June 5, 2008

Humboldt County Planning Commission
3015 H Street
Eureka, California 95501

Subject: Public Comments for GPU

Dear Planning Commissioners and County Planning Staff:

In 1997 five Humboldt Bay and Eel River watersheds were declared sediment-impaired by a multi-agency team. That year, Humboldt Watershed Council (HWC) was founded as an advocacy organization to protect public infrastructure, and watershed residents' property, health, and safety from sediment impacts of upstream land management practices.

HWC Board submits this comment to the following elements: Water Resources, Biological Resources, Health & Safety, Forest Resources, Conservation & Open Space

Our watersheds provide fresh water; fish; nutrient cycling for forests, aquaculture, & agriculture; flood & climate control; biodiversity; minerals; recreation; and flushing necessary for our bay & estuary ecosystems. These values, products, and services are important not only to us in Humboldt County, but are of growing importance to the state and nation as well.

From over a decade of monitoring both the physical conditions of our watersheds and the science and policies governing them, we have come to these conclusions:

1. our regulatory system has failed our watersheds

2. the most important factor is Cumulative Impacts or Cumulative Watershed Effects (CWE)

3. county planning needs to take a watershed-scale approach based on Cumulative Watershed Effects, to protect and restore our beneficial uses of water (as defined by Calif Water Quality Act), and concomitant property damage and health hazards. (see Appendix A)

Watersheds suffer under state and federal regulations

As of 2001, 14 river and creek basins in Humboldt County were and continue to be considered polluted or impaired by EPA and the state and regional water quality control boards. These include the Klamath and Trinity Rivers, Redwood Creek, Mad River, Freshwater Creek, Elk River, Van Duzen River, the five forks and the delta of the Eel River, and the Mattole River.

Native salmon populations have decreased dramatically in Humboldt Bay watersheds over the past few decades, resulting in the listing of coho, chinook, and steelhead as threatened with high risk of extinction.

"California has a number of species, in particular salmon, that are endangered threatened or otherwise seriously at risk, due in very significant part to forestry activities that impair their spawning, breeding and rearing habitat." (Findings for the California Coastal Non-point Program and CZARA Action Plan, USEPA/NOAA, 1999)

In addition to habitat loss, increased erosion and runoff from development and high rates of logging in the Eel, Mattole, and Humboldt Bay watersheds, from the 1980s to the present, have resulted in massive changes in channels and floodplains, resulting in the Stafford landslide of 1997, chronic flooding of homes and property, threats to public infrastructure, and permanent damage to water supplies, septic system function, land use and other property values

Sediment dredged periodically from Humboldt Bay comes from the ocean and Freshwater, Elk, Jacoby, and Eel River watersheds. Much of the hillslope erosion could be prevented at the source with appropriate land management practices.

State and federal regulatory agencies have been powerless to stop the damage generated by large scale industries in our watersheds such as timber and gravel mining, leaving small operators, property owners, and taxpayers to bear more than their fair share of regulatory requirements and costs of damages.

In regulating human activities, federal environmental laws only require disclosure of potential impacts with no requirement to prevent or mitigate them. Similarly, California environmental laws cannot prevent environmental damage from human activities, but only require feasible alternatives or mitigation to reduce impacts.

"Feasible" has come to mean economically viable, and is usually interpreted to subordinate environmental benefits. Mitigations are often untested and ineffective, and reduction of impacts may delay but cannot prevent cumulative impacts.

Failure of regulatory agencies

Beginning in 1997 Humboldt Watershed Council attempted to work with federal and state agencies to reduce the unprecedented rates and intensity of harvesting responsible for the widespread sediment impairment of Humboldt Bay watersheds, and resulting damages to salmon habitat and downstream properties. HWC petitioned California Department of Forestry (CDF), state and federal wildlife agencies, and North Coast Regional Water Quality Control Board (NCRWQCB) for reduced rates of harvest, which were reaching **10% per year** in some watersheds.

The response of the agencies over the following 10 years has been to allow continued logging at rates allowing even highly populated and closely scrutinized watersheds such as Freshwater Creek to be **80% harvested in 20 years.**

In WATERSHED CONDITION, TURBIDITY, AND IMPLICATIONS FOR ANADROMOUS SALMONIDS IN NORTH COASTAL CALIFORNIA STREAMS, A Report to the California North Coast Regional Water Quality Control Board, May 2008, Randy Klein, Hydrologist, Redwood National and State Parks, Dr. William Trush, River Ecologist, McBain and Trush, and Matthew Buffleben, P.E., California Regional Water Quality Control Board recommend harvest rates 5 to 6 times lower -

annual average timber **harvest rates (measured as CCE-15) of 1.5% to 2.2% can begin to cause significant CWEs** (cumulative watershed effects) to the stream ecosystem and anadromous salmonids.

average annual harvest rates greater than about 1.5% (representing a 67-year rotation cycle) should be avoided in North Coast watersheds.

CDF approved harvest rates 4 to 6 times above their own findings, allowing significant declines watershed functions and beneficial uses of water -

The California Department of Forestry and Fire Protection (CDF), in preparing draft Sensitive Watershed Criteria for the Board of Forestry, suggest **timber harvest exceeding 20% of a watershed within a ten year period (equating to an annual harvest rate of 2%) could result in consideration of a watershed as "sensitive"** (Munn and Cafferata 1992).

CDF's Tuttle (1992) cites threshold values of 27% weighted average basal area removed and 15% of the watershed area harvested with even-aged regeneration methods within the past decade, resulting in an **annual harvest rate of 1.5%-2.7%, to be used as a threshold for triggering examination of impacts to beneficial uses of water**.

Report of the Scientific Review Panel On California Forest Practice Rules and Salmonid Habitat, Prepared for The Resources Agency of California and the National Marine Fisheries Service, State of California selected panel of scientists, 1999, indicates that **"the Forest Practice Rules" and their administration by the California Department of Forestry "do not protect the beneficial uses of water."**

even though timber harvest plans prepared for private lands in California since 1985 contain statements attesting that the plans will not result in increased levels of significant cumulative impacts, **obvious cumulative impacts have accrued from carrying out those plans** (Reid, Leslie M. 2001. Cumulative watershed effects: Then and Now. Watershed Management, Council Networker 10(1): 24-33)

The Independent Science Review Panel (ISRP) convened by North Coast Regional Water Quality Control Board in 2003 to evaluate effectiveness of methods to address cumulative watershed effects of logging in Pacific Lumber watersheds, including their HCP, stated …we were charged with assessing from a scientific standpoint whether the existing land use planning framework can be relied upon to protect water quality. Our conclusion is that it cannot. (Humboldt Watersheds ISRP: Response to Questions Posed on the Phase II Report, September 8, 2003)

Because of the ISRP findings and recommendations, NCRWQCB has instituted Watershed Wide Waste Discharge Requirements for permitting timber harvest, and expedited the TMDL process for assessing and setting thresholds for sediment in our impaired watersheds. However, NCRWQCB's politically appointed Board has weakened key provisions, and the TMDL continues to languish from insufficient staffing and funding.

In spite of many years of study, improved permitting requirements, better management practices, mitigations, and monitoring, the impacts continue, and there is no evidence of recovery.

- Our environmental laws are filled with exemptions and loopholes;
- mitigations are insufficiently tested and many are not working;
- penalties are too weak to serve as disincentives;
- state and federal agencies are chronically overworked, underfunded, and intensely politicized;
- and the "less than significant" activities permitted in our watersheds have accumulated over time to produce highly significant impacts.

Thus, if the General Plan's intent to "continue participation in all state, regional or local water resource planning efforts" and "coordinate with federal and state land management agencies to ensure adequate protection of watersheds", does not include more active monitoring, input, and regulation on the part of the county, continuing damage to our watersheds may be ensured.

Primacy of Cumulative Impacts

Without adequate consideration of cumulative impacts and cessation of causes, there is little that mitigation, restoration, research, best management practices, or monitoring can do to restore our impaired watersheds.

The Council on Environmental Quality (CEQ) describes Cumulative Impacts as

the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. (CEQ Guidelines, 40CFR 1508.7, issued 23 April 1971.)

Both CEQ and EPA have published guidelines for assessing cumulative impacts which are available online, and many other publications address CWEs in Humboldt County watersheds, See Appendix B

Cumulative Watershed Effects in local watershed are described in the *Humboldt Bay Watershed Salmon and Steelhead Conservation Plan*, March 2005, published by Natural Resources Services, RCAA Appendix D. Some of the causes are listed below.

Humboldt Bay watershed has been impacted by increased sediment inputs, primarily generated by timber harvest activities on steep, unstable slopes in the upper watershed. Additional land uses such as riparian removal, road and levee construction, traffic on unpaved roads, residential encroachment, separation of the stream from the floodplain, removal of LWD from the stream and herbicide use in the Humboldt Bay watershed contribute to cumulative watershed effects. Other factors contributing to CWE are past over-fishing, poor ocean conditions, erosive geology, hatchery introductions and mixed stock. Cumulative impacts from increase in sediment loads in Humboldt Bay watershed includes modification of the estuary system; reduction of channel conveyance and aggravation of flood hazard; infilling of channel pool habitat; and water quality degradation.
Factors such as weather patterns, ocean conditions, tidal influences, and the inherent instability of underlying geologies are fundamental, and must always be accounted for in assessing cumulative risks.

The problem of cumulative impacts has long concerned Dr. Leslie Reid, internationally recognized geomorphologist, presently employed at US Forest Service Redwood Sciences Laboratory in Arcata. The following excerpts are from Reid. Leslie: *Cumulative Watershed Effects: Caspar Creek and Beyond*. Biological Resources USDA Forest Service Gen. Tech. Rep. PSW-GTR-168. 1998

Before, regulations could be written to allow an activity to occur as long as the impacting party took the best economically feasible measures to reduce impacts. If the portion of the impact attributable to a particular activity was not independently damaging, that activity was not accountable. Now, however, **the best economically feasible measures are no longer sufficient if the impact still occurs**. The activities that together produce the impact are responsible for that impact, even if each activity is individually responsible for only a small portion of the impact.

EPA's recent listing of 20 north coast rivers as impaired waterways because of excessive sediment loads, altered temperature regimes, or other pervasive impacts suggests **that whatever the methods used to prevent and reverse cumulative impacts on public and private lands in northwest California, they have not been successful**.

It is important to note that an activity is partially responsible for a significant cumulative impact if it contributes an incremental addition to an already significant cumulative impact. For example, if enough excess sediment has already been added to a channel system to cause a significant impact, then **any further addition of sediment also constitutes a significant cumulative impact**.

Because of failure to regulate for cumulative impacts, small property owners are deprived of rights to use their land and resources in ways that produce minor impacts because of the already significant cumulative impacts generated by the large timberland owners. Anger from the small owners is often directed at environmentalists and agency staff, and encouraged by the large users who paint themselves as fellow sufferers.

Watershed-scale County Planning

Humboldt Watershed Council believes that watershed-scale county planning based on sound cumulative impacts analysis is necessary to reverse the ongoing threats to property, health, fisheries, and other beneficial uses of our waters.

A large and growing body of approaches to addressing Cumulative Watershed Effects is available, some of which are listed in Appendix C. Educating county decision-makers and the public about cumulative impacts, is crucial.

The above referenced 2003 Humboldt Watersheds ISRP recommends comprehensive & integrated county-wide assessment, planning, public education, and policy-making using BMPs developed

by Water Quality Control Board and other well-known & proven science-based methodologies to optimize water quantity & quality, and the health of natural aquatic systems. The NCRWQCB's coming Total Maximum Daily Loads process (TMDL)* for turbidity and sediment is a promising tool for assessing CWEs and establishing thresholds and BMPs.

*A TMDL is a calculation of the maximum amount of a pollutant that a body of water can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. A TMDL is calculated for pollutants determined by the Administrator of EPA as suitable for such calculation

The precipitous decline in our native salmon mirrors the decline of the expanse, diversity, and functionality of our native ecosystems and serves as an indicator of the condition of our watersheds. Thus, policies which would serve to restore and maintain viable populations of wild salmon would also serve to restore and maintain other watershed services and resources, from forests to the bay. It is now well-recognized that logging which causes soil loss on hillslopes & sedimentation of waterways not only damages aquaculture and fish habitat but results in diminishing health and productivity of forests with each successive cycle of harvest. It is also becoming evident that the great salmon runs were a significant contribution to soil fertility as they brought massive quantities of nutrients from the oceans to lands many miles upstream, fueling the food chain and fertilizing the land. The ISRP suggests that if the five watersheds have not recovered by 2015-2020 (the next Pacific Decadal Oscillation), extinctions could result.

Information intended for use in the General Plan Update was produced by The *Salmon and Steelhead Conservation Plan (SSCP)*, Humboldt Bay Watershed Advisory Committee and The Natural Resources Services Division of Redwood Community Action Agency, 2005. Appendix D

SSCP goals and objectives important to the General Plan include remediation of the following:

- turbidity concentrations and sediment transport
- channel form and dynamics
- riparian ecosystem function
- long-term large woody debris supplies
- water retention and flow regimes
- floodplain and estuary processes
- water temperature and chemistry

All of the above require comprehensive watershed planning from ridgetop to ocean.

HWC Recommendations

1. Design ordinances for comprehensive & integrated county-wide assessment, planning, and public education to protect beneficial uses of our watersheds based on current best Cumulative Watershed Effects science for local watersheds. Require thorough Cumulative Impacts assessments according to recognized standards & guidelines for all projects where impacts to watersheds are possible, bearing in mind that there are no less-than-significant impacts in watersheds which are already significantly impacted or impaired. See EPA guidelines in Appendix B

2. Discontinue Negative Declarations for developments and exemptions for timber and agricultural practices in impaired waterways. It is meaningless to mitigate impacts of individual developments if the combined cumulative impacts of all developments are not considered. Review and comment on timber harvest plans in these watersheds, based on CWEs. Require all appropriate agencies to provide on-the-ground assessment and written comments.

3. Set quantifiable impact thresholds for all watersheds and quantifiable targets for recovery in impaired watersheds. Expedite the TMDL process.

The Humboldt Bay *Salmon and Steelhead Conservation Plan (SSCP)* offers much guidance for recovery in local watersheds.

Also see EPA examples of thresholds, Appendix B, and Appendix D, which contains threshold and target recommendations from WATERSHED CONDITION, TURBIDITY, AND IMPLICATIONS FOR ANADROMOUS SALMONIDS IN NORTH COASTAL CALIFORNIA STREAMS, A Report to the California North Coast Regional Water Quality Control Board, May 2008

Threshold-based methods would allow for altering land-use prescriptions once a threshold of concern has been surpassed. if the index of land-use intensity rises above a defined threshold value, further activities are deferred until the value for the watershed is once again below threshold. (Reid. Leslie: *Cumulative Watershed Effects: Caspar Creek and Beyond)*

This basis would need to account for the occurrence of large storms because actual impact levels rarely can be identified in the absence of a triggering event. Thresholds are more commonly considered from the point of view of the impacted resource. This approach has limited utility if the intent is to reverse existing or prevent future cumulative impacts because most responses of interest lag behind the land-use activities that generate them. . (Reid, Leslie M. 2001. Cumulative watershed effects: Then and Now. Watershed Management, Council Networker 10(1): 24-33)

4. Set requirements for riparian buffers according to best available, peer-reviewed scientific standards for our local watersheds.

Numerous studies show that most sediment in steep, forest watersheds enters via 1st order drainages and so-called 'zero' order basins (hollows with ephemeral drainage and seeps). These locations are the steepest parts of the watershed, have the highest degree of flow accumulation, and tend to be source areas for debris flows. Such areas correspond to Class III and Class II streams. Much of the sediment entering the stream network in Class III streams will be in the form of debris flows coming off the slopes above. Debris flows are unlikely to be stopped by a ten-foot buffer or an equipment exclusion zone.

For slopes less than 15%, most sediment settling occurs within a 25 to 30 feet wide buffer of grass. Greater width may be required for shrub and tree vegetation, on steeper slopes, or where sediment loads are particularly high." Note that many of the slopes in the five watersheds are considerably steeper than 15%, that wider buffers are required for trees than for grass, and that sediment loads in these watersheds are higher than typically found in agricultural settings. Where the issue is preventing pesticides or herbicides from reaching streams the authors recommend up to 100 ft buffers. Similarly, to protect water from thermal heating they recommend up to 100 ft buffers. (Humboldt Watersheds ISRP: Response to Questions Posed on the Phase II Report
September 8, 2003)

…the Northwest Forest Plan is careful to point out that riparian reserves and their accompanying standards and guidelines are not in themselves sufficient. These measures are expected to be effective only in combination with (1) watershed analysis to identify the causes of problems, (2) restoration programs to reverse those causes and speed recovery, and (3) careful protection of key watersheds to ensure that watershed-scale refugia are present. The Northwest Forest Plan thus recognizes that BMPs alone are not sufficient, although they can be an important component of a broader, landscape-scale approach to recovery from impacts. (Reid, Leslie M. 2001. Cumulative watershed effects: Then and Now. Watershed Management, Council Networker 10(1): 24-33)

Also see Reid, L.M. and S. Hilton. 1998. Buffering the Buffer. USDA Forest Service.

5. Accept only well-tested mitigations and Best Management Practices (BMPs). Require appropriate application, timely implementation, and funding for monitoring and maintenance to ensure long-term effectiveness.

Zero net increase cannot be used to reverse the trend of impacts already occurring because the existing trend of impact was created by the levels of sediment input present in 1986. To reverse impacts, inputs would need to be decreased to below the levels of input that originally caused the problem.

To ensure that such a system does more than perpetuate the existing problems, it would be necessary to require that all future impacts from a plan (and its associated roads) are repaired as part of the plan, not as mitigation measures to offset the impacts of future plans.

Offsetting mitigation activities are usually accounted for as though the predicted impacts were certain to occur if those activities are not carried out. In reality, there is only a small chance that any given site will fail in a 5-year period. Appropriate mitigation would thus require that considerably more sites be repaired than are ordinarily allowed for in

mitigation-based plans. Furthermore, mitigation at one site does not necessarily offset the kind of impacts that will accrue from a planned project. If the project is located where impacts from a given sediment input might be particularly severe, offsetting measures in a less-sensitive area would not be equivalent. Similarly, mitigation of one kind of source does not cancel the impact of another kind of source. It would thus be necessary to carry out mitigation activities well in advance of the activities which they are designed to offset so that impact levels are demonstrably decreasing by the time the unavoidable new impacts are generated.

BMPs alone are not sufficient, although they can be an important component of a broader, landscape-scale approach to recovery from impacts. A new approach to BMPs has recently appeared in the form of standards and guidelines for designing and managing riparian reserves. Any land-use activities to be carried out within the reserves must be shown not to incur impacts on the aquatic system. (Reid, *Cumulative Watershed Effects: Caspar Creek and Beyond*)

Without effectiveness monitoring and periodic assessment, there is no way to know whether mitigation strategies are effective

The net result of mitigation activities may be to save some sediment over twenty years' time, but in the short term they are producers of sediment.

The Panel concurs with the Dunne Committee that there is no science-based justification for assuming that sedimentation and water quality impacts can be mitigated to zero levels or even produce positive benefits.

In regard to the effectiveness of BMPs, the Panel elaborates that BMPs are developed through a normative process that weighs, evaluates, and incorporates many types of information. Consequently, BMPs represent compromises in social, political, economic, and ecological goals for management of aquatic habitats. During the period between 1970 and 1990, while BMPs developed through the process of compromise were in effect, the quality of riparian and aquatic habitats in the Pacific Northwest and Northern California declined. The Panel is not aware of any examples in the peer-reviewed literature where salmonid populations or salmonid habitats responded positively to intensive timber harvest activities, even with BMPs in effect. (Humboldt Watersheds ISRP: Response to Questions Posed on the Phase II Report, September 8, 2003)

6. Review and incorporate best available information on planning for recovery of impaired watersheds, including the Humboldt Bay *Salmon and Steelhead Conservation Plan,* and findings of Independent Science Review Panels convened locally.

the best that can be done is to postulate a plan based on the best available information, continually test the plan using a combination of compliance, effectiveness, and trend monitoring, and revise the plan in a timely and appropriate manner based on monitoring results

plans can be designed to provide staged implementation based upon an open process of review and assessment of the degree to which objectives are being achieved

the five-year review of threshold attainment conducted by the Tahoe Regional Planning Agency was cited as an example. This review is supported by an inter-agency monitoring program and has provisions for public comment and discussion. The assessment culminates in written findings. There is a feedback loop, in that if certain hoped-for targets are not met, the agency's land-use permitting decisions must reflect this finding in its review of impact-causing activities during the next five-year cycle. This process is keyed to the agency's EIR/EIS obligations, and thus has formal status and transparency. (Humboldt Watersheds ISRP: Response to Questions Posed on the Phase II Report, September 8, 2003)

7. Offer education, incentives, & partnerships for preservation & restoration of water resources, and for development practices which eliminate impacts. Issue educational materials on basic watershed functions and appropriate management to owners of streamside properties, e.g. "Stream Care Guide" 2000 from Natural Resources Services Division of RCAA.

8. Seek partnerships and funding for acquisition of community forests and easements for watershed protection, including policies to collaborate with municipalities, community services districts, and other stakeholders to promote community forests, especially in areas adjacent to rapidly urbanizing communities.

9. Establish categories for open space, conservation, and restoration zoning.

10. Establish more stringent requirements and penalties for large commercial land owners with outside investor obligations.

11. Establish a differential weighting system for public input that rectifies the problem of short term economic advantages for special interests which eclipse the long-term good of the community.

12. Adopt GPU recommendations from California Department of Fish and Game, and ensure adherence to implementation agreements with DFG before permits for building, lake & streambed alteration, or diversions are issued.

13. Curtail conversions of natural resource or open space areas to residential zoning, until current zoning is assessed for Cumulative Watershed Effects. By failing to limit canopy removal, building, and roads upstream, the County could effectively be taking the property rights of those who live downstream. Those places where the floodplain and flooding regime have been altered, the County should consider rezoning to accurately reflect increased constraints.

At this point in the update process, Humboldt Watershed council views a strengthened version of Option A as the only General Plan alternative that will not continue breaching the threshold of significance for impacts to water resources in the 13.6 Preliminary CEQA Analysis - the only alternative capable of restoring the health of our watersheds.

We appreciate the dedicated and difficult work being done by the Planning Department, and strongly encourage continued additions and refinements necessary to fully address cumulative impacts.

Thank you for your patience and the opportunity for participation in this extremely important process.

Sincerely yours,

Carol Argyle
Susan Brater
Richard Gienger
Cletus Isbell
Jeanette Junger
Joyce King
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Kristi Wrigley

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APPENDIX A

The Healthy Humboldt Coalition *www.healthyhumboldt.org mail@healthyhumboldt.org*

Excerpt from April 12, 2007 Letter to Planning Commission and Planning Staff re Chapter 3

Safety

The Staff Report reads:

"The approach taken in this General Plan involves: 1) consideration of appropriate land use designations in order to limit the populace exposed to hazardous areas; 2) assessment and conditioning of development applications according to the hazards on a site; 3) policies tailored to specific hazardous conditions; and, 4) an action program to improve overall safety conditions within the County."

This fails to recognize the impact that human land use activities have in causing or worsening some of these hazards. It has been well documented in Humboldt County's watersheds that forest canopy removal from logging increases peak flows from rainfall, thus increasing the amount of water flowing into our creeks and rivers during any given rainfall event. The impact of these increased peak flows can be considerable, as it effectively increases both the severity and frequency of flooding.

Other related studies have clearly shown the relationship between ground-disturbing activity and landsliding on our hillsides. Among timber harvest-related activities, the greatest cause of landsliding is not the logging itself but the road building. This is true even of today's engineered, armoured, and 'weather-proofed' roads. In Elk River, landslides caused by timber harvest-related activities have triggered landsliding volumes of over 750,000 cubic yards.

Of course, the best (or worst) example of the hazard posed by road building and the clearing of land on our sensitive hillsides is the Stafford landslide of January 1, 1997, which destroyed some 17 homes. The geologic hazards element must recognize that human activities in our upper watersheds, particularly clearing and road building, have a causal relationship with landsliding and geologic instability.

Along with posing a direct safety hazard, this human-caused landsliding also contributes vast amounts of sediment into our creeks, streams and rivers, and into Humboldt Bay. This sedimentation creates downstream safety hazards that can persist for many years. Freshwater and Elk River have both been shown to suffer from massive amounts of sediment deposits which have reduced their carrying capacity by 60% or more. The volume of storm water which could once be accommodated in these streams can no longer fit. Additionally, as pointed out above, there is now more water flowing off of the slopes due to the loss of canopy, meaning that there is more water flowing into a smaller channel.

The result is greatly increased flooding. It has been well-documented that routine rainfall events now cause greatly-increased flood levels. "50 year floods" now occur on an annual basis, and floods the magnitude of the 1955 "flood of record" for these watersheds now occurs every 2-3 years. The December 28th 2005 storm, which dropped 2.46 inches of rain over 3 days, created a flood level in Freshwater Creek that was fully 15 inches higher than the 1955 flood.

All of this history and documentation has shown the cumulative impact of too much road building and canopy removal in these watersheds. Studies by the North Coast Regional Water Quality Control Board have led them to only permit canopy removal of approximately 1.5% per year in these watersheds. However, this is only for the temporary canopy removal due to timber harvesting. That canopy grows back over time, leaving perhaps 5% or so of the watershed denuded at any given time.

Development in these erosive watersheds would bring permanent canopy removal and road building. The potentially disastrous cumulative effects of these activities must be considered fully in advance, and absolute limits on permanent canopy removal should be instigated. While Elk River and Freshwater provide the best information base for this issue, the concept should be applied broadly across Humboldt County to prevent the impacts that these watersheds now suffer from.

APPENDIX B

Consideration Of Cumulative Impacts In EPA Review of NEPA Documents
U.S. Environmental Protection Agency, Office of Federal Activities (2252A)
EPA 315-R-99-002/May 1999

Excerpts

According to EPA, proper consideration of Cumulative Impacts should:

- use **geographic and time boundaries large enough** to include all potentially significant effects on the resources of concern, and *for the most important impacts to become evident;*
- delineate appropriate geographic areas including natural ecological boundaries,
- evaluate the time period of the project's effects and **beyond the life of the action at** time scales long enough for the potential for impact accumulation to be identified
- **focus on each affected resource, ecosystem, and human community** and address the sustainability of those resources
- **determine all past, present, and future actions** that contribute to significant cumulative effects on the resources of concern, l **including all federal, nonfederal, and private actions.**
- include the use of trends information and interagency analyses on a regional basis to determine the **combined effects** of past, present, and future actions
- be interdisciplinary enough to recognize patterns and interactions among diverse impact mechanisms occurring in the vicinity of the project
- **address additive, countervailing, and synergistic effects.**

The analysis should accurately depict the **condition of the environment** used to assess cumulative impacts, addressing one or more of the following:
1) how the affected environment functions naturally and whether it has been significantly degraded;
2) the specific characteristics of the affected environment and the extent of change, if any, that has occurred in that environment; and
3) a description of the natural condition of the environment or, if that is not available, some modified, but ecologically sustainable, condition to serve as a benchmark.

For the evaluation of the environmental consequences to be useful, it is important that the analysis also incorporate the **degree that the existing ecosystem will change over time under each alternative.**

Analysis should include **specific thresholds** required under law or by agency regulations or otherwise used by the agency. In the absence of specific thresholds, the analysis should include a description of whether or not the resource is significantly affected and how that determination was made.

Examples of thresholds include:

- The total change in land cover is a simple indicator of biotic integrity; thresholds for areas with high alterations would generally be lower than areas that are not as degraded; if open space or pristine areas are a management goal then the threshold would be a small percentage change in land cover.

- Patch size distribution and distances between patches are important indicators of species change and level of disturbance. Thresholds would be set to determine the characteristics of an area needed to support a given plant or animal species.

- Estimates of fragmentation and connectivity can reveal the magnitude of disturbance, ability of species to survive in an area, and ecological integrity. Thresholds would indicate a decrease in cover pattern, loss of connectivity, or amount of fragmentation that would significantly degrade an area.

- Indicators of water quality and watershed integrity can be used to set thresholds. Specific concentrations and levels of nitrogen, phosphorous, turbidity, dissolved oxygen, and temperature can be used.

- Thresholds for a decline in water quality can take the form of size and amount of riparian buffer zones. Condition of riparian zones and changes in percent of buffer areas can indicate a decline in water quality due to soil erosion, sediment loading, and contaminant runoff.

Appendix C

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APPENDIX D

Humboldt Bay Watershed Salmon and Steelhead Conservation Plan, prepared for the California Department of Fish & Game and the California Coastal Conservancy by Humboldt Bay Watershed Advisory Committee and The Natural Resources Services Division of Redwood Community Action Agency, March 2005

Excerpts

Goals and objectives in the *SSCP* are consistent with goals for the State Water Resources Control Board's (SWRCB) *Watershed Management Initiative*, in that this Plan promotes cooperative and collaborative efforts and is designed to focus limited resources on key issues. Protecting and enhancing the anadromous salmonid resources is a broad goal stated by the SWRCB for the Humboldt Watershed Management Area. Goals and objectives of the *SSCP* are being incorporated into the Humboldt Bay Management Plan (currently being developed by the Humboldt Bay Harbor, Conservation, and Recreation District) and the **Humboldt County 2005 General Plan Update.**

Information and goals from the *SSCP* have been incorporated in varying degrees, in to state and federal coho recovery planning and Total Maximum Daily Load (TMDL) process, including the CDFG *Recovery Strategy for California Coho Salmon*, and Elk River and Freshwater Creek's TMDLs.

SSCP research of limiting factors include:

- Concentrations and durations of suspended sediment levels during wet months in Freshwater Creek, and Elk River, and to a lesser extent Jacoby Creek, frequently exceed accepted thresholds for salmonid growth and, at times, survival. Sediment is considered to be the most important limiting factor for salmonids in Freshwater Creek and Elk River
- The floodplain capacity and function in the Humboldt Bay watershed has been substantially reduced over the past 150 years. Human activity has caused a loss of connectivity between streams and their floodplains reducing overall habitat complexity and availability of backwater and side channel habitat that is important rearing habitat for juvenile salmonids.
- Estuary habitat around Humboldt Bay has been significantly reduced by construction of levees and tidegates, and placement of fill. This habitat is necessary for salmon as it allows them to adapt to salt water and provides significant food resources for growth giving them the best possible chance for survival before they enter the ocean environment.
- The quality and complexity of instream habitat is degraded especially in low gradient reaches that are important for salmonids. There is an overall lack of large wood, deep pools, cover, and clean gravels in all of the watersheds tributary streams.
- Increased sediment inputs from legacy and current timber management activities in the upper watershed, have changed the channel morphology, and reduced channel capacity in the low gradient sections of Jacoby and Freshwater Creeks and Elk River (storage reaches).
- There is a lack of large wood in the middle and lower reaches of Humboldt Bay tributaries. Lack of large wood has reduced available rearing habitat.
- Diminished riparian habitat in Humboldt Bay tributaries has led to increased erosion, bank destabilization, lack of cover and complexity for fish habitat.

II. B. Recent Trends

The Humboldt Bay area was once a complex ecosystem that supported an amazing abundance of wildlife. From ridge top oaks and old growth redwoods to meandering river estuaries, the Humboldt Bay watershed boasted rich biodiversity. Since European contact, the region's natural environment has severely deteriorated. Old growth redwood forests have been reduced to a mere few thousand acres and the original estuary system is cut off from the bay. Salmon populations are on the verge of extinction and the once-abundant elk population no longer lives in the watershed. Significant landscape alterations have occurred in land directly adjacent to Humboldt Bay. From 1870 to around 1927, the amount of land in agriculture increased by about five times, and today only one-fifth of historic tidal wetlands remain. The amount of land used for residential and commercial/industrial uses has also increased dramatically, particularly since about 1940. Residential land use tripled between 1940 and 1980 (Shapiro and Associates 1980; Barnhart, Boyd, and Pequegnat 1992). Growth has continued in the watershed with the unincorporated area outside Eureka being one of the fastest growing regions in Humboldt County (Split Rock Ventures 2001).

The predominant land uses in the watershed, as well as in Humboldt County, are still agriculture and timber production (Index of Economic Activity 2000). In 1972, the State of California passed the Z'berg/Nejedly Forest Practice Act. This act provided the first real regulation of forest harvest practices, including protection for streams and riparian areas. For example, the construction of Humboldt stream crossings became illegal under this act, and riparian areas were given some protection from harvest and road construction. With the exhaustion of timber resources and tighter regulations on forestry practices, production dropped to 500 to 800 million board feet in the 1970s and 1980s. Timber harvest rates increased again in the 1990s when large portions of the upper Humboldt Bay watershed were harvested. In the 1990s, decreasing salmonid population numbers brought scientists' and policy-makers' awareness to the detrimental effects of forestry practices on salmonid habitats.

The state organized the Independent Scientific Review Panel (ISRP) in 1998 to comprehensively review California Forest Practice Rules with regard to their adequacy for protection of salmonids (ISRP 1999). The ISRP recommended many changes to California Forest Practice Rules to enhance protection of salmonids and their habitat. Similarly, timber

companies are developing Habitat Conservation Plans (HCPs) for the protection of salmonids and other federally listed species. In Humboldt Bay watershed, Pacific Lumber Company has been operating under a multi-species HCP developed in 1999. The restrictions of the HCP were to remain in place until the company conducted watershed analyses for Freshwater Creek and Elk River to guide future timber harvest. The Freshwater Creek watershed analysis was completed in December 2003, and the Elk River watershed analysis has been publicly released in a draft form. The results of the process have been a source of much controversy and it remains to be seen what changes will result. Green Diamond has voluntarily developed an Aquatic HCP, and currently in 2005, Green Diamond is implementing the plan (the conservation measures and monitoring are being applied) , but the plan has not yet been approved by the regulatory agencies.

IV. C. Cumulative Watershed Effects in Humboldt Bay Watershed

Cumulative impacts are defined as "...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." (CEQ Guidelines, 40CFR 1508.7, issued 23 April 1971.) "Cumulative watershed effects" was not formally defined by the Council on Environmental Quality (CEQ), but in this document the term refers to cumulative effects that involve watershed processes (specifically, those cumulative impacts that influence or are influenced by the flow of water through a watershed). Such impacts may include: degraded water quality, reduced viability of aquatic and riparian species, nuisance flooding, and damage to recreational and residential properties. Because almost all watershed impacts are influenced by multiple activities, those impacts must be evaluated as cumulative rather than individual (Reid 1999).

Quantification and regulation of CWEs has been a topic of debate for many years in Humboldt Bay watershed. The last five years have seen increasing efforts to quantify and correlate cumulative effects of sediment discharge on channel aggradation, turbidity, and salmon viability, in an attempt to determine appropriate rates and approaches to timber harvest, agriculture, and other land use activities. Other watershed factors, such as traffic on unpaved roads, riparian vegetation changes, residential development, legacy effects, levee construction, separation of the stream from the floodplain, and historic removal of LWD are also important contributors to CWE related to sediment impairment and viability of salmonid populations. Influences beyond the watershed that also contribute to the impacts of concern include results of bay and estuary management, commercial fishing, and hatchery competition. Factors such as weather patterns, ocean conditions, tidal influences, and the inherent instability of underlying geologies are fundamental, and must always be accounted for in assessing cumulative risks. Almost all off-site environmental impacts are cumulative impacts.

The word "cumulative" indicates that the impact is influenced by multiple activities. Cumulative watershed impacts are of considerable concern because they are responsible for much of the damage to property and to public trust resources that occurs away from the site of a land-use activity (Reid 1999). Because impacts can accumulate through time and space, they may take a long time to become evident, and they may occur a long distance from the activities that generate them (Reid 1999). Humboldt Bay watershed water quality and fisheries habitat has been and still is impacted by multiple land use activities that have changed the amounts, delivery rates, and transportation rates of watershed products – sediment, water, and woody debris. Changes in these watershed products are the most common causes for downstream cumulative impacts. The initial removal of all of the old-growth forest in the watershed resulted in impacts including unprecedented increases in sediment in the stream channels. The canopy of these forests held millions of gallons of water in their foliage, branches, and trunks over the ground layer, creating local microclimates, which buffered the forest floor from temperature extremes. Within the stream zone, large old-growth tree trunks defended streambanks from erosion, defined stream channels, and created deep pools in the stream which protected fish and other aquatic organisms from predators (Murray and Wunner 1988).

Humboldt Bay watershed has been impacted by increased sediment inputs, primarily generated by timber harvest activities on steep, unstable slopes in the upper watershed. Additional land uses such as riparian removal, road and levee construction, residential encroachment, removal of LWD from the stream and herbicide use in the Humboldt Bay watershed contribute to cumulative watershed effects. Other factors contributing to CWE are past over-fishing, poor ocean conditions, erosive geology, hatchery introductions and mixed stock. Cumulative impacts from increase in sediment loads in Humboldt Bay watershed includes modification of the estuary system; reduction of channel conveyance and aggravation of flood hazard; infilling of channel pool habitat; and water quality degradation. Forests influence runoff by intercepting and evaporating rainfall before it hits the ground. Data from Caspar Creek, California (Ziemer 1998, Reid 1999) show that logging of this second-growth redwood forest has increased flood peaks in completely clearcut watersheds by an average of 27 percent, and that the effect is proportional to the amount of forest cover removed in the watershed. Impervious surfaces caused by logging, road building, and urbanization affect runoff rates, which lead to increased stream flow, and quicker responses to storm events (Tuttle, 1985).

Cumulative impacts of water withdrawal can result in lack of summer rearing habitat for juvenile salmonids, especially in drought periods. Due to the fragile geology of Humboldt Bay watersheds, particularly in Elk River and Freshwater Creek watershed, naturally occurring events need to be considered when determining other land uses, which individually and combined, may contribute to limiting factors affecting salmonid habitat and therefore populations. Cumulative impacts affect watershed processes, which in turn affect fish species differently depending on life stage requirements.

Appendix E

WATERSHED CONDITION, TURBIDITY, AND IMPLICATIONS FOR ANADROMOUS SALMONIDS IN NORTH COASTAL CALIFORNIA STREAMS

A Report to the California North Coast Regional Water Quality Control Board, May 1, 2008
Randy Klein, Hydrologist, Redwood National and State Parks
Dr. William Trush, River Ecologist, McBain and Trush, Arcata CA
Matthew Buffleben, P.E., California Regional Water Quality Control Board

Recommendation No. 1. The following methodology for applying CWE thresholds for the averaged water year is proposed for determining significant CWEs for third-order north coastal California watersheds within the regional boundaries of this study:

- Background CWE on Anadromous Salmonid Habitat Capacity and Stream Ecosystem Productivity occurs when 55% of the days between November 15 and June 15 equal or exceed a Lower Bound turbidity threshold of 10 NTU in the averaged water year.

- Moderate CWE on Anadromous Salmonid Habitat Capacity and Stream Ecosystem Productivity occurs when 20% of the days between November 15 and June 15 equal or exceed a Lower Bound turbidity threshold of 25 NTU in the averaged water year.

- Severe CWE on Anadromous Salmonid Habitat Capacity and Stream Ecosystem Productivity occurs when 10% of the days between November 15 and June 15 equal or exceed a Lower Bound turbidity threshold of 50 NTU in the averaged water year.

The specific targets may not be appropriate across the entire north coast region because they are based on applying Lower Bound slope-harvest rate relationships to the Elder Creek example. However, with the data set assembled for this study, the potential exists for developing within-region targets that accommodate north coast variability. If one CWE threshold is exceeded the other two are typically exceeded as well; all CWE thresholds are more likely to be exceeded in wet water years than dry.

Recommendation No. 2. Our modeled turbidity biological analyses indicated that an average annual timber harvest rate, measured as CCE 0-15, between 1.4%/yr and 2.3%/yr could cause significant CWEs to the stream ecosystem and anadromous salmonids. Annual average harvest rates above 1.4% in planning watersheds should be reason for heightened scrutiny of additional harvest proposals.

Recommendation No. 3. Old second growth streams are not adequate for establishing background conditions for steelhead populations, and should not be used for this purpose. Although old second growth streams have turbidities considerably below the CWE thresholds recommended in this report, chronic turbidity effects are still likely occurring.

Recommendation No. 4. Evaluation of potential CWEs from the timber harvest rate should be focused on a watershed's intrinsic supportable population (WISP) for steelhead rather than on total adult run size. The transition to an impaired adult steelhead run population in our third-order watershed (Elder Creek), using 10 adults/mile as the threshold, occurred at an average annual timber harvest rate between 1.5% to 2.0%.

Recommendation No. 5. Development of better and more universal smolt-to-adult return curves (SAR) for steelhead should become a high priority for assessing CWEs.

Recommendation No. 6. For streamflows greater than approximately 30 cfs/mi^2, apply the SEV protocol of Newcombe and Jensen (1996) assessing acute CWE effects on a continuous hourly time-step.