this trench purportedly benefited migrating chinook salmon and was not opposed by CHERT, it resulted in an extra 36,755 cy of 'approved' volume over that recommended by CHERT for the Van Duzen River and brought the river total to almost 240,000 cy. As it turned out, the same operator under-extracted at other areas on the site, as did another operator on the Van Duzen, thus the actual extraction volume was only about 167,000 cy, a volume close to the present sustained yield estimate for the river. However, had all approved volumes been extracted along with the fish migration trench, sustained yield would have been exceeded by a large amount (73,000 cy). Better coordination between regulatory agencies and CHERT will help avoid this type of problem in the future.

Table 2. Mad River extraction volumes for 2002.

Site (operator)	Rec'd Volume	Extracted Volume	Percent Extracted	Extraction Type	Comments
O'Neill Bar (ESG)	7,240	6,080	84%	bench skim	OK (mined by GRA)
Johnson-Spini Left Bank Bar (MIA)	6,500	4,700	72%	bench skim	OK
Johnson-Spini Right Bank Bar (ESG)	31,392	31,585	101%	crown skim	OK
Essex Bar (MFC)	4,130	3,483	84%	bench skim	OK
Johnson Bar (GRA)	5,939	6,428	108%	bench skim	too low on XS-3
Christie Bar Area #1 (ESG)	18,004	13,851	77%	bench skim	OK
Christie Bar Area #2 (ESG)	14,278	14,013	98%	bench skim	OK
Christie Bar Area #3 (ESG)	12,540	12,737	102%	bench skim	too low on XS-2
Blue Lake Bar Area #1 (GRA)	6,689	7,093	106%	bench skim	OK
Blue Lake Bar Area #2 (GRA)	18,124	19,795	109%	bench skim	too low on XS-4
Blue Lake Bar Area #3 (GRA)	8,083	8,847	109%	bench skim	OK
Emmerson Bar Area #1 (GRA)	8,607	8,173	95%	wetland pit	OK
Emmerson Bar Area #2 (GRA)	8,112	10,110	125%	wetland pit	too low on XS-4, 7, 8, and 10*
Emmerson Bar Area #3 (GRA)	3,171	3,854	122%	alcove	OK
Guynup Bar Area #1 (MRS)	24,051	12,931	54%	dry trench	OK
Guynup Bar Area #2 (MRS)	20,584	8,257	40%	dry trench	OK
Guynup Bar Area #3 (MRS)	7,547	0	0%	bench skim	OK
Mad River Total =	204,991	171,937	84%	---	---

- It should be noted that grade control is more difficult in wetland pits than in typical skims, which may explain the over-extraction at Emmerson Bar Area #2. Because this was a wetland pit, the deviation from approved grade should not cause or increase habitat degradation. However, the operator is encouraged to explore means to better control grade and meet approved volumes.

Table 3. Lower Eel River extraction volumes for 2002.

Site (operator)	Approved Volume	Extracted Volume	Percent Extracted	Extraction Type	Comments
Worswick Bar (HUM)	17,500	0	0%	bench skim	no extraction in 2002
Sandy Prairie Area A-1, Plant A (MFC)	25,326	22,926	91%	bench skim	OK
Sandy Prairie Area A-1, Plant B (MFC)	26,889	3,435	13%	bench skim	OK
Sandy Prairie Area A-2 (MFC)	46,578	46,699	100%	dry trench	too low on XS-10 and too wide on XS-10.4L through XS-10.7L
Sandy Prairie Area B-1 (MFC)	37,489	19,990	53%	crown skim	OK
Sandy Prairie Area B-2 (MFC)	84,060	31,703	38%	bench skim	OK
Sandy Prairie Area B-3 (MFC)	0	0	0%	bench skim	no extraction in 2002
Sandy Prairie Area B-4 (MFC)	47,438	0	0%	bench skim	no extraction in 2002
Hansen Bar (HAN)	49,070	28,841	59%	bench skim	OK
Hauck Bar Area #2 (ESG)	52,993	56,500	107%	horseshoe pit/fish migration trench	OK (volume includes fish channel outside CHERT purview)
Truck Shop Bar (PALCO)	29,750	25,480	86%	crown skim/trench	OK
Three Mile Bar (PALCO)	14,955	13,775	92%	dry trench	OK
Elinor Bar (PALCO)	30,012	27,852	93%	bench skim	OK
South Fork Bar (PALCO)	29,390	28,187	96%	bench skim	OK
Bowlby Bar (PALCO)	28,660	26,314	92%	bench skim	OK
Total for Lower Eel River =	520,110	331,702	64%	---	---

Table 4. South Fork Eel River extraction volumes for 2002.

Site (operator)	Approved Volume	Extracted Volume	Percent Extracted	Extraction Type	Comments
Cooks Valley Area #1 (MFC; MenCo)	2,556	1,611	63%	horseshoe pit	OK
Cooks Valley Area #2 (MFC; MenCo)	11,454	8,094	71%	trench	OK
Cooks Valley Area #3 (MFC; MenCo)	439	358	82%	trench	OK
Cooks Valley Area #4 (MFC; HumCo)	6,243	5,167	83%	bench skim	OK
Cooks Valley Area #5 (MFC; HumCo)	2,882	1,756	61%	trench	OK
Cooks Valley Area #6 (MFC; HumCo)	1,620	3,395	210%	bench skim	too wide on XS-13; unapproved extraction on XS-12.5E
Cooks Valley Area #7 (MFC; HumCo)	1,143	1,882	165%	bench skim	unapproved extraction on XS-14.5E
County Bar (RAN)	5,004	5,468	109%	bench skim	too low on XS2 and 2E, too low and wide on XS 4E
Tooby Park Bar (RAN)	4,107	3,893	95%	bench skim	too low on XS-5 and 6E
Home Bar (RAN)	22,715	16,498	73%	bench skim	OK
Wallan and Johnson Bar (WAL)	10,011	11,652	116%	crown skim	too wide on XS-2, 1.4E, 1.7E, and 2.5E
Total for South Fork Eel River =	58,163	48,122	83%	---	---

Table 5. Van Duzen River extraction volumes for 2002.

Site (operator)	Approved Volume	Extracted Volume	Percent Extracted	Extraction Type	Comments
Rock Upper Bar Area A (LEL)	13,360	13,219	99%	horseshoe pit	OK
Rock Upper Bar Area B (LEL)	43,130	23,705	55%	wetland pit	OK
Rock Lower Bar Area C (LEL)	37,368	27,407	73%	horseshoe pit	OK
Rock Lower Bar Area D (LEL)	0	36,755	n/a	fish migration trench	OK (project outside of CHERT purview)
Noble Bar Area #5 (NOB)	62,000	24,030	39%	bench skim	extraction occurred completely outside of approved limits
Noble Bar Area #6 (NOB)	28,000	25,155	90%	bench skim	OK
	18,670	17,095	92%	bench skim	OK
Total for Van Duzen River =	202,528	167,366	83%	---	---

Table 6. Trinity River extraction volumes for 2002

Site (operator)	Approved Volume	Extracted Volume	Percent Extracted	Extraction Type	Comments
Rowland Bar (KRA)	15,645	0	0%	bench skim	no extraction
Airport Bar Area #1 (MFC)	2,500	5,560	222%	bench skim	too wide on XS-5.7E
Airport Bar Areas #2 and #3 (MFC)	10,500	6,954	66%	bench skim	OK
Airport Bar Area #4 (MFC)	9500	6880	72%	trench	OK
Trinity River Total =	38,145	19,394	51%	---	---