15.10.01

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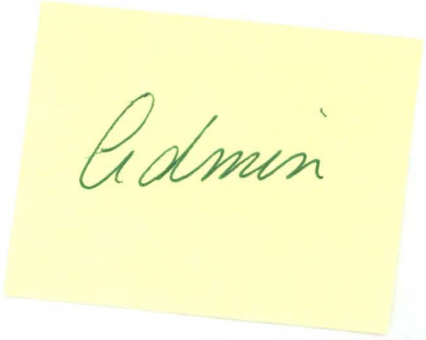
Public comments on the Draft Update to Injured Resources

David Stutzer, Homer
David Janka, Cordova, Auklet Charter Services
Shelley Romer
Laura Litzky, Seattle, University of Washington, School of Aquatic and Fishery Sciences
Barbara Meyer, Homer
Greg Streveler, Gustavus
Mike Gracz, Homer
Susan Payne, Kodiak
Dena Matkin, Gustavus
Corrie Bosman, Sitka, Center for Biological Diversity
Jim Adams, Anchorage, National Wildlife Federation, Alaska office
Scott Sterling, Wasilla (formerly [1987-1993] counsel for City of Cordova)
Lynn Highland, Anchorage
Dan Esler, Delta, British Columbia, Centre for Wildlife Ecology, Simon Frasier University
Michelle Wilson Nordhoff, Alaska Center for the Environment
Lauren Joy Padawer, Eyak Preservation Council, Cordova
Maryellen Oman, Anchorage
Udi Lazimy, Wisconsin
Dune Lankard, Cordova
J. Todd Brown
Carol Hoover (2 comments), Cordova, Eyak Preservation Council
Dorothy Keeler, Anchorage, Wilderness Inspirations
Donna Anderson, Douglas
Marybeth Holleman
Scott Metzger, Anchorage
Jim Curland, Moss Landing, CA, Defenders of Wildlife



Molly McCammon

To: Cherri Womac

Subject: FW: Classification of species impacted by EVOS

keep in file for TC meeting in June.
-----Original Message-----
From: David Stutzer [mailto:dastutz@pobox.xyz.net]
Sent: Monday, May 06, 2002 9:52 PM
To: molly_mccammon@oilspill.state.ak.us
Cc: Craig Matkin
Subject: Classification of species impacted by EVOS

Molly McCammon
Executive Director, Exxon Valdez Trustee Council

Dear Ms. McCammon,

This letter concerns the recent reclassification of species impacted by the Exxon Valdez oil spill, in particular, killer whales and herring. I am very concerned that killer whales have been classified as recovered when the research shows that both the local pods and the transients are nowhere near their prespill population levels. Since there has been a recent increase in the resident AB pod, this group should be listed as recovering and the transient AT1 pod should be listed as not recovering. Herring were severely impacted by the oil spill and apparently, from documents produced by the Trustee Council, have not recovered to prespill levels and have not shown a strong age class since the spill. This would indicate a need for a classification of "non-recovering" for herring in PWS.

I would hope that science is what drives classifications of the species affected by the Exxon Valdez oil spill. These recent reclassifications seem arbitrary and unscientific. The facts seem to clearly indicate that at least herring and killer whales have not recovered from the oil spill. You are not doing anyone a service by trying to gloss over that fact. It is important to remind the public how pontentially dangerous our relationship with the oil industry can be.

Please classify herring and killer whales as I have suggested above and continue to have their populations monitored. Thank you.

David Stutzer
P.O. Box 2296
Homer, AK 99603

Cherri Womac

From: shelley romer [shelleyromer@hotmail.com]
Sent: Thursday, May 09, 2002 10:40 AM
To: restoration@oilspill.state.ak.us
Subject: Killer Whales

Dear Molly McCammon:

I am writing to express that I don't agree with the assessment of recovery status for killer whales and that I feel killer whale monitoring should continue. Killer whales are not "recovered." AB pod should be listed as "recovering." Acknowledgement should also be made for the lack of recovery of the AT1 group. The oil spill has demonstrated that long-term monitoring of killer whales is vital and productive. We would have had no idea of the spill effects on these whales had monitoring not been in place, nor would we have predicted the time involved in recovery. Herring should be listed as "non-recovering" to draw attention to repeated lack of recruitment of a strong age class in this severely reduced population. Herring are a cornerstone in the PWS marine ecosystem. I hope that this issue is not taken lightly and will be reconsidered as severe consequences in the marine ecosystem could result from hasty decision making. Thank you for your time.

Shelley Romer

Cherri Womac

From: Molly McCammon [molly_mccammon@oilspill.state.ak.us]
Sent: Wednesday, May 08, 2002 8:35 AM
To: Cherri Womac
Subject: FW: Draft Status of Injured Resources

add to injury comments.

-----Original Message-----
From: David Janka [mailto:info@auklet.com]
Sent: Tuesday, May 07, 2002 6:02 PM
To: molly_mccammon@oilspill.state.ak.us
Subject: Draft Status of Injured Resources

Hi Molly,

It was really nice to visit with you during your birding trip to Cordova.

I have been thinking about some of our conversations and want to pass a few thoughts along to you. Please add this to the public comments on your Draft Status of Injured Resources.

I guess I fall into the group that will never be able to say that the Sound has recovered from the Exxon spill. The practical/common sense reality is that it will never be the exact same as it was before the spill. The political reality will eventually say it has. The scientific will fall somewhere in between. Any amount of residual oil, any population that either by number or reproductive health is not the same as before the spill or any usage by subsistence, commercial or private users that continues to be altered or different because of the spill will mean it has not recovered. If nothing else was going on in the Sound; changes in weather, usage by humans, ocean/food web fluctuations, etc. it could return to exact pre-spill conditions, maybe. But the spill kicked some things one way and because it is an active and dynamic ecosystem certain things will never kick back to the same conditions.

Boating around the Sound before the spill one would regularly see a friendly, social pod of Killer Whales. AB Pod. It is rarely seen today. Some family members have taken up with another pod. Their numbers are still down and they do not have the same reproductive success as other pods. They are recovering but I find it insulting to call them recovered. Please consider listing them as recovering.

The spill mainly impacted wild stock pink salmon streams in the Sound and did no noticeable damage to hatchery fish. It has only been in the past few years that I have begun to see even a few pink salmon returning to some of the streams in the impacted area. These returns are very small. There used to be commercial openers for salmon around Knight Is. before the spill. These fisheries have not returned to a pre-spill regularity. Unlike Killer Whales, which have ongoing research to show their recovery as well as their continuing impact, there is no pink salmon monitoring taking place in the impacted wild stock streams. They are recovering but to call pink salmon recovered without any data to support it is poor science. Please consider keeping pink salmon listed as recovering until data shows otherwise.

On a trip out to Montague Island recently it was good to see what seemed to be a better herring spawn then the past few years. One year of slightly better spawning when predator impacts on eggs, larvae and adults is still to take place leaves the health of the population in question. There is no sign of their population being able to get above what the year-round predator needs are any time soon. It seems that they are not recovering but are possibly only stabilizing at a much lower

population level as before the spill. Like the pink salmon many of the monitoring studies have been dropped for herring. I would suggest that you consider downgrading herring in PWS to not recovering or.....herring, pink salmon as well as the AB pod could be given a Recovery Unknown classification which is defined as "limited data on life history or extent of injury; current research inconclusive or not complete." I think that is very true of the three. The extent of injury, actual oil on a whale, is not known for the AB pod. Current research on the herring and pink salmon is not complete. Along this line I would ask that you seriously consider adding the AT1 transient Killer Whale pod to the Recovery Unknown listing as well. All of the above criteria for listing them holds true.

I am curious about the Common loon and the 3 species of cormorants. Have there been any studies before, during or after the spill? It seems they would be better listed under Recovery Unknown because of the lack of information and study.

I have a few things that have been bothering me that don't fall into the Status of Injured Resources. Hope you don't mind my adding these thoughts and concerns.

I feel the impacts of intrusive science is approaching the residual impacts of the spill. I think this is true of some of the bird studies as well as ones for otters and seals. Now with large amounts of money for sea lion research they will be falling prey to similar harassment. Year after year you are chased, herded, netted and caged to be poked, prodded, examined, sampled, measured, operated on and transmitter implanted. You're then released and expected to act like nothing happened. The amount of money is very large for these kinds of projects and I am not sure the information gained is a very good value. I think there is a great deal still to be gained by basic, non-intrusive observations of behavior and interactions with human activities, clutch sizes, scat sampling and population surveys. When will there be a year that the birds and mammals in the spill impacted area and it's corresponding control areas be left alone?

I am appalled at how poorly run some of the projects at the Sea Life Center have gone with captured birds and animals. All but one of the land otters died and the one that was released died soon after. Ducks that were fed oil are now unable to be released into the wild. People at the Center where not properly trained in how to feed captive birds causing problems with projects as well as the well being of the birds. This is terrible science and I hope it is not continued especially through support from the Trustee Council.

Thank you for your time and consideration of my comments, suggestions and concerns.

Sincerely,
David P. Janka
Owner/Operator
Auklet Charter Services

Auklet Charter Services
Custom multi-day boat charters
throughout Prince William Sound.
David and Annette Janka
P.O. Box 498
Cordova, AK 99574-0498
voice/message: 907-424-3428
email: <info@auklet.com>
web: www.auklet.com

Cherri Womac

From: Laura Litzky [llitzky@u.washington.edu]

Sent: Thursday, May 09, 2002 11:03 AM

To: restoration@oilspill.state.ak.us

Subject: Trustee Council

To Whom It May Concern,

I am writing to express my disagreement with you recent assessments of killer whale and herring status. In particular:

1. Killer whales are not "recovered." AB pod should be listed as "recovering." Acknowledgement should also be made for the lack of recovery of the AT1 group.

2. The oil spill has demonstrated that long-term monitoring of killer whales is vital and productive. We would have had no idea of the spill effects on these whales had monitoring not been in place, nor would we have predicted the time involved in recovery.

3. Herring should be listed as "non-recovering" to draw attention to repeated lack of recruitment of a strong age class in this severely reduced population. Herring are a cornerstone in the PWS marine ecosystem.

Thank you,

Laura Litzky

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Laura Litzky
University of Washington
School of Aquatic and Fishery Sciences
Office: 260B Fishery Sciences
Mail: Box 355020, Seattle, WA 98195
Phone: (206)221-5453
FAX: (206)616-9012
email: llitzky@u.washington.edu

Cherri Womac

From: Molly McCammon [molly_mccammon@oilspill.state.ak.us]

Sent: Friday, May 10, 2002 8:15 AM

To: Grace Meyer

Subject: RE: orca whale status

thanks for your comments Grace. I'll be sure they get to the Trustee Council. Molly McCammon

-----Original Message-----
From: Grace Meyer [mailto:g.meyer@mindspring.com]
Sent: Friday, May 10, 2002 7:22 AM
To: molly_mccammon@oilspill.state.ak.us
Subject: orca whale status

To: Molly McCammon, Exec. Dir.

From: Barbara Meyer
PO Bx 1675
Homer, AK 99603

Dear Molly,

I'm actually out of state at the moment, visiting in CO and using email there, but I had heard before leaving AK about the changing status of orca whales on the recovery list from the oil spill, and it's very concerning to me. I am just an Alaskan citizen, not a scientist, but I have lived in Homer since 1985 and feel strongly about protecting the land/sea environment of our state. The oil spill deeply affected me, as it did everyone, and I want to do everything in my power to prevent it from happening again. To me, part of that effort comes in learning everything we can from the incident, especially over the decades. To be rushing (as I see it) to change the listing of orcas from "recovering" to "recovered" is really a dangerous thing to do, giving the wrong impression to the public, to scientists and environmentalists, and especially to the oil industry. I feel that long-term monitoring of orcas, herring, and many other species is going to show that recovery of PWS is still decades away, if indeed it ever happens. I'm especially dismayed when the organization pushing the re-classification is the very group that should be fighting it.

While I do understand the turnover to the GEM program, I'm worried that this re-classification of the whales may be more about the Council starting this new time with a clean slate. Alaskans need to keep the issue of marine ecosystem protection alive, and I believe the best way we can do that is to be slow and extremely thorough about research before saying the system is healthy once again. Please use your influence to list the orcas as recovering and herring as non-recovering until we all know much more than we do now. Please continue to fund long-term research and monitoring of these and other species devastated by the spill.

Thanks for your attention to this letter. my home email is babz@xyz.net, should you want to respond.

Sincerely, Barbara Meyer

Cherri Womac

From: Molly McCammon [molly_mccammon@oilspill.state.ak.us]
Sent: Monday, May 13, 2002 9:32 AM
To: Cherri Womac
Subject: FW: Sound Recovery List

-----Original Message-----
From: Greg Streveler [mailto:grigori@gustavus.ak.us]
Sent: Friday, May 10, 2002 3:05 PM
To: molly_mccammon@oilspill.state.ak.us
Subject: Sound Recovery List

Molly,
As a strong proponent of the good work your council has done over the years since the spill, I am mystified and disappointed over the recent decisions to gloss over the considerable difficulties still exhibited by orcas and herring. It seems very clear to me that these species still need attention, which they are less apt to receive if listed as proposed.
If there is the possibility of revisiting the designations for these species, I would strongly advocate that.

Sincerely,

Greg Streveler

Cherri Womac

From: Mike Gracz [anmbg@uaa.alaska.edu]

Sent: Monday, May 13, 2002 9:27 AM

To: restoration@oilspill.state.ak.us

Cc: GERALD TANDE; Craig O. Matkin

Subject: PWS "recovering"? taxa

Molly McCammon, Executive Director
***Exxon Valdez* Trustee Council,**

The most reliable data show that two killer whale groups, AT1 and AB are "not recovering" and "recovering", respectively, and not "recovered" as your proposed new classification suggests. AT1 hasn't seen an increase since it's dramatic post-spill drop; and AB is not near pre-spill numbers yet. Killer whales are long lived organisms which produce few offspring at relatively long intervals, taxa with this reproductive strategy (k selected) are sensitive to catastrophic disturbance, and recover slowly, if at all. K selected taxa also face the danger of a genetic bottleneck- where survivors of catastrophe retain insufficient genetic reserve to continue- so numbers alone fail to tell a complete recovery story- new recruits may lack fertility. An upgrade to "recovering" is appropriate for this killer whales as a whole.

When herring stocks again become commercially exploitable in the sound, then list that taxon as recovering. After ten years of successful harvest (or at least patterns mimicking other nearby stocks) then "recovered" seems appropriate. Please err on the side of caution when considering the fate of a complex ecosystem we do not not fully understand. Please help continue the necessary, though often unglamorous, work of monitoring the complete picture of recovery- and lack thereof.

Sincerely,

Mike Gracz

Molly McCammon, Executive Director
Exxon Valdez Trustee Council
441 West 5th Ave. Suite 500
Anchorage, AK 99501-2340

May 10, 2002

Dear Ms. McCammon,

The Exxon Valdez Trustee Council is in a unique situation to be able to maintain long standing research projects in the affected area of the Exxon oil spill. It has come to my attention that the Exxon Trustee Council is not interested in funding or maintaining the ongoing research of Craig Matkin and colleagues on the killer whale pods of Prince William Sound, the AB pod and AT1 group. I am writing you to please continue your involvement in this long-term study of these killer whale groups to see how long and under what factors these pods recover to their pre-spill population levels.

I have read information from Craig that shows how these groups have not recovered to their pre-spill population levels and continue to exhibit uncommon behavior from before the spill. This may hinge on their dependence on PWS herring, which also seems to be maintaining depressed recruitment since the spill.

We in the public are fortunate that Craig and the North Gulf Oceanic Society were monitoring the PWS killer whales before the spill because we have been able to see the effects on these killer whale communities. We have been fortunate that you have contributed to this research for some time, and I urge you to continue this funding to further enlighten us to the condition of PWS, to remind us of the oil spill effects, and let us know when these stocks are fully recovered to pre-spill levels. Please continue funding this project; what you gain in knowledge of these killer whale groups and thus the health of the PWS ecosystem is worth the price!

Sincerely,

Susan Payne

Susan Payne
PO Box 1903
Kodiak, AK 99615

Cherri Womac

From: Dena Matkin [denamatkin@hotmail.com]
Sent: Monday, May 27, 2002 4:46 PM
To: restoration@oilspill.state.ak.us
Subject: Recovery status of orca & herring in PWS

To Whom I Hope It Concerns:

I have studied killer whales in southeastern Alaska for the past 15 years, and am a former resident of Prince William Sound. I do not agree with your assessment of the recovery status of killer whales and herring in Prince William Sound. I am writing to recommend that killer whale AB Pod designation be changed to just barely "recovering" as current research has indicated the pod crashed from 36 to 22 (an unprecedented loss), now only up to 26 individuals. Also, you should recognize the AT group decline from 22 down to 9 individuals shows that it is "non-recovering."

Further, herring should be down-graded from "recovering" to "non-recovering." Trustee Council documents have indicated an unprecedented crash in herring in 1993, and that recovery has stalled due to a repeated lack of recruitment of a strong age class.

Please continue to fund long-term monitoring research on killer whales in Prince William Sound that also explores feeding habits, genetics, contaminant loads, acoustics and habitat needs. Thank you for your consideration to rethink these designations. You have the power to really help Prince William Sound. Please use it.

Sincerely,
Dena Matkin
Box 22
Gustavus, Alaska
99826

Center for Biological Diversity

Protecting endangered species and wild places
through science, policy, education, and environmental law.

Molly McCammon, Executive Director
Exxon Valdez Oil Spill Trustee Council
441 West 5th Avenue, Suite 500
Anchorage, AK 99501-2340

June 7, 2002

Re: Comments on Draft Update of Injured Resources and Services

Dear Ms. McCammon:

These comments are submitted on behalf of the 7,500 members of the Center for Biological Diversity (The Center). The Center works on protection for endangered species and the habitat that supports them. For this reason we are particularly interested in the Trustee Council's findings in the Draft Update on Injured Resources and Services April 30, 2002 (Draft Update). The Draft Update serves an important role in educating the public of the overall health of the Prince William Sound ecosystem in the aftermath of the oil spill. For this reason, it is important to insure that any conclusions the Council makes regarding the status of the indicator species and habitats chosen for monitoring are not only accurate, but made with certainty. Where information is lacking or indeterminate, the Council has an obligation to proceed in a precautionary manner until it is conclusively demonstrated that a species has truly reached the point of recovery. Below are some of our particular concerns with the Draft Update.

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I. AB Pod of Killer Whales:

The Draft Update recommends moving the Prince William Sound AB pod of killer whales from the "not recovering" list to the "recovered" list. The AB pod is one of the eight resident killer whale pods found in Prince William Sound. Prior to 1989, the pod numbered 36 animals. Immediately following the oil spill seven members of the pod were found missing and later determined dead. These missing pod members included three adult females (leaving behind 2 young calves) and four juveniles (EVOS Restoration Notebook, 1997 at 8). By 1990, six additional whales from the AB pod were missing and presumed dead. This second loss included one mature female (who left behind one young calf), one mature male and four juveniles. All three of the orphaned calves died in the years following. From 1992-94 five additional adults from the AB pod were lost and presumed dead. At this time four new calves were born. Between 1996-98 two additional adults were lost, and five new calves were added (Status of Injured Resources, EVOS Report 1999). The rates of disappearance and mortality in the AB pod far exceed normal mortality rates of less than 1 percent per year. In comparison, in 1989 the AB pod had a 19.4 percent mortality rate and in 1990 the mortality rate increased to 20.7 percent (Restoration Notebook at 8). Mortality rates of the AB pod "far exceeded rates observed for other pods in British Columbia and Puget Sound over the last 30 years, and in the northern Gulf of Alaska over the last 18 years" (Draft Update at 17).

The initial definition of recovery adopted by the EVOS Council in its 1994 Restoration Plan states: "Full ecological recovery will have been achieved when the population of flora and fauna are again at former or pre-spill abundances, healthy and productive, and there is a full complement of age classes at the level that would have been present had the spill not occurred." The AB pod of killer whales clearly does not meet this definition of a recovered species. Prior to 1989, the pod had 36 members, this number dropped to a low of 22 in the early 1990's and now has increased to 26. The current population is a 27 percent decline in number of individuals

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from pre-spill state. Furthermore, it is fairly clear that the population is not healthy and productive as evidenced by the break away of a matrilineal group from the AB pod to join the AJ pod. This split-off is unprecedented for resident pods of PWS and other regions (Restoration Notebook at 9). Lastly, the loss of so many whales in the years following the spill has resulted in a different age and sex class than present prior to the spill's occurrence.

In 1999, the recovery objective for the AB pod was changed to: "the number of individuals in the pod stable or increasing **relative to the trends of other major resident pods in Prince William Sound."** (EVOS Report 1999, emphasis added). The population of the other resident killer whale pods in Prince William Sound has increased consistently each year since 1987 at a rate close to 2 percent (Restoration Notebook at 6). In comparison, the AB pod has experienced a 27 percent decline in population since 1989 and although calf recruitment has occurred in the last five years, the pod still remains ten individuals short of its pre-spill number. Compared to the relative trends of other major resident pods in Prince William Sound the AB pod is clearly not recovered.

Frustratingly, the recovery objective set by the Council for the AB pod in the new Draft Update (April 2002) has **again lowered the standard.** The comparative language of the 1999 standard has been removed in favor of a much less stringent standard of recovery. "The pod will have recovered when the number of individuals in the pod is stable or increasing." On its face this standard is absurd. Under this standard, if only one whale is left in the pod and it remains year after year, the population would be deemed stable and therefore recovered!

Even if the Council should apply this new weaker standard, it does not lead to the conclusion that the AB pod has fully recovered. First, as discussed above the pod remains at 26 individuals, far less than the pre-spill number of 36. The part of the AB pod that split off to join the AJ pod has still not rejoined the AB membership. Lastly, the age and sex structure of the AB pod has undergone serious changes from its original pre-spill composition. Female killer whales do not

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reach sexual maturity until between 11 and 15 years of age and calves on average are born to a reproductive female only once every five years (Restoration Notebook at 6). Forty-three percent of all calves born are believed to die within their first year." The low birth rate coupled with the high mortality rate for calves; means that it will likely be a long-time, if ever, before the AB pod reaches its pre-spill size and can be considered "recovered"

While it is certainly good news that the AB pod has increased in size, we do not believe it is justifiable at this point to say that the pod has "recovered". The more appropriate listing would be to list the pod in a "recovering" state.

Pink Salmon:

The Draft Update also proposes moving pink salmon to the "recovered" species list. We are disturbed at both the changes in the definition of recovery and its application for pink salmon. In 1999, to meet the recovery objective a sequence of two years each of odd-and-even runs without differences in egg mortality was required (EVOS Report 1999). Because the Alaska Department of Fish and Game found the study too expensive to replicate for another four years, the Council has adopted a new recovery objective. This new objective is based solely on hydrocarbon exposure of embryos. "Pink salmon will be recovered when ongoing oil exposure is negligible." This standard does not meet overall recovery objectives discussed earlier for the sound adopted in 1994 and furthermore, appears rather arbitrary.

The Council has decided "it is highly unlikely that oil is now accumulating in pink salmon embryos and having any significant effects". Yet, the Council fails to present adequate evidence to support this conclusion. Field testing 6 streams for hydrocarbons in a one-year period does not make for a scientifically justifiable conclusion that all is well for the pink salmon. This is especially true given the fact other inter-tidal areas in the Sound continue to demonstrate high concentrations of hydrocarbons. The new recovery standard only takes into account one possible injury, exposure of embryos to oil, completely discounting other potential effects of oil. First,

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assuming that no on-going embryo exposure exists, this objective fails to account for all of the exposure and potential long-term impacts resulting from contact over the past 13 years. Second, the standard fails to take into account other potential adverse impacts from the oil such as impacts to out-migrant fry. It is clear that patches of oil still remain in inter-tidal areas (Draft Update at 25). Prince William Sound is notorious for its storms, of which even a moderate one can potentially release oil situated in the intertidal zone. This is the same area out-migrate fry pass through. The Council draws a blanket conclusion that since these areas are located outside salmon streams, that salmon will not be impacted. Lastly, the new recovery standard fails to take into account ecological changes in the Sound since the spill, including a different predator/prey field than previously existed and fails to address account possible long-term genetic mutations.

The Council's conclusion that pink salmon have fully recovered in the Sound has no scientific validity and no certainty. Instead it is based on speculative assumptions and optimistic thinking. In the face of this uncertainty the Council should act in a precautionary manner and not elevate pink salmon to the recovered list. If the Council does not have adequate information to assess impacts to the pink salmon, they should be moved into the "recovery unknown" category.

Pacific Herring:

Herring are an integral part of the Prince William Sound ecosystem and a key to the marine food web. A variety of marine mammals, birds, fish and invertebrates depend upon some lifestage of the herring for food. The Draft Update lists the pacific herring as a "recovering" species. It is clear that the Exxon Valdez oil spill had significant impacts to herring egg biomass, adult fish and overall population levels. The Draft Update proposes the herring as a "recovering" species, but there is no clear information to support this proposition. In 1993 the herring experienced an "unprecedented crash" when only 25 percent of expected adults returned. The recovery indicated by the increased biomass seen in 1997 and 1998 has stalled.

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The Sound's herring population has yet to recruit a highly successful year class, a fundamental sign of the recovery of this species (Draft Update at 22). When a successful year class is recruited the Council could then cautiously claim the herring is **on the way** to recovery, but until that time the proper classification for the pacific herring is "not recovered". Since herring are the cornerstone of the Sound ecosystem, the Sound can not be truly recovered until the herring recover. By classifying the herring as a "recovering" species, the public is being misled to think the Sound has been restored to its pre-spill state. Herring should be down-listed to "not recovered" status.

AT-1 Group of Killer Whales:

While the AT-1 transient pod is not one of the populations that the Council chose to monitor over the years, it is clear that the pod is in serious decline. This genetically unique group lost nearly half its members immediately following the oil spill. In fact whales from the pod were seen surfacing in the oil slick next to the tanker immediately following the spill. Prior to 1984, 22 individuals were part of this unique group (Restoration Notebook at 6). Since 1990, 11 individuals have gone missing from the pod. No new calves have been recruited since the mid 1980's (1999 Status Report). Furthermore, one of the main food source for the pod, harbor seals, have declined 60 percent in the sound over the last two decades, adding further stress this declining population. Lastly, there are serious concerns regarding abnormally high (10 times greater than average) contaminant levels of individuals in the group. It is suspected that these high concentrations of DDT and PCB compounds may be correlated with the lack of calf recruitment.(Restoration Notebook at 10) The decline of the AT-1 transient pod is a clear indication that the Sound ecosystem has not returned to the healthy state it once was.

Conclusion: We respectfully request that the Council re-address its findings in the Draft Update for the AB pod of Killer Whale, pink salmon and herring. The Council needs to use indicator recovery objectives that accurately assess the species that are consistent with the overall recovery

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objectives set out in 1994. Furthermore, in the face of indeterminate information, the Council must not make conclusions based on optimism rather than reality. As a matter of public policy, the Council has a duty to accurately represent the ecological condition of the Sound and its inhabitants. Based on the Council's Draft Update, only 9 of the 25 species being monitored have reached "recovered status". The conclusion is clear-the overall health of the Sound has not recovered to its pre-oil spill state. Lastly, we strongly advocate for the continued funding for scientific research on the restoration and recovery of the sound. Long-term monitoring of the sound ecosystem is fundamental to determining changing conditions of the ecosystem into the future.

Thank you for considering these comments and please keep us informed.

Sincerely,

Corrie Bosman

Alaska Program Coordinator

Center for Biological Diversity

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NATIONAL WILDLIFE FEDERATION®
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Alaska Office

June 5, 2002

Molly McCammon
Exxon Valdez Oil Spill Trustee Council
441 West 5th Ave, Suite 501
Anchorage, AK 99501-2340

Dear Ms. McCammon:

The National Wildlife Federation (NWF), the nation's largest education and conservation organization, and Eyak Preservation Council (EPC) urge the *Exxon Valdez* Oil Spill Trustee Council to alter its draft proposal to change the status of several monitored resources.

NWF and EPC appreciate the difficulty of determining whether a resource has recovered from the oil spill. Nonetheless, the spill had devastating impacts on resources, and the Trustee Council has appropriately elected to represent those impacts and the recovery from those impacts to the public through the injured resources status report. Having made that choice, the Council is obligated to ensure that its determinations are as accurate as possible, and also that they are conveyed to the public in an understandable form as accurately as possible.

Not all of the Trustee Council's proposed status changes meet these goals. Some decisions to upgrade the status of a resource are pervaded with a sense of impatience with the task at hand. The Trustee Council, it appears, is ready to move on to its larger ecosystem projects, such as GEM, leaving smaller monitoring tasks and questions about the status of individual species behind.

In several cases in this document, the Trustee Council has no new information about resources, or has information that is simply indeterminate. Nonetheless, the Council upgrades the resource based on the assumption that the Sound must be recovering. It goes without saying that if the Council does not have the information to upgrade a resource, it should not upgrade the resource. If the Council wishes to halt monitoring and does not have the information to declare a resource recovered, the Council should make use of the recovery unknown category.

In a few other cases, the Council's definitions of recovery do not match a conventional view of recovery, and therefore provide a confusing and potentially inaccurate message to the public. The Council's own definition of ecosystem recovery states that:

> full ecological recovery will have been achieved when the population of flora and fauna are again present at former or prespill abundances, healthy and productive, and there is a full complement of age classes at the level that would have been present had the spill not occurred. A recovered ecosystem provides the same functions and services as would have been provided had the spill not occurred.

This definition is an appropriate benchmark, and the definitions of recovery for individual resources should be consistent with this definition. In other words, species should be present at prespill abundances, with a full complement of age classes at the level that would have been present had the spill not occurred. Some of the definitions, notably the definition for recovery of the AB pod, simply don't meet this common sense criteria.

With these ideas in mind, NWF and EPC have specific comments on four of the proposed changes.

Harlequin ducks: NWF and EPC disagree with the proposal to list harlequin ducks as recovering. This is one of the places the Trustee Council simply appears eager to "get on with it." There is a hodge podge of confusing data on the ducks, but there is no new data since the 1999 status report on injured species that suggests that harlequins are "recovering" now if they were not then. In fact, although the population of harlequins has been trending upward, in general the population has been growing much faster in unoiled portions of the Sound than in oiled portions of the Sound. This strongly suggests that ducks in the oiled portions of the Sound continue to be exposed to hydrocarbons that have an impact on their survival. In other words, not only have the ducks not recovered from the spill, they are still being actively injured by the spill.

NWF and EPC agree that the data is difficult to interpret. If the Trustee Council despairs of understanding whether harlequins have recovered, then the ducks should be placed in the recovery unknown category. At this point, however, a "not recovering" categorization continues to be appropriate.

AB pod of orcas: The difficulties of defining recovery are apparent in this category. It is possible that the oil spill changed the dynamics in Prince William Sound enough so that the AB pod will never return to its former size and structure. What is certain, however, is that the AB pod has been chosen to represent an oil spill injury, and that it is both structurally different and ten whales smaller (more than 25% smaller) than before the spill. In the minds of most people, that does not constitute recovery. Nor is it consistent with the larger definition of recovery for the Sound that states that flora and fauna will have returned to pre-spill levels.

If the Trustee Council feels too many uncertainties make it impossible to determine whether the and when the AB pod will have recovered, then the Trustee Council should make that clear, and place the AB pod in the "recovery unknown" category. However, a message to the public that the AB pod has recovered when, in fact, the AB pod has 10 fewer whales is misleading.

Pink salmon: In this case, the Trustee Council has no new data on pink salmon recovery. Although the 1999 definition of recovery was changed due to lack of data, there appears to be no data to support a determination that pink salmon meet the new definition of recovery either. If the Trustee Council does not have the data to make a determination, then salmon should be placed in the recovery unknown category.

Subtidal communities: There appears to be no new data on the health of subtidal communities. Despite this, the Trustee Council declares subtidal communities recovered based on "seven years of additional natural recovery." While time may heal all wounds, the Trustee Council has an

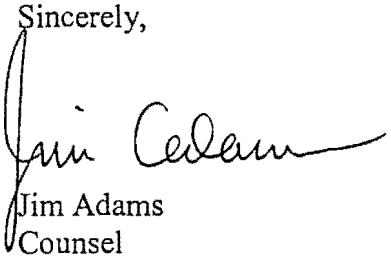
obligation to rely on evidence rather than truisms when upgrading the status of a resource. If the Trustee Council feels that the status of the resource must be changed despite the absence of new evidence, then NWF and EPC suggest subtidal communities be listed, with a suitable explanation, in the "recovery unknown" category until additional data comes to light.

In addition to our comments on proposed changes, NWF and EPC propose that the Trustee Council downgrade herring's status from recovering to not recovering. Herring are not recovering. In the Council's own words, "in the last several years the recovery has stalled and the population has yet to recruit a highly successful year class, which is fundamental to the recovery of the species." Given herring's importance to the Sound ecosystem, it is essential that the Council provide an accurate representation of their situation in order to provide an accurate representation of the health of the Sound. In this case, that means downgrading the status of the species.

Finally, in keeping with the theme of accurately portraying the health of the Sound to the public, it is worth noting that even with the changes proposed by the Trustee Council, only 9 of the 26 monitored resources will have been designated as recovered. This makes a strong statement about the health of the Sound and the impacts of the spill, and NWF and EPC suggest that the Council lead with that information in its news releases on the revisions to most effectively convey it to the public.

Thank you for the opportunity to comment.

Sincerely,



Jim Adams
Counsel
National Wildlife Federation-Alaska Office

Lynn Highland

.om: Lynn Highland [lhighland@gci.net]

Sent: Thursday, June 13, 2002 12:51 PM

To: 'molly_mccammon@oilspill.state.ak.us'

Subject: official public comments

Regarding the proposal to upgrade the recovery status of 9 of the 25 monitored injured species and habitats resulting from the Exxon Valdez Oil Spill.

I am a licensed USCG captain and have been operating a boat in Western Prince William Sound since 1979.

While my observations have no scientific baseline data and are, therefore anecdotal, it seems obvious to people with a history of observing the Sound that those areas affected by the spill have not fully recovered.

- It is relatively easy to find residual oil.
- The Sea Otter population in the areas affected by the spill is a fraction of the pre spill level. Bainbridge Passage is a clear example.
- Killer Whales are seen much less frequently. Please reference Craig Matkin's work on the impact of the spill on the Orca population. The AT pod, which is genetically unique, may go extinct. Orcas were observed in the spilled oil and never seen again.

Thanks very much for the opportunity to provide input.

R. Lynn Highland
4650 Southpark Bluff Drive
horage, AK 99516
/-345-5035

Cherri Womac

From: Molly McCammon [molly_mccammon@oilspill.state.ak.us]

Sent: Thursday, June 13, 2002 8:22 AM

To: Cherri Womac

Subject: FW: Species Recovery - Public Comment

public comment.

-----Original Message-----
From: Scott Sterling [mailto:sasjmm@alaska.net]
Sent: Wednesday, June 12, 2002 6:30 PM
To: molly_mccammon@oilspill.state.ak.us
Subject: Species Recovery - Public Comment

Dear Molly: I am not an expert on animals nor the sea, nor oil spills. You could say that I had some direct personal and professional experience with the EVOS owing to my experience as counsel for the City of Cordova in 1987-1993, including a term as president of Prince William Sound RCAC. I suppose I know something about the impact of oil spills in general and EVOS in particular on people and community. With regard to the fauna and sea life affected by EVOS, however, I tend to put my faith in the effort of the trustees to adhere to an honest and scientific approach to the question of what is recovering, what is in doubt and what is in jeopardy. Regarding the pending proposal to reclassify the status of certain species according to rate and depth of recovery from the spill, I believe that the council should deem a species "recovered" if and only if the evidence of that status is all but incontrovertible. Taking a cautious approach does no harm, and gives us time to put right what we so badly put asunder. Thank you for considering my comments. Scott A. Sterling, 900 Susitna Drive, Wasilla, Alaska 99654.

6/18/02

Esler comments on EVOSTC Update on Injured Resources and Services

I have reviewed the draft updated recovery status for harlequin ducks. I recognize the difficulty of assimilating data sets, contrasting them with a recovery objective, and placing recovery status into a discrete category. Based on my own attempt at the process, I conclude that harlequin ducks should remain on the "not recovering" list rather than being upgraded to "recovering". Here's why:

I consider the recovery objective to be an appropriate target for harlequin ducks, and it highlights the important parameters that have been identified over the years as particularly relevant to population status and recovery. Many of the recovery objectives have not been met, which clearly indicates that recovery is not complete. Further, my interpretation is that most of the available data also do not indicate progress towards recovery, which leads to my conclusion that harlequin ducks are not yet ready for the "recovering" category.

Hydrocarbon exposure is still occurring. The NVP project identified exposure through March 1998, /423 studies have indicated exposure through at least November 2000, and NOAA studies found remaining, intertidal oil in summer 2001. Hence, we are not close to meeting the first recovery objective. What this means on a population-level is the remaining question (which /423 is addressing).

The survey data are indeed confusing. ADFG data from falls 95-97 indicated declining populations, which matched concurrent findings of hydrocarbon exposure and lowered adult female survival from NVP. USFWS winter data indicated increasing numbers of harlequins on oiled areas from 1989-98, which is good news and could be considered evidence of progress towards recovery. However, because the increasing trend was similar in unoiled areas, USFWS considered their results evidence of lack of recovery, under the assumption that the rate of increase on oiled areas should be higher than on unoiled for recovery to be occurring, after accounting for broad-scale changes in numbers unrelated to the EVOS. I've not seen the analysis with 1997 through 2000 data, but (based on the description in the recovery status update) those seem to indicate stable numbers on oiled areas (recovering?) but increasing numbers on unoiled (oiled area not recovering?). In sum, it seems like the second recovery objective (stable or increasing numbers) has been met, although interpretation with regard to recovery is a bit muddy. Dan Rosenberg's ADFG spring surveys might go a long way towards clearing up some of the confusion; I've not seen these recently, so I'm not sure what they would indicate.

Are demographic attributes similar between oiled and unoiled areas? Some of them certainly are. For example, ADFG findings of similar age ratios between oiled and unoiled areas suggest that recruitment is similar between areas. Dispersal is similar between areas and low overall (NVP and /423 studies). However, the NVP finding that adult female survival was lower in oiled areas than unoiled areas during 1995-98 is critically important, and indicated that, in fact, demographic attributes were not similar. Hence, based on the recovery objectives, recovery had not occurred and, in fact, there was continued injury and thus no progress towards recovery. Findings from /423 suggest a similar survival scenario during 2000-02. The /423 data set is not complete, nor powerful enough for final conclusions at this stage; however, there are hints that demographic differences may persist.

Finally, return to prespill densities is difficult to determine, given that few prespill winter data were available for harlequin ducks. However, as of 1997, winter densities in oiled areas were lower than would be expected given the habitat, suggesting that recovery had not fully occurred by this time. Again, recent data from ADFG may shed light on whether densities are increasing in the most heavily oiled areas.

Frankly, I'd love to see harlequin ducks in a position where they could be considered "recovering". I just don't see the data lining up solidly behind that conclusion. Harlequin ducks have provided an interesting case – a well-studied instance of a particularly sensitive species that has suffered long-term, chronic effects of environmental contamination. They are definitely an anomaly and I'd agree that most bird populations (including the similar Barrow's goldeneye) are recovering or recovered. However, I recommend that the anomalous situation of harlequin ducks be recognized and their status as "not recovering" maintained.

Fr: Michelle Wilson Nordhoff
Re: Testimony to EVOS Trustee Council
Dt: Friday, June 14, 2002

These comments are on behalf of Alaska Center for the Environment regarding the DRAFT report Update on Injured Resources and Services related to the Exxon Valdez oil spill disaster.

We are uncertain as to what appears to be a recent change in recovery objectives for several key species, in addition to the immediacy to list species as 'recovered' when the scientific studies show otherwise or if they studies are still incomplete.

Furthermore, the Injured Resources list needs to reflect changes not only in recovery but also in non-recovery. Today we are asking that several resources be 'down listed' in classification.

(1) Lingering Oil in the Intertidal

To begin, we would like to highlight findings from the newly-released final report coming from Auke Bay Laboratory, the Alaska Fisheries Science Center, National Marine Fisheries Service, NOAA titled **"Vertical Oil Distribution within the Intertidal Zone12 Years after the Exxon Valdez Oil Spill in Prince William Sound Alaska"** [draft final attached]. This study is important since previous reports have assumed low oil persistence in these areas.

This groundbreaking study provides timely insight about the unexpected amount of oil—largely liquid oil matching the Exxon Valdez-- that remains in the productive lower intertidal areas.

To quote: "the persistence and dominance of subsurface oil in the mid- and lower- intertidal ... is a very surprising result. The frequency of encounters was more than expected, and the trend of subsurface oil at lower tidal elevations was spread across all beach-oiling categories."

Furthermore, the report states:

"The prevalence of liquid subsurface oil in the mid- and lower-intertidal has important biological implications. The presence of oil provides a potential for bioavailability, and the potential is greatly increased when liquid oil is associated with the productive biological zone in the lower intertidal.

Mussels, clams, and other invertebrates may be exposed directly to the oil, and provide a source of oiled prey to predators. "

We are concerned about the continued instability and low productivity of the intertidal areas, particularly the lower and mid-intertidals. Since many invertebrates and their predators depend on varied age-classes of Fucus (or rockweed), their lack of recovery, the new evidence of extensive oil in the intertidal and the none recovery of clam populations on oiled and treated intertidal are grave concerns that demand further restoration.

The Conclusion states: "Our study viable source of contamination for those species that forage in the lower intertidal and continue to show evidence of protracted oil exposure."

This report has implications for most of the Council's monitored resources and services.

(2) Clams

We are particularly concerned about the lack of recovery of clams in western Prince William Sound. Sites that were examined in 97 – oiled and treated—were not showing any signs of recovery from pre-spill populations. We know some of the clams were still recovering from the Earthquake, but there is a difference from oiled and treated areas in the Sound, compared to sediments and shoreline areas that were not affected. According the main researcher for clams populations assessments (not contamination issues), Dennis Leese, their not seeing the recruitment events necessary and the balances are not stabilized.

There is no recovery of the clams on the beaches that were treated from the clean-up. The high-pressure hot water treatments basically "cooked" the clams—causing enormous mortality rates-- that were making them unable to re-establish themselves, reducing food

sources for the predators that depend on them. Predators such as Otters and Sea Ducks.

We are also asking for CONTAMINATION studies on clams that are in these oiled areas.

From Auke Bay's new report, we are also concerned about the mussel beds in the intertidal areas. While many of the mussels have improved in rocky, cobble areas, ...

We feel that until the final report on Leese's study comes out, expected in January of 2004, the Clams must be listed as Not Recovered.

(3)Harlequin Ducks

We are concerned about the continued hydrocarbon exposure and possible effects on reproduction of female Harlequin Ducks since the oil spill.

Considering new evidence of unexpected intensity of liquid oil in the lower and mid-intertidal areas, prime foraging areas for Harlequins ducks, coupled with survey results which are still inconclusive and mixed, we ask that the Council take a precautionary approach and that Harlequins remain in the 'not recovered' category until further studies demonstrate the toxic exposure to hydrocarbons are no longer having effects.

(4) AB Pod of Killer Whales

The AB Pod were "the most commonly seen by tourists, fisherman, and other individuals who work and recreate in Prince William Sound... members of the AB pod were seen in and near oil slicks after the Exxon Valdez spill". ("Special Oil Spill Issue" ADF&G, July-Aug 1989, p. 29)

The AB pod has experienced a 27 percent decline in population since 1989 and although, fortunately, calf recruitment has occurred in the

last five years, the pod still remains ten individuals short of its pre-spill number. Without reaching it's pre-spill population abundance and productivity, the AB pod is not recovered. While other pods are increasing at approx 2 percent annually since the spill, the AB pod is far from pre-spill levels.

We disagree with this proposed change recovery objective in this new Draft Update. The new standard states, "The pod will have recovered when the number of individuals in the pod is stable or increasing." So you are attempting to say, if the AB pod gives birth to one more calf, the pod is considered recovered?

We believe the AB pod must continue to be monitored and it is not suitable to change the definition of the recovery objective in light of their instability. We ask that the Killer Whales remain classified as 'recovering'.

(5) Pacific Herring

The Draft Update proposes the herring as a "recovering" species, but there is no clear information to support this proposition. We concur with the Center for Biological Diversity that when a successful year class is recruited the Council could then cautiously claim the herring is **on the way** to recovery, but until that time the proper classification for the pacific herring is "not recovered".

(6) **Sea otter**

We appreciate your acknowledgement of the non-recovery of Sea Otters in the most heavily oiled bays in the Western Sound. Bodkin's research on liver damage from chronic oil exposure, particularly research in northern Knight Island, is a great concern.

According to your prescribed recovery objective: "Sea otters will have recovered when the population in oiled areas returns to its prespill abundance and distribution. An increasing population trend and normal reproduction and age structure in western Prince William Sound will indicate that recovery is underway."

We would like the Council to add a phrase in the objective about sea otters ability to forage on non-contaminated food sources. We would also ask that the Council provide more public education about the state of Sea Otters non-recovery in Western Prince William Sound.

(7) **Black oystercatcher** –The draft report says "it is likely that the population of PWS is probably as large or larger than previous to the spill", yet the biological effect of exposure to contaminated mussels and other prey is still of concern to us. "Earlier studies with oiled mussel beds have demonstrated persistence of oil beneath the mussels, and contamination of the mussels (Carls et al., 2001)." Therefore we feel the Black Oystercatchers must cautiously remain in the 'recovering' category for further monitoring.

(8) Pink Salmon

We disagree with the new recovery objective for Pink Salmon: "Pink salmon will be recovered when ongoing oil exposure is negligible." We fail to understand how out-migrate fry are not being exposed to hydrocarbons that are remaining in the intertidal areas of the western Sound. The assumption that Pink Salmon –at any part of the life cycle—are not getting exposed to hydrocarbons is unsupported. When we have studies demonstrating that the smallest ppb of hydrocarbons can cause damage to the during early embryonic life stages and delayed reproductive impairments from chronic exposure to hydrocarbons (at low ppb), then we request more studies and public education from the Council regarding the damage to the reproductive DNA from hydrocarbon exposure in Pink Salmon.

In the face of this uncertainty the Council should act in a precautionary manner and not elevate pink salmon to the recovered list.

(9) Precautionary Principle

To conclude, it is imperative for the Trustee Council to err on the side of caution in proposing upgrades to the list of Injured Resources and Services resulting from the oil spill.

We urge the Trustee Council to refrain from altering the recovery objectives in such a way that does minimizes the recovery standards set in 1994 for the resources and services in the spill area. Also, we urge the use the Precautionary Principle, applying precautionary measures even if some cause-and-effect relationships are not fully established scientifically.

Lastly, we ask that the Trustee Council send a strong message to ExxonMobil that good environmental stewardship means holding to promises, such as agreements to pay for injuries and damages that were unanticipated at the time of the disaster.

DRAFT

Vertical Oil Distribution within the Intertidal Zone12 Years after the *Exxon Valdez* Oil Spill in Prince William Sound Alaska

J. W. Short, M. R. Lindeberg, P. M. Harris, J. Maselko, S. D. Rice
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National Marine Fisheries Service, NOAA
Juneau, Alaska, USA
Jeff.Short@noaa.gov

Abstract

In 2001, 12 years after the *Exxon Valdez* oil spill, we conducted a quantitative assessment of the vertical distribution of oil remaining on the beaches within Prince William Sound Alaska. Oil was found at 53 of the 91 sites surveyed. Surprisingly, most of the oil from the 4,249 quadrats evaluated was found in subsurface pits rather than at the surface, with 80% of the subsurface oil below the +3.3 m tidal elevation. This is a significant departure from random distribution with respect to tidal elevation. The amount of oil, lack of weathering in the subsurface oil from the lower zones, and the immediate proximity to biota give cause for concern for continued chronic exposure for species that live, prey, or spawn in the lower intertidal zones.

1 Introduction

The 1989 *Exxon Valdez* oil spill left 40%-45% of the more than 42,000 m^3 of oil initially released stranded on beaches within Prince William Sound (PWS), Alaska (Wolfe et al. 1994). The oil was deposited under high-energy wave conditions during an intense three-day storm that began three days following the incident. The vertical elevation range of the beached oil was constrained by the extent of tidal excursions during the storm, which was +0.2 m to +5 m above mean lower low water (MLLW).

Most of the beached oil dispersed back into the ocean during the three years following the incident. Dispersion was promoted by beach cleaning efforts in 1989 and 1990, and by high-energy waves generated by winter storms. Only 2% of the volume of oil spilled initially was estimated to remain on PWS beaches by the end of 1992 (Wolfe et al., 1994). Most of this oil was thought to be located in the upper intertidal, in the area of the "bath tub ring", where oil was so visually evident during the months just after the spill. Much of that oil was beneath an armouring layer of boulders or cobbles that protected oil from wave-dispersion (Neff et al. 1995, Gibeaut and Piper, 1998, Hayes and Michel 1998). The rate that the surface oil appeared to leave these beaches between 1989 and 1992 suggested that natural dispersive processes would remove the oil remaining to negligible levels within a few years.

We conducted a field study during summer 2001 to evaluate the amount of oil remaining on PWS beaches twelve years following the incident. This study was motivated in part by controversial reports of persistent oil. Visible surface oil was not evident for the most part, yet residents continued to complain of oil encounters, leading to a significant beach cleaning effort in 1997 and an unexpected finding of oil persistence (Brodersen et al. 1999). By the late 1990's, some studies were continuing to find recovery problems and evidence of continued oil exposure for sea ducks and

sea otters (Bodkin et al., 2002, Esler et al., 2000a,b, Irons et al., 2000, Lance et al., 2001, and Trust et al., 2000). In summer 2001, we surveyed 91 sites in the spill zone within Prince William Sound and found oil at 53 of these sites. The geographical extent of the oiled area will be reported elsewhere (Short et al. in prep). This paper reports the vertical distribution of surface and subsurface oil at the 53 sites where oil was found.

2 Methods

Our study area is located in western PWS, an area that includes all the shoreline impacted by the oil spilled from the T/V *Exxon Valdez* (Figure 1). Our sampling focused on three categories of beaches as defined by the persistence of visually evident oil during surveys conducted from 1989 through 1993. These categories included discrete sections of beaches that were described as heavily (category I) or moderately (Category II) oiled at some time during the period 1990 to 1993, and beaches that were described as heavily oiled during 1989 but only light to no oil impact during subsequent years (Category III). Category III beaches were not expected to have significant amounts of oil, but surveys after 1989 were scant for this category. The total length of the discrete sections where oil was seen during these surveys was 116.6 km, which comprises lengths of 24.4 km, 49.1 km, and 43.1 km in Categories I, II, and III respectively.

2.1 Random Sampling of Beaches

Sections of beaches in each category were drawn by simple random sampling if 100 m in length, or by probability proportional to length (ppl), if less than 100 m. A total of 7.8 km of shoreline, comprising 91 distinct sections, was sampled with emphasis on category I where 5.2 km of cumulative shoreline was selected, and where most remaining oil was anticipated. The cumulative lengths selected from the other two categories were 1.9 km (II) and 0.69 km (III). Oil was found on 53 of the 91 distinct beach section sampled (see Figure 1 for a distribution of oiled sites), and we report here the distribution of this oil with respect to tidal elevation on these 53 beach sections.

2.2 Random Sampling within Beaches

The distributions of surface and subsurface oil on the beach sections selected for sampling were estimated by stratified random sampling (SRS) of the intertidal beach surface. The beach surface of a selected section between +1.8 m and +4.8 m above MLLW was partitioned into rectangular blocks by a number of equal-width alongshore columns and six 0.5 m vertical tidal elevation intervals. Each tidal elevation interval is considered as a distinct sampling stratum. These tidal elevations were sampled because previous surveys indicated oil was most persistent in the upper intertidal (Neff et al. 1995, Hayes and Michel 1999), and because lower exposure frequency made sampling in the lower intertidal less tractable.

The maximum beach section length, 100 m, was divided into eight columns, each 12.5 m wide, resulting in 48 blocks. Shorter beach sections were divided into fewer columns and blocks. Two 0.25 m^2 quadrats were randomly placed within each block, and each quadrat was evaluated for the presence of surface and of subsurface oil. A total of 4,249 random quadrats were drawn and evaluated for the presence of surface and subsurface oil on the 53 oiled beach sections. Only vertical cliffs were

eliminated from the sampling protocols; bedrock quadrats were evaluated for surface oil, and counted as "no oil" for the subsurface sampling. Whenever subsurface patches of oil were discovered during random sampling, additional pits (about 3000) were excavated to delineate the patch sizes, including portions of patches that extended below the lowest tidal elevation of our sampling grid.

2.3 Determination of Oil in Sampling Quadrats

Oil visually evident within the uppermost 5 cm of a beach surface was considered surface oil. Surface oil included surface layers of asphalt (AP) or mousse (MS), rocks coated with oil films (CT), oil coated beach sediments (SOR), and tarballs (TB), as defined by Gibeaut and Piper (1998).

The presence of subsurface oil was evaluated by digging a test pit within each quadrat to a depth of 0.5 m or until boulders or bedrock was encountered, and examining the pit for visual and olfactory evidence of oil. Oil was usually detected visually from the evident sheens on the water that collected at the bottom, and confirmed by a characteristic smell. Subsurface oil was classified as oil film (OF), light, medium, or heavy oil residue (LOR, MOR, and HOR respectively), as defined by Gibeaut and Piper (1998).

Twelve samples typical of surface oil deposits and twelve samples typical of subsurface oil deposits were analyzed by gas chromatography-mass spectrometry at our laboratory to verify the origin of the oil (Short et al. 1996, Short and Heintz 1997).

2.4 Data Analysis

The significance of variation in the distribution of oil with respect to tidal elevation on the sampled beaches was evaluated by Chi-squared tests. Each of the 0.5 m tidal elevation intervals was considered as a class, giving 5 degrees of freedom for the test. This test was only applied when the expected frequencies within each class exceeded 5. Expected frequencies were calculated from the null hypothesis that oil distribution is independent of tidal elevation.

3 Results

Of the 53 beaches where oil was found, most of the oil was found in subsurface pits and chemical fingerprinting confirms the origin as from the *Exxon Valdez* oil spill. Surface oil seldom extended beyond a meter from any one quadrat; in contrast, there were many patches of subsurface oil that were extensive laterally, as in a zone, and extended below our sampling grid. Only 11% of quadrats that contained surface oil also contained subsurface oil. Category I beaches (those described as heavily oiled sometime during 1990-1993 surveys) had a higher frequency of oil encounters, both subsurface and surface oil, than either category II or III beaches (those beaches described as moderately oiled sometime during 1990-1993 surveys or heavily oiled in 1989 but not after). Further, the category I beaches had virtually all of the most heavily oil subsurface pits (HOR) in this survey of 2001.

3.1 Vertical distribution of surface and subsurface oil

Subsurface oil was encountered in 8.2% of the quadrats (Table 1), with over 80% below +3.3 m tidal elevation, an extremely significant departure from random distribution with respect to tidal elevation ($P < 0.001$). Subsurface oil was liquid,

readily forming sheens or droplets of oil on water that collected in the bottom of the excavation pits.

Each of the subsurface oiling classifications showed similar trends of increasing frequency at lower tidal elevations when examined independently (Table 1). Each classification is most frequently encountered at tidal elevations below +3.3 m, and this trend is significant for the OF, LOR, and MOR classifications ($P < 0.005$, $P < 0.001$, and $P < 0.001$ respectively). The number of HOR quadrats is too small for a meaningful Chi-square test, but the trend is consistent with those of the other oil classifications.

Subsurface patches of oil discovered during our random sampling extended to tidal elevations that were below our sampling grid on 15 of the 53 oiled beaches. We confirmed that some of these patches extended to tidal elevations below 0 m., but we were not able to evaluate all the patches consistently because of coverage by tides during our visits at some beaches.

Surface oil was encountered in 5.3% of the quadrats (Table 1), with over 60% of these surface oil occurrences were within the tidal elevation interval 2.8 m - 4.3 m. The distribution of surface oiled quadrats with respect to tidal elevation (Table 1) was marginally significant ($0.05<P<0.10$), and surface oil was never found near the zero tide line. Surface oil was usually present as asphalt or as high-viscosity "mousse", in contrast to the liquid state in which subsurface oil was found.

3.2 Vertical Distribution of oil from different beach oil categories

The trends in the distributions of surface oil with respect to tidal elevation are different when the data from the beach sampling categories are combined than when analyzed separately. Surface oil on beaches described as heavily oiled sometime during the period 1990 through 1993 (i.e. category I) was encountered in 6.3% of the quadrats evaluated from sampling category I beaches, with 62% within the tidal elevation interval 2.8 m - 4.3 m (Fig. 2). This distribution of surface oiled quadrats with respect to tidal elevation is significantly different from a random distribution ($P < 0.05$), and is similar to results for the combined data from all three beach sampling categories because most of the sampling effort was directed at category I beaches. However, the distribution of surface oil on category II beaches (described as only moderately oiled during the period 1990 through 1993) was consistent with a random distribution with respect to tidal elevation ($P > 0.98$; Fig. 3).

In contrast, the trends in the distributions of subsurface oiling classifications are very similar regardless of whether the data are analyzed separately for each beach sampling category (I or II; Figs 2 and 3) or combined (Table 1). Each classification of subsurface oil was most often encountered at tidal elevations below +3.3 m, and this trend was significant whenever enough oiled quadrats were present to conduct the Chi-squared test ($P < 0.005$; compare Figs. 2 and 3) (except HOR on category II beaches, where only 1 quadrat was found). Data for sampling category III beaches are scant, but are consistent with these trends; all six oiled quadrats (MOR) found for this sampling category were below +2.8 m.

4 Discussion

The persistence and dominance of subsurface oil in the mid- and lower-intertidal as reported here is a very surprising result. The frequency of encounters was more than expected, and the trend of subsurface oil at lower tidal elevations was

spread across all beach-oiling categories. The results were surprising because previous beach surveys by Owens (1991) argued that the adherence of oil to the beach is greatest in the upper intertidal of PWS because it is driest there, and this conjecture appears to have guided sampling for shoreline assessment surveys conducted from 1989 through 1993 (Neff et al. 1996, Gibeaut et al. 1998). Certainly the upper intertidal was impacted heavily in the early stages of the spill with the stranding of oil, creating the "bathtub ring" effect that impressed observers. Earlier surveys on the persistence of oil in PWS also seemed to implicitly assume that oil persistence was correlated with initial oiling intensity (Neff et al., 1996, Gibeaut et al., 1998, Hayes and Michel, 1999), and we also incorporated this assumption into our sampling design. In truth, probably all these surveys were "prejudiced" by the initial oiling, and certainly the priority of the initial surveys was slanted heavily toward the needs to clean up the surface oil. When surface oil was a dominant feature and problem, subsurface oil was not a priority, and little effort was spent to document the extent or intensity. Hence, searches for subsurface oil were conducted on beaches "...at locations where team members believed oil would most likely be found" (Owens, 1991).

We suspect that the subsurface oil we found below the upper-intertidal "bathtub ring" (+2.8 - +4.3 m above MLLW) had been there since the initial landfall of the oil, and was not the result of down-slope movement of oil over a period of several years, although down slope movement from the "bathtub ring" can not be ruled out. The uniform trend of increasing prevalence of subsurface oil at lower tidal elevations within our sampling grid regardless of oiling classification or of beach sampling category strongly suggests that subsurface oiling was widespread during the years immediately following the spill, and is not a consequence of unusual geomorphological conditions on a few beaches. Oil probably settled down into the beach substrate during low tides, and was partially lifted off the surface at higher tides. After repetition of many tides, significant oil quantities accumulated below the surface. Beach cleaning, particularly natural cleaning over the years would affect the top few inches, but has little impact at 20 cm depth and below. Down slope oil movement cannot be ruled out, and this process may also occur along with initial deposition in the lower intertidal.

Subsurface oil in the mid- and lower-intertidal might easily have been overlooked during previous surveys for several reasons, all related to the fact that the mid- and lower intertidal is covered by seawater more often than the upper-intertidal. Physical processes that promote oil dissolution, such as wave energy, have less impact below the beach surface. There is less time to survey and sample the beach at lower tidal elevations, and algae and kelp make traversing the lower intertidal more difficult. Without visual surface oil evident, there was little motivation to sample the lower intertidal in a systematic fashion.

The methods that were used to monitor the persistence of oil following the *Exxon Valdez* spill (cf. Owens, 1999) were developed and are routinely used to direct beach cleaning effort following catastrophic spills, and are practical and appropriate for that purpose. The most pressing priority following a spill is to limit damage; accurate measurement of oil remaining is rightfully a secondary priority. However, our study strongly suggests that the methods developed for directing clean-up operations, which must necessarily emphasize speed at some cost to accuracy, may have serious shortcomings for accurately measuring the extent or quantity of

lingering subsurface oil.

In contrast with the distribution of subsurface oil, the distribution of surface oil with respect to tidal elevation we found in 2001 is consistent with impressions reported from prior surveys (Neff et al., 1995, Gibeaut et al., 1998, Hayes and Michel, 1999). Most of the remaining surface oil is in the "bathtub ring" where initial oiling was thought to be heaviest (Owens 1991), and there was no trend of increasing surface oil in the lower intertidal. This would also support the notion that there was no down slope movement of oil or there would be a trend with surface oil, where physical processes are much more active.

The presence of surface oil was a poor indicator of subsurface oil. The correlation we found between surface and subsurface oil (11%) is even lower than was reported in 1991 (about 33%; Neff et al., 1995). The use of surface oil to predict subsurface oil probably gets worse with time because physical factors such as wave energy will be more effective in the removal of surface oil compared to subsurface oil, particularly in the upper intertidal where wave energy exposure is more pronounced.

The prevalence of liquid subsurface oil in the mid- and lower-intertidal has important biological implications. The presence of oil provides a potential for bioavailability, and the potential is greatly increased when liquid oil is associated with the productive biological zone in the lower intertidal. Mussels, clams, and other invertebrates may be exposed directly to the oil, and provide a source of oiled prey to predators. Earlier studies with oiled mussel beds have demonstrated persistence of oil beneath the mussels, and contamination of the mussels (Carls et al., 2001). In recent years, recovery of some sea ducks and sea otters appears to be less in the heavily oiled areas (where we continue to find significant subsurface oil), and protracted exposure to xenobiotic chemicals such as PAH are indicated (Bodkin et al., 2002, Esler et al., 2000a,b,). These species all forage in the lower intertidal, and our study suggests that encounters with oiled prey or substrate may have been more frequent in those heavily oiled areas than has been recognized heretofore based on the previous reports of low oil persistence (Neff et al., 1995, Gibeaut et al., 1998, Hayes and Michel, 1999).

5 Conclusion

Subsurface oil was more frequently encountered than surface oil, and was surprising because it was found much lower in the intertidal than expected. Further, the subsurface oil was much less weathered than surface oil, was found in liquid form, and in close association with the productive biological zone in the lower intertidal. Our study provides a viable source of contamination for those species that forage in the lower intertidal and continue to show evidence of protracted oil exposure.

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Table 1. Vertical distribution of surface and subsurface oil for all beach categories combined (I, II, III). The number of quadrats evaluated and those with oil are broken down by each 0.5 m tidal elevation. Subsurface oil classifications given: OF = Oil Film; LOR, MOR and HOR = Light, Medium, and Heavy Oil Residue, respectively. Surface oiling categories include asphalt, mousse, oil coat, and tarballs.

Tide Height (m)	Total # of Quadrats Sampled	Number of Oiled Quadrats					
		All Oiling Classifications		Subsurface Oiling Classificatioins			
		Surface Oil	Subsurface Oil	OF	LOR	MOR	HOR
4.3-4.8	601	28	4	1	3	0	0
3.8-4.3	703	43	18	5	10	3	0
3.3-3.8	725	49	44	1	33	9	1
2.8-3.3	743	44	71	9	45	14	3
2.3-2.8	735	36	106	8	65	24	9
1.8-2.3	742	26	104	14	61	22	7
Totals:	4249	226	347	38	217	72	20

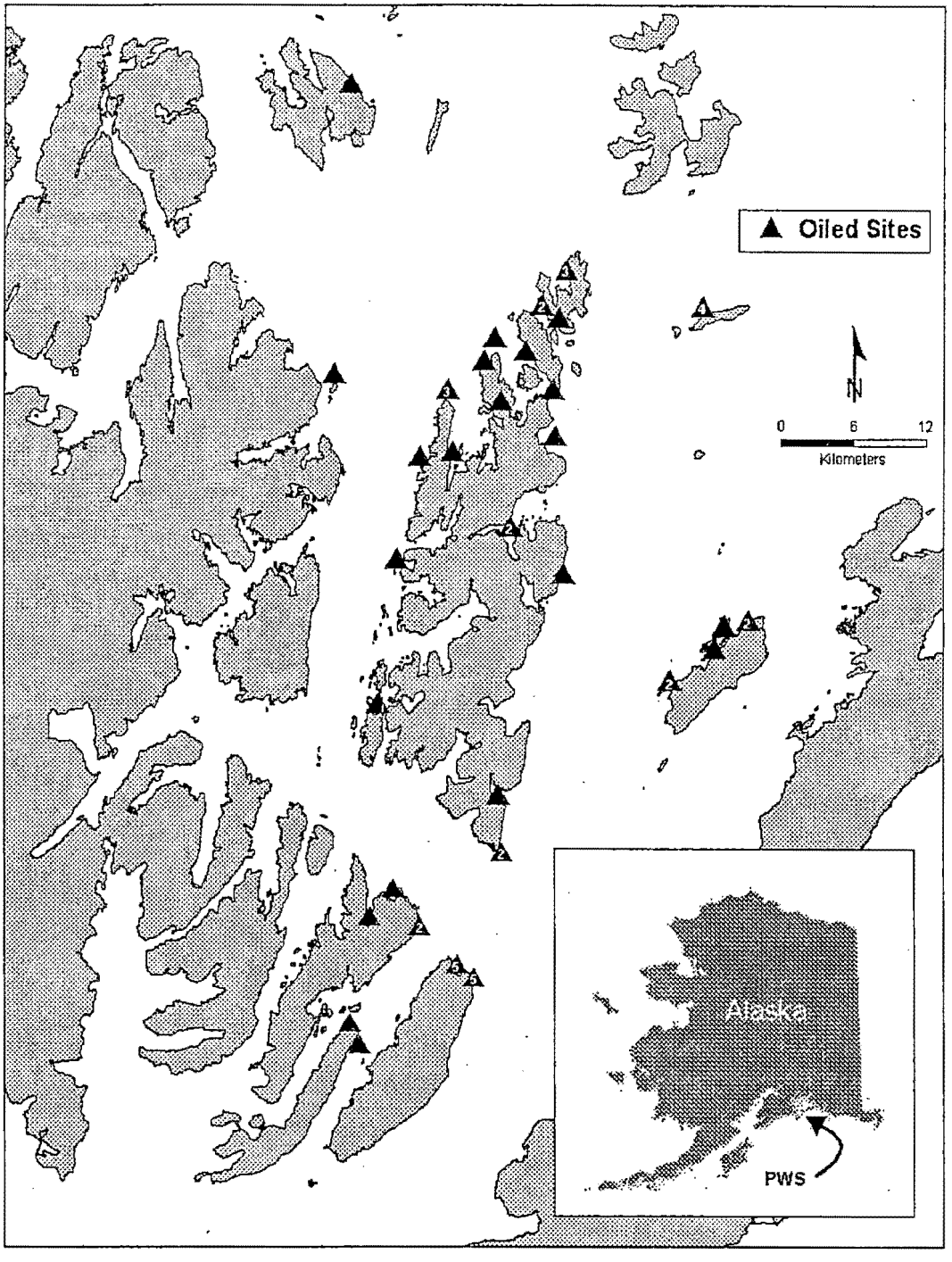

Figure 1. Location of 53 beaches where oil was discovered in summer 2001 in Prince William Sound, Alaska (see arrow) from the 1989 *Exxon Valdez* oil spill. Numbers inside symbols indicate the number of beach sites in close proximity to each other.

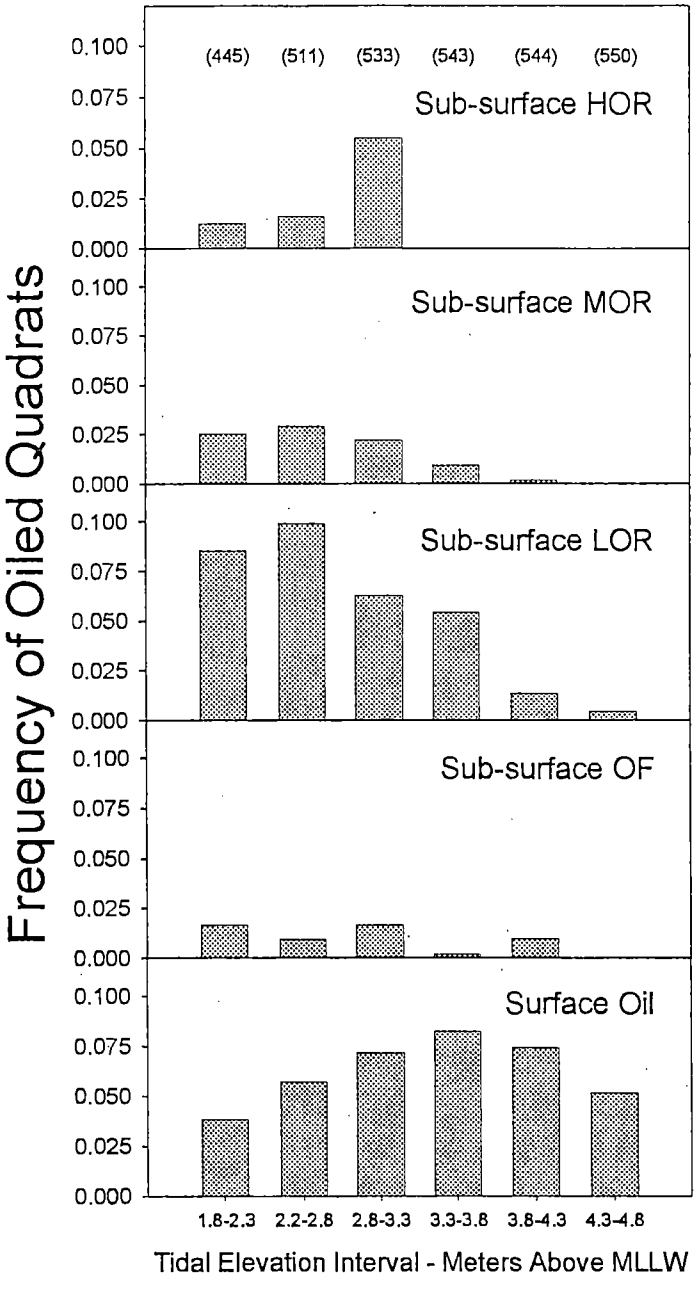

Figure 2. Category I: Vertical distribution of surface and subsurface oil at beaches (those beaches where oil was described as heavy sometime during 1990-1993). Tidal heights by meters above mean low low water. The number of quadrats sampled in each vertical zone for this category beach is given at the top of the frame. Subsurface oil is broken down by oiling classification (OF=oil film; LOR= lightly oiled; MOR = moderately oiled; HOR= heavily oiled).

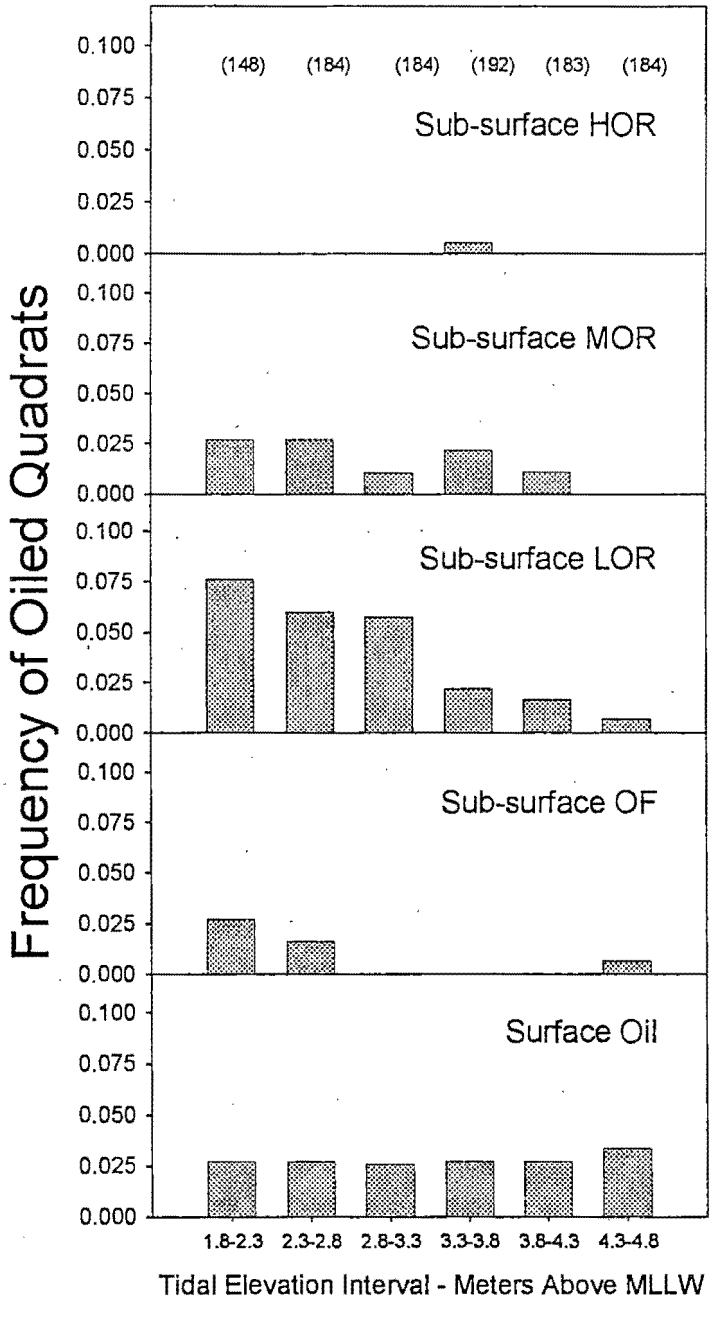

Figure 3. Category II: Vertical distribution of surface and subsurface oil at beaches (those beaches where oil was described as moderate sometime during 1990-1993). Tidal heights by meters above mean low low water. The number of quadrats sampled in each vertical zone for this category beach is given at the top of the frame. Subsurface oil is broken down by oiling classification (OF=oil film; LOR= lightly oiled; MOR = moderately oiled; HOR= heavily oiled).

Exxon Valdez Oil Spill (EVOS) Legacy: Shifting Paradigms in Oil Ecotoxicology[1]

Riki Ott, Ph.D., Charles Peterson, Ph.D., and Stanley Rice, Ph.D.[2]

Abstract. *Oil is much more toxic to coastal fish, birds, and mammals than previously predicted by short-term laboratory bioassay studies used during the 1970s and 1980s to develop a "paradigm" or model understanding of oil toxicity. Hundreds of comprehensive field assessments and lab studies conducted by government and academic researchers after the Exxon Valdez oil spill (EVOS) show that oil is persistent in important shoreline environments and causes long-term, population-level injury to coastal sealife. These 1990s studies frame a new oil toxicity paradigm, showing that risk evaluation or "ecotoxicity" models developed in the 1970s severely understate environmental damage from chronic oil pollution. Public policies based on the 1970s oil toxicity paradigm are not adequately protective of sealife. Policies guiding every phase of oil use from production to consumption and waste disposal need to be reevaluated in light of the 1990s oil toxicity paradigm.*

1970s Oil Toxicity Paradigm: History & Limitations

With the passage of the federal Clean Water Act in 1972, scientists developed standards to protect fish and wildlife in marine and fresh water environments from harmful levels of oil, among other chemicals. Scientists used short-term (usually 96-hour) laboratory "bioassays" as a way of exposing organisms to oil dissolved in the water column or the "water soluble fraction" (WSF) and then measuring the effects of this exposure (usually as mortality) to determine what levels of oil were harmful (*1*).

The oil toxicity paradigm[3] that emerged as a result of these bioassays (2) held that the primary compounds of concern in crude oil, which is composed of hundreds of different hydrocarbons, were the 1- and 2-ring aromatic hydrocarbons, which dissolve rapidly in water or air. Other larger aromatic hydrocarbons (3-5 rings) were more toxic, but they did not dissolve or mix into the water rapidly, and were not a factor in the short-term bioassays. The 1- and 2-ring aromatic hydrocarbons were quick in toxic action, but also short in duration - easily diminished by dilution, volatilization, and dispersal. Hence, the 1970s oil toxicity paradigm was based on *acute* toxicity, with toxic concentrations to fish and invertebrates in the low parts per million. There was some concern for long-term toxicity and safety factors were

[1]*Briefing Paper for Power Point presentation on www.alaskaforum.org*

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[3]*Note: in this paper, a "paradigm" is a theoretical framework created by scientists to explain a functional relationship in natural science. Paradigms are fluid, not static, models and they shift to accommodate new understanding as science advances. For example, a scientific paradigm once held that the world was flat, but we no longer believe this.*

suggested by guess work: for example, 1/100th of the acute toxicity *should* be safe.

What was Wrong with the 1970s Acute Toxicity Paradigm for Oil?

There are two basic problems with the acute toxicity model that evolved out of the 1970s - persistence and toxic mechanism. First, persistence of toxic compounds was not considered to be a problem. 1- and 2-ring aromatics do not persist in the natural environment, but their larger 3- , 4- , 5- ring cousins can. The larger compounds are not volatile, not soluble, but much more difficult to degrade. Second, the mechanism for toxicity is very different between the small and large aromatics. The 1- and 2-ring aromatics are toxic to membrane function and cause a "narcosis" type of toxicity. This acts quickly and leads to a variety of system failures. Fish, for example, loose equilibrium when exposed to 1-ring aromatics, there are function failures in gills and other organs, and the fish typically die within minutes of exposure.

In contrast, the mechanism of toxicity for larger compounds operates within the cell, where proteins and DNA can be directly affected. Embryos will suffer injury where cellular DNA is damaged and then replicated during embryonic growth, creating more cells with damaged DNA. Rather than causing an acute narcosis death, this damage affects "fitness" and results in a juvenile that is less capable of normal growth, avoiding predators, or capturing prey. In contrast to a direct narcosis death, this mechanism is more indirect (getting eaten, for example), but the result is still a loss in numbers of recruiting individuals. Populations slowly decline.

The limitations of the 1970s oil toxicity paradigm, based on acute toxicity, are such that it cannot be used to predict oil toxicity in an environment where oil may persist for some time (*1*). Acute bioassays were designed originally to measure potency of insecticides, not assess environmental safety to wildlife, where there are complex and long-term interactions among growth, body condition, maturation, diseases, reproduction, and predation.

Until now after results of EVOS studies have been compiled, resource and environmental managers only had available the 1970s oil toxicity paradigm to use to establish water quality standards and develop environmental risk models. A body of public policy (environmental laws) emerged, based on the 1970s paradigm, supposedly to protect aquatic and marine life from oil pollution.

1990s Oil Toxicity Paradigm & Supporting Studies

The 1970s oil toxicity paradigm failed to predict the long-term impacts of the EVOS, stemming from persistent oiling and subsequent bioavailability of oil in critical nearshore habitats (*1, 3*). As part of the Restoration Program undertaken by the federal and Alaska state governments, scientists designed comprehensive field and lab studies to explore and explain the population-level impacts that occurred, notably, in Prince William Sound, where nearly half of the oil from the *Exxon Valdez* had stranded on beaches (*4*). These studies and the resulting 400+ peer-reviewed papers frame the new 1990s oil toxicity paradigm. The persistence of substantial amounts of oil for more than a decade in biologically important, protected shoreline habitats, such as deltas of anadromous fish

streams, mussel beds, and boulder-cobble shores (*1, 3*), was unanticipated and has induced the long-term exposures that underlie the new 1990s paradigm.

The 1990s oil toxicity paradigm holds that the compounds of concern are not the 1- and 2-ring aromatic hydrocarbons but 3-, 4- , 5-ring PAHs, or polycyclic aromatic hydrocarbons that were ignored in the 1970s paradigm. PAHs are persistent and bioavailable: PAHs are toxic during chronic exposure to early developmental life stages of herring and pink salmon at 0.4 to 1 part per *billion*, respectively, or levels 1,000 times lower than predicted by the 1970s paradigm (*5, 6*). A range of maladies was found in a variety of fish, birds, and mammals from field exposure to PAHs at levels of low parts per billion (ppb) (Table 1). Both direct and indirect effects were reported. In brief, these findings are as follows.

FISH. After the EVOS, weathered oil characterized by 3- , 4- , 5-ring PAHs was trapped in protected beach environments such as subsurface groundwater of anadromous fish streams for at least 4-8 years (*7*). PAHs were bioavailable to embryos and larvae of pink salmon as the PAHs were absorbed across the yolk membrane of eggs: prolonged exposures for months during incubation to levels as low as 1 ppb were found to be toxic (*6*). In addition to enhanced embryo mortality through chronic exposure to PAHs in weathered oil in groundwater (*8*), "sublethal" (not directly toxic) oil exposure led to population-level impacts. Evidence of higher rates of abnormal development and larval deformity in pink salmon and herring following oil exposure imply enhanced mortality (*5, 6*). Exposure of salmon fry to *Exxon Valdez* oil resulted in lower growth rates in 1989 and increased subsequent mortality through predation (*9, 10*). Finally, controlled laboratory studies of embryo development demonstrated reproductive impairment in the form of lower embryo survival of eggs from returning adult pink salmon that had been exposed to PAHs in weathered oil in streams during incubation as eggs and fry (*11*).

The 1990s paradigm of oil ecotoxicity to fishes incorporates both enhanced embryo mortality and delayed reproductive impacts of chronic exposure of embryos to persistent PAHs in weathered oil at low ppb concentrations, and it includes population-level consequences of sublethal impacts on growth of juvenile stages.

MARINE MAMMALS. Prior to the EVOS the widely accepted risk assessment model predicting population-level impacts to marine mammals and seabirds held that this wildlife had to be physically oiled and the resulting loss of insulation to fur or feathers led to hypothermia, drowning, and death. While the EVOS confirmed this model during the early weeks of the spill in that thousands of sea otters (*12*) and hundreds of thousands of seabirds (*13*) died from physical contact with oil, researchers also found that other processes caused previously unanticipated long-term population-level effects.

Smooth-skinned mammals-documented for harbor seals (*14*) and killer whales (*15*)-declined in abundance in 1989 in oiled areas of Prince William Sound. Brain lesions, evident in necropsies of seals implicate inhalation of toxic fumes, the 1- and 2-ring aromatics, and were considered to have caused mortality through observed behavioral disorientation, lethargy, and stress response (*16*). Killer whales in Prince

William Sound experienced unprecedented losses in the years following the spill. Early losses arose from direct toxic exposures, whereas long-term, delayed

Table 1. Evidence of Effects of Chronic Oil Pollution. Examples of species, life stage, connection to the intertidal zone, and lowest level of PAHs causing effect (in parts per billion). "Elevated P450 enzyme" indicates PAHs are bioavailable; further effects as noted. From Peterson (2001) and Rice et al. (2001).

Species	Life Stage	PAH s (ppb)	Connection to intertidal (Effect)
Pink salmon	Embryo	1 µg/g	Early development (death, genetic damage to 1st, 2nd generation)
Pink salmon	Juvenile	1 µg/g	Nursery (decreased growth & reduced marine survival)
Dolly Varden char	Juvenile, adult	low ppb	Forage (decreased growth for 1 yr)
Cut-throat trout	Juvenile, adult	low ppb	Forage (decreased growth for 2 yr)
Pacific herring	Egg, embryo	1 µg/g	Early development (death)
Black oystercatchers	Adult	low ppb	Nest (delayed recovery due to problems with rearing chicks)
Harlequin ducks	Adult	low ppb	Forage on mussels (depressed over winter survival of females, 9 yr)
Barrow's goldeneye	Adult	low ppb	Forage on mussels (depressed recovery, elevated P450 enzyme, 9 yr)
Cormorants, murres, black-legged kittiwake, pigeon guillemot (PG), loons, mergansers	Adult	low ppb	Forage on high lipid fish (delayed recovery for 9 yr (loons 5 yr); PG lower productivity of young, elevated P540 enzyme 9 yr)
Masked greenling	Adult	0.40 µg/g	Resident (elevated P450 enzyme up to 7 years post spill)
Sea otters	Juvenile	low ppb	Forage on mussels (high mortality for up to 3 yrs)
Sea otters	Adult	low ppb	Forage (high mortality of prime breeding age adults for 5 yr)
River otters	Adult	low ppb	Forage (expanded feeding territories, poor condition, elevated P450 enzyme

effects on survival, reproduction, and recruitment success were the indirect consequences of loss of parents and experienced older members, disrupting the social structure of the pods (*17*).

In addition to the thousands of early sea otters deaths caused by acute toxicity, long-term studies revealed processes inhibiting recovery of otters in heavily oiled areas. Intensive documentation of sea otter population dynamics for over a decade after the EVOS revealed a reduced population growth rate and increased death rate of prime-age and juvenile sea otters in oiled areas of Prince William Sound (*18*). Sea otters feed heavily on clams that they dig out of eelgrass beds and on mussels and crabs. Clams and mussels sequester (absorb and store in their bodies) oil hydrocarbons: sediment in eelgrass beds and under mussel beds remained contaminated with PAHs from *Exxon Valdez* oil, which remained bioavailable to sea otters through their shellfish diet (*19*).

The 1990s paradigm of oil ecotoxicity to marine mammals recognizes risk from inhalation of toxic fumes, behavioral interdependencies among social animals, and long-term exposure to oil through diet and residual weathered oil in sediments.

SEABIRDS. Guilds of seabirds that feed in nearshore habitats suffered greater initial declines, delayed declines, and delayed recovery compared to those that feed offshore (*20, 21*). In particular, species of seaduck that feed heavily on mussels such as Barrow's goldeneyes and harlequins showed no evidence of recovery through the 1998 survey (*22*) and continued exposure to PAHs, as evidenced by high levels of enzymes that metabolize or break down oil (*23*). For years after the EVOS, harlequins experienced high over-wintering mortality rates and continued population decline in oiled areas of Prince William Sound (*24*). Black oystercatchers, a shorebird that feeds heavily on mussels, also had reduced incidence of breeding, smaller eggs, and reduced growth of offspring in oiled areas in 1989 (*25*). Results of studies on seabirds imply that energetic costs of metabolizing oil ingested through diet are substantial and create sublethal effects on growth, body condition, and reproduction (*26*) with population-level impacts (*27*).

The 1990s paradigm of oil ecotoxicity to seabirds recognizes risk from long-term exposure to oil through diet and subsequent sublethal effects on reproduction, growth, and survival with population-level impacts.

INDIRECT EFFECTS. The current risk assessment models used for predicting population-level effects of oil pollution lack all indirect effects and treat species populations as independent of one another. Studies after the EVOS demonstrated two main types of indirect effects in communities of sealife associated with rocky shores: loss of critical habitat through loss of species that provide structural habitat and "trophic-level" (food web) interactions among species (*3*).

The macroalga *Fucus* provides critical habitat, a virtual seaweed forest, for a variety of marine invertebrates that serve as prey for seabirds and shorebirds, sea and land mammals, and young pelagic and benthic fish (*3*). Dramatic loss of *Fucus* in the intertidal zone by oiling and the pressurized hot water (*28*) wash inhibited recovery of both the *Fucus* itself, which depends upon recruits being protected from desiccation by the seaweed canopy

(29), and also the community of invertebrates that shelters under the seaweed (30). The subsequent sequence of community development and species succession extended over a decade as opportunistic species of fauna and flora were gradually replaced by single-aged stands of *Fucus*, which died in cycles, starting the whole process again (31).

In the Gulf of Alaska, large reductions in sea otter populations, not spill-related, have been shown to predictably reduce predation on sea urchins, which then can experience a population explosion and overgraze their kelp and macroalgal foods. The consequent loss of the kelp forests has dramatic negative impacts on the fish and invertebrate community that resides within the forest and subsequently on the seabirds and marine mammals that prey on these resources (32). The potential for such a trophic cascade existed in Prince William Sound after the EVOS, but it was not fully realized as only the initial phase of increased sizes of sea urchins was documented in oiled areas with depleted sea otter populations (19).

Another indirect trophic impact, however, was realized in Prince William Sound when populations of important species of forage fish crashed after the EVOS (33). Herring in particular are critically important to seabirds and marine mammals because of their high lipid (fat) content and surface schooling habits, making them nutritious and easy to capture (34). Several fish-eating seabirds, including murres, cormorants, mergansers, pigeon guillemots, and black legged kittiwakes (21), and marine mammals, such as harbor seals (14), have exhibited persistent reductions in abundance in oiled areas since the EVOS.

The 1990s paradigm of oil ecotoxicity recognizes risk of delayed recovery of apex consumers (seabirds and marine mammals) due to indirect, bottom-up trophic interactions of oil inducing prey limitation. It also recognizes that interspecific interactions will lead to a sequence of delayed indirect effects on rocky intertidal communities.

Public Policy Implications

In light of the recent research on chronic oil pollution, the current regulatory framework is grossly inadequate to protect marine life from chronic, non-point source discharges, especially along urbanized coastlines. The current regulatory framework is based on outdated risk assessment models (acute toxicity models based on narcosis) that fail to recognize (a) chronic direct population-level effects from persistent PAHs; (b) sublethal, indirect, and trophic-level effects of weathered oil; and (c) the importance of habitat quality in maintaining population structure (1, 3).

Streams and estuaries serve as critical habitat, a nursery, for vulnerable early developmental life stages of many species of fish and other sealife: these habitats also receive bulk chronic hydrocarbon discharges. Scientists estimate that the amount of highway runoff in the US to be about one quart of oil per person per year. This means that for every 50 million people the equivalent of an EVOS (or 11 million gallons as reported by Exxon) is dumped every year, year after year, into productive coastline habitats as urban run-off (1). Clearly, if sustainable coastal fish populations and other wildlife are to co-exist with industrialized societies, our focus needs to shift to the prevention, control, and restoration of these habitats from

contamination–whether it is from acute spills or chronic non-point source pollution.

One place to start is with our federal water quality standards for PAHs, which are currently 300 ppb. Scientists now recognize a toxicity threshold of 1 ppb aqueous PAHs for habitats where fish eggs and larvae rear (*35*). Revisions to federal storm-water discharge regulations should be based on the 1990s oil toxicity paradigm (*1*), where chronic toxicity mechanisms are the concern not short-term narcosis.

Resource managers and oil spill response managers currently use outdated ecotoxicity models from the 1970s to assess only the short-term acute toxicity risks and damage from oil pollution and, in so doing, severely understate environmental impacts of chronic oil pollution (*1*, *3*). The regulatory framework governing oil discharge from offshore drilling platforms, oil tankers, and oil facilities regulated by federal discharge permits needs to be re-examined in light of the 1990s oil toxicity paradigm. Policies governing natural resource damage assessment following oil spills also fail to reflect this new appreciation of impacts of long-term toxicity. For example, the Oil Pollution Act of 1990 has effectively eliminated long-term biological damage assessment and long-term monitoring in oil spills after the *Exxon Valdez*.

A precautionary approach to oil and gas development and use seems advisable in the face of mounting evidence that oil is far more persistent and deadly in protected nearshore habitats than previously recognized. Unless restrictive regulations of anthropogenic PAH sources are adopted to minimize the ubiquitous chronic oil pollution, public resources–land, water, fish, and sealife–will subsidize at great cost the environmental burden of our oil dependency.

Acknowledgements

This paper was built upon the work of countless numbers of scientists who contributed to evaluating impacts of the EVOS. Financial support for preparation of the paper came from the Packard Foundation through the Environmental Defense Fund Academic Minigrant Program to the Alaska Forum for Environmental Responsibility.

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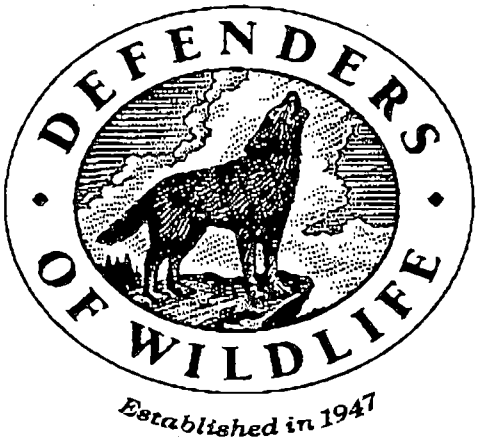
A Quick Message From:



Jim Curland
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[redacted]

Monday, July 8, 2002

Number of Pages (Including cover sheet)-4

Please deliver ASAP to: **Molly McCammon**
Exxon Valdez Oil Spill Trustee Council

(907) 276-7178

Regarding: Official Public Comments-Draft Status of Injured Resources

Please find attached our comments.

Should you have trouble with this transmission, please contact me.

thanks,

Jim Curland

July 8, 2002

Exxon Valdez Oil Spill Trustee Council
441 W. 5th Avenue, Suite 500
Anchorage, AK 99501

Dear Members and Staff of the EVOS Trustee Council,

Defenders of Wildlife (Defenders), on behalf of over 450,000 members nationally and 1,500 in Alaska, appreciates the opportunity to submit comments on the proposed changes to the ***Draft Status of Injured Resources*** (Draft Status Report) which updates the status of species affected by the 1989 **Exxon Valdez** oil spill (EVOS). Defenders' is a leading nonprofit conservation organization recognized as one of the nation's most progressive advocates for wildlife and its habitat. Defenders' is dedicated to the protection of all native wild animals and plants in their natural communities. We focus our programs on what scientists consider two of the most serious environmental threats to the planet: the accelerating rate of extinction of species and the associated loss of biological diversity, and habitat alteration and destruction. Long known for our leadership on endangered species issues, we also advocate new approaches to wildlife conservation that will help keep species from becoming endangered. Our programs encourage protection of entire ecosystems and interconnected habitats while protecting predators that serve as indicator species for ecosystem health.

Out of the thirty species and habitat types, as recognized by the EVOS Trustee Council (Council) as having suffered effects from EVOS, it is our understanding that the Council is planning on changing the status of nine of these resources by changing their classification to "Recovered" or "Recovering". In our comments, we will focus on the reclassification of the northern sea otter (*Enhydra lutris kenyoni*) and the killer whale (*Orcinus orca*).

We strongly disagree with the Council's recommendation that the northern sea otter be reclassified as "Recovering". In the most recent marine mammal stock assessment report (SAR) for the northern sea otter found in Alaska, U.S. Fish and Wildlife Service (FWS) concluded, "at present, abundance of sea otters in some oiled areas of Prince William Sound remains below pre-spill estimates, and evidence from ongoing studies suggests that sea otters and the nearshore ecosystem have not yet fully recovered from the 1989 oil spill (Bodkin et al., in press, Stephensen et al. 2001). Other areas outside of Prince William Sound that were affected by the spill have not been intensively

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studied for long-term impacts"[1]. In addition, the SAR reports that the vulnerability of sea otters to oiling from EVOS was demonstrated by the total estimates of mortality for the Prince William Sound area that varies from 750 (range 600-1,000; Garshelis 1997) to 2,650 (range 500 - 5,000; Garrot et al. 1993). Statewide, it is estimated that 3,905 sea otters (range 1,904 - 11,257) died in Alaska because of the spill (DeGange et al. 1994).

The Draft Status Report points out the Council's Nearshore Vertebrate Predator project that addressed the lack of recovery in sea otters in the heavily oiled bays of western Prince William Sound. In the report, it is stated that, "the lack of recovery may reflect the extended time required for population growth for a long-lived mammal with a low reproductive rate, but it also could reflect the effects of continuing exposure to hydrocarbons or a combination of both factors. An extremely cautious approach must be used in assessing the status of sea otters found within the oiled areas. Declines in the southwest stock of sea otters are unprecedented and the cause is yet to be fully determined. Further monitoring of these areas and the sea otter population must continue to accurately determine their status. It is premature and without any scientific evidence for the Draft Status Report to conclude that, "it is clear that sea otter recovery is underway for much of the spill-area, with the exception of populations at the most heavily oiled bays in western Prince William Sound. For this reason, sea otters continue to be in the recovering category."

The AB Pod of resident killer whales in Prince William Sound was severely impacted by the EVOS. Prior to 1989, there were approximately 36 whales in this pod. The AB pod of Killer Whales, the most commonly seen killer whales prior to and during the oil spill, has experienced a 27 percent decline in population since 1989 and is still ten individuals short of it's pre-oil spill population. According to killer whale researcher Craig Matkin, "considering their low birth rate and high mortality rate for calves, it will be a long-time, if ever, before the AB pod reaches its pre-spill size and can be considered "recovered"". Researchers believe that the most likely cause of the high mortality in the AB Pod was a result of inhalation of petroleum vapors. Exposure to oil can cause both immediate mortalities and subsequent deaths due to pneumonia or other disorders.

The AB pod has failed to show signs of recovery to its pre-spill size of 36. The AB pod must remain classified as "recovering", NOT "recovered".

In addition, we urge the Council to reclassify Harlequin Ducks, Herring, Clams --species and invertebrates dependent on non-contaminated, lower and mid-intertidal habitats-- as "Not Recovering" or "Recovery Unknown". This reclassification should equally apply to Intertidal Communities and Sediments until more studies are completed. Since much of the oiled sediments (surveyed last summer by the National Marine Fisheries Service) underlies productive nearshore habitats of the western Sound--home to mussels and clams and other intertidal life--the Intertidal Communities, their dependent predators and web of life, require more precautionary status.

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[1] Draft Revised Marine Mammal Stock Assessment Report for the Northern Sea Otter. Revised February 13, 2002. U.S. Fish and Wildlife Service, Marine Mammals Management. Anchorage, Alaska.

A precautionary approach to recovery status is needed. These proposed changes are rash, considering new evidence of the intense and extensive lingering subsurface oil in intertidal areas of western Prince William Sound. These are critical foraging areas for many species, and toxicological evidence indicates effects of chronic oil pollution exposure to species and invertebrates that are dependent on these intertidal habitats.

There is an inconsistency between the scientific data presented in the Draft Status Report and that which exists in the peer-reviewed science relating to EVOS and its affect on the marine life and habitats. These decisions must take into consideration the injuries unanticipated at the time of settlement with Exxon. It is also imperative that the Council make determinations based on best available science and that the Precautionary Principle is applied when making recommendations for reclassifications. Public education about the status of species is an important responsibility of the Council, and these resource status updates must continue to be made available to the public.

Thank you for the opportunity to comment. Should you have any questions, please contact Jim Curland, Marine Program Associate, at (831) 726-9010 or through email at jcurland@defenders.org or Karen Deatherage, Alaska Program Associate, at (907) 276-9453 or through email at kdeatherage@defenders.org.

Sincerely,

Jim Curland

Karen Deatherage

Jim Curland
Marine Program Associate

Karen Deatherage
Alaska Program Associate

Cc: Rosa Meehan (**U.S. Fish and Wildlife Service**)
Jim Bodkin (**U.S. Geological Survey**)
Michelle Wilson (**Alaska Center for the Environment**)
Don Baur, esq.
Don Mooney, esq.

Molly McCammon

From: Marybeth Holleman [nellie_juan@yahoo.com]
Sent: Monday, July 08, 2002 11:59 AM
To: molly_mccammon@oilspill.state.ak.us
Subject: comments on proposed species status changes

8 July 2002

Dear Members and Staff of the EVOS Trustee Council:

I appreciate the opportunity to comment on your proposed changes to the status of recovery of species injured from Exxon's oil spill.

First, I strongly request that the AB Pod of Killer Whales remain classified as "Recovering", NOT recovered. The pod has not yet returned to its pre-spill size, nor its pre-spill age/sex structure. Please follow the advice of the scientist who best knows the AB pod, Craig Matkin, and continue listing this pod as "Recovering."

Second, pink salmon should remain in the "Recovering" category since you can't document that they have recovered from all effects of the spill. I'm concerned that you changed the recovery objective for this species to one that you don't have and aren't collecting data for. Changing a recovery objective at this point in time undermines the entire process for which you are responsible.

Third, herring should be downgraded from "recovering" to "not recovering." As your own draft document states, their recovery has stalled--which means they are no longer recovering.

Fourth, harbor seals should be listed in a new category, "Declining." Their population continues its steep decline, and so warrants the creation of a new category which honestly reflects the population's status.

And finally, Harlequin Ducks, Clams, Sea Otters--species and invertebrates dependent on non-contaminated, lower and mid-intertidal habitats--should be recategorized as "Not Recovering".

These decisions must take into consideration the injuries unanticipated at the time of settlement with Exxon. It is also imperative that the Trustee Council make determinations based on current peer-reviewed science and the Precautionary Principle when making recommendations for reclassifications.

I urge you to consider the best available data and to make your decisions with extreme caution. As I am sure you are well aware, this is a ground-breaking process that the entire world is watching carefully.

Thank you for the opportunity to comment.

Sincerely,

Marybeth Holleman

Molly McCammon

From: dune lankard [dune@redzone.org]
Sent: Monday, July 08, 2002 1:55 AM
To: molly_mccammon@oilspill.state.ak.us
Cc: hooves@redzone.org; laurenjoy@redzone.org; ulazimy@hotmail.com; georgia_rodgers@hotmail.com
Subject: comment letter

July 8, 2002

Dear Molly:

We, here at the Eyak Preservation Council (EPC) hope all is well with you and the Trustee Council. I would like to take this time and comment on on your proposed changes to the status of recovery of species injured from Exxon's oil spill and the current status of Prince William Sound (Sound).

Many species are struggling to recover from the oil spill, I feel that it is premature to relist the status without indepth and personal discussions with the villages and residents of the Sound. There is traditional and cultural knowledge and perspectives about certain species and their current status of recovery that your science does not cover. I would suggest that you come down here to Cordova and hold a EVOSTC public hearing and hear for yourself from PWS citizens, with firsthand experience about the current state of the Sound and the wildlife.

These decisions must take into consideration the injuries unanticipated at the time of settlement with Exxon. It is also imperative that the Trustee Council make determinations based on current peer-reviewed science and the Precautionary Principle when making recommendations for reclassifications. Public education about the status of species is an important responsibility of the Trustee Council, these recovery and lack-of-recovery findings must continue to be made available to the general public.

I strongly request that the AB Pod of Killer Whales remain classified as "Recovering." Changing the status of any of the Sound's wild and sealife is much too soon. Our ocean way of life here in the Sound is being treated like a political football that scientists and government continue to just throw around.

Please take the time to reevaluate your actions and pursue the $100 million re-opener and help us get our feet back on the ground. There is science that shows that oil is much more toxic than we thought. And, that there was much more oil spilled than Exxon or the Government is willing to admit too. Therefore, the effects are much worse and will last much longer than expected or stated.

We are witnessing a complete collapse of the environment, wild and sealife and our local fishing economy. Please rethink this critical relisting process. We must work together to ensure the health of our region and full recovery of our wild inhabitants of the Sound. Thank you for your time.

In Spirit of the Sound,
Dune

Dune Lankard
Eyak Preservation Council
PO Box 460

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Molly McCammon

From: Deborah Mole [jtbrown@gci.net]
Sent: Friday, July 05, 2002 1:58 PM
To: mollymccammon@oilspill.state.ak.us
Subject: Comments

Hello Molly,

Firstly, I am writing to let you know that I would prefer that your organization err on the side of safety and protection when considering the "status" of habitat or species. These determinations should dpend upon independent, non-stakeholder reviews of studies, or independent and paralell studies by non-stakeholder and non-stakeholder associated entities. I think it is very important to consider the leverage that the stakeholders exert throughout the process, and re-balance to achieve justice for all.

I am concerned that so many of the council are employees of the State of Alaska, which recieves all of it's money from Oil Companies. Also that many have direct ties to Oil Companies. Why don't we have Environmental Engineers, and Scientists on the panel. Please excuse me if I am being presumptuous ofthe history or philisophical leanings of the board. I do however recognize that the money and power behind the oil companies is unparalelled worldwide. It seems to me that within an environment of this type it is imperative that we question our processes to determine the true stressors which bring about final decisions regarding important natural and human resources. This type of environment rewards people socially, economically, and vocationally when the wishes of the industry are complied with, no matter how "seemingly" innocuous. The "status" of a given species as determined by a state entity may hold great weight when considering damages in future and past litigation, regulatory policy, grants for protection, and public interest in specific habitat or regions. It is my sincerest wish that the "status" of species be determined through the most rigorous of processes. Any thing less is a service to those who would do needless harm for the sole/soul purpose of self enrichment.

Also, has anyone contacted your organization regarding Prince William Sound Keeper and the possibility of your organization providing funds for "Habitat Protection" in the sound. I find it a striking point that, not to detract from their importance, the only habitat protection implemented so far have been temporary conservation easements.

Thank you for your time,

J. Todd Brown

Molly McCammon

From: Donna [ecofem2000@yahoo.com]
Sent: Friday, July 05, 2002 10:47 AM
To: molly_mccammon@oilspill.state.ak.us
Subject: Status of Recovery

Dear Members and Staff of the EVOS Trustee Council,

I appreciate the opportunity to weigh in on your proposed changes to the status of recovery of species injured from Exxon's oil spill.

I strongly request that the AB Pod of Killer Whales remain classified as "Recovering", NOT recovered. Harlequin Ducks, Herring, Clams, Sea Otters--species and invertebrates dependent on non-contaminated, lower

and mid-intertidal habitats-- be recategorized as "Not Recovering".

These decisions must take into consideration the injuries unanticipated at the time of settlement with Exxon. It is imperative that the Trustee Council make determinations based on current peer-reviewed science and the Precautionary Principle when making recommendations for all reclassification.

Public education about the status of species is an important responsibility of the Trustee Council, these recovery and lack-of-recovery findings must ontinue to be made available to the general public.

Thank you for the opportunity to comment.

Signed,
Donna Anderson
2212 Great Western, D
Douglas, Alaska 99824
907-364-2388

Molly McCammon

From: Carol Hoover [hooves@redzone.org]
Sent: Monday, July 08, 2002 6:29 AM
To: Molly McCammon
Cc: Dune Lankard
Subject: Re: Comment letter

Dear Molly:

Thank you so much for the personal reply.

It was very disconcerting when this past spring Dune went out on the Sound and the only beach he went on had oil just beneath the surface. We filmed there - it was really sad. Also - Riki is presenting some important "science" that I would recommend that the Trustee Council review. The effects of oil in sea water are much worse than previously thought, and the repercussions much longer lasting. The effects on salmon are multi-generational, with unhealthy embryo's for years being the result. With oil still on the beaches, still seeping into the food chain, much more research and indeed, restoration, needs to be done to allow us to make sane decisions about the effects of the oil and hydrocarbons we accidentally spill, as well as that which we indiscriminately distribute into pristine ecosystems (and the recovering once pristine ones).

Please do get in touch with us if there is anything we can do to assist in this process. We must work together to ensure the health of our region and all of its "civilized" and wild inhabitants.
Thank you.
Best regards,
Carol
--
Carol Hoover
Kyak Preservation Council
PO Box 460
Cordova, AK 99574
907 424 5890 v
907 424 5891 f
www.redzone.org

Molly McCammon wrote:

> Thanks Carol for your comments. No one has suggested harlequins, herring,
> clams or sea otters are recovered. I'm sorry if somehow you received
> incorrect information. The issue is where on the line between "not
> recovered" and some signs of "recovering" these species should be. I will be
> sure to pass on your comments to the Trustee Council. Sincerely, Molly
> McCammon
>
> -----Original Message-----
> From: Carol Hoover [mailto:hooves@redzone.org]
> Sent: Wednesday, July 03, 2002 12:53 PM
> To: molly_mccammon@oilspill.state.ak.us
> Subject: Comment letter
>
> Dear Molly:
>
> I have been working in Cordova since 1994 - and am friends and
> associates with many who love, work and do science in the Sound.

> It is NOT recovered. Many species that we know of, and many species
> sytems that are not listed may not be recovered. The Orcas are NOT -
> this is a fact. The

> Harlequin Ducks, Herring, Clams and Sea Otters are NOT - this is a fact.
> There is oil on the beaches still polluting the environement. There are
> no herring. The people of the area are still suffering economic,
> pshycological and physical trauma from the spill. That is a fact.
>
> The fact that the Council is even considereing giving these species and
> others in the Sound a recovered status is undeniably unsound, unwise,
> unfair and smacks of a strange sense of blind values. I feel that it
> will take courage to tell the truth in this situation and for some
> reason we are not aware of, there seems to be a push to declare theses
> species, and the Sound for that matter, as recovered.
>
> As I am sure you may know, we know now that it is only one part per
> billion of oil pollution in salt water that causes harm to the
> reproductive abilities of salmon and other wildlife - NOT one part per
> million as was thought at the time of the spill. What else will we find
> out in the future about the harm that this disasterous spill has caused?
>
> It is also imperative that the Trustee Council make determinations based
> on current peer-reviewed science and the Precautionary Principle when
> making recommendations for reclassifications. Public education about the
> status of species is an important responsibility
> of the Trustee Council, these recovery and lack-of-recovery findings
> must continue to be made available to the general public.
>
> Thank you.
> Best regards,
> Carol Hoover
>
> --
> Carol Hoover
> Eyak Preservation Council
> PO Box 460
> Cordova, AK 99574
> 907 424 5890 v
> 907 424 5891 f
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Molly McCammon

From: scott metzger [slm@adnmail.com]
Sent: Wednesday, July 03, 2002 3:30 PM
To: molly_mccammon@oilspill.state.ak.us
Subject: official public comments

EVOS Trustees Council, July, 3,2002

The following are my official public comments regarding the recovery status of the 9 species up for reconsideration by the Council. This is in regards to the 25 species injured by the Exxon Valdez Oil Spill.

First of all it is my opinion that the only factor that should affect whether a species is listed as "not recovered", "recovering", or "recovered" should be solid scientific evidence. This should not be a politically motivated decision making process and if there is not enough evidence to support a "recovered" listing, then no species should be listed as "recovered".

In the instances where there is not enough scientific iformation gathered or the studies remain inconclusive, the most scientifically sound thing to do would be to list those species as "recovery unkown" or "not recovered."

The AB Pod of Killer Whales has shown a low birth rate, high calf mortality, and is still 10 whales short of the pre spill population size. Based on these facts the AB pod should remain classified as "RECOVERING", or "NOT RECOVERED".

Based on new studies completed in 2001 by NOAA, there is evidence that oil still exists on most of the heavily oiled beaches in PWS. The affects of this lingering oil on intertidal invertebrates is still completely unknown. Therefore it is premature to classify Clams, herring, Harlequin ducks, and sea otters as anything but "RECOVERY UNKNOWN", or "NOT RECOVERING". All of these species rely on intertidal areas for foraging and reproduction. These species cannot be recovered when the lingering affects of this oil remain unstudied.

Thank you , Sincerely, Scott Metzger

Molly McCammon

From: Leo & Dorothy Keeler [info@akwildlife.com]
Sent: Wednesday, July 03, 2002 9:29 PM
To: molly_mccammon@oilspill.state.ak.us
Subject: Draft Update to Injured Resources

Dear Members and Staff of the EVOS Trustee Council,

I appreciate the opportunity to address your proposed changes to the status of recovery of species injured from Exxon's oil spill.

I emphatically request that the AB Pod of Killer Whales remain classified as "Recovering", NOT recovered. Harlequin Ducks, Herring, Clams, Sea Otters--species and invertebrates dependent on non-contaminated, lower and mid-intertidal habitats-- be recategorized as "Not Recovering".

These decisions must take into consideration the injuries unanticipated at the time of settlement with Exxon. It is also imperative that the Trustee Council make determinations based on current peer-reviewed science and the Precautionary Principle when making recommendations for reclassifications.

Public education about the status of species is an important responsibility of the Trustee Council, these recovery and lack-of-recovery findings must continue to be made available to the general public.

Thank you for the opportunity to comment.

Signed,

Dorothy Keeler

Wilderness Inspirations™
P.O. Box 190647
Anchorage, Alaska 99519
(907)248-9916
fax(907)248-8589

Molly McCammon

From: Lauren Joy Padawer [laurenjoy@redzone.org]
Sent: Thursday, July 04, 2002 4:06 AM
To: molly_mccammon@oilspill.state.ak.us
Subject: Exxon Valdez Oil Spill Trustee Council public comment

Dear Ms. Molly McCammon-

In regards to your recent debate about the contention between policy and scientific questions, I offer the following opinions as a citizen, an ecologist, and as a public interest activist.

When the Council has "no new evidence", should a species or resource not be moved to the 'recovery' line? I believe that EVOS needs to use language that is clearly understood for use with the public in media and reports. It is highly confusing to call a species 'recovered' when the science is NOT 100% conclusive. As long as population numbers are not recovered to prespill conditions, it is unacceptable and misleading to label them as 'recovered'. This I perceive as a tool conceived by oil corporate-funded politicians and Trustee Council members to usurp the truth from scientists and community members in the Sound who have seen continuing devastation to animals and habitat.

We're hearing a lot about the listing being a "public education tool" from the oil spill (not including global warming, tourism and other issues). When we list a species as recovered, the public thinks that means the species is healthy overall, how can we address this? It is clear that in ALL cases, the public needs to understand that the oil is NOT cleaned up, that it is impossible to clean up oil spills, and that oil is extremely toxic as water-soluble fractions (WSF's) and extremely hazardous as polycyclic aromatic hydrocarbons (PAH's), whether from spilled oil OR carbon emissions to humans, aquatic and terrestrial plant and animal life.

"We know there is still oil in the environment-large amount-could be there over 100 years, or longer. We know all these species at some stage of their life cycle will encounter this. Does that prohibit recovery? Some are looking for zero tolerance oil exposure. How can we address this issue?" I believe the environment has an incredible power to recover itself from human accidents and thoughtless destruction. However, the timeline for this kind of renewal takes anywhere from 10-800 years depending on the amount and type of degradation. Clearly, the amount of oil spilled in the Sound in 1989 is astounding and much larger than Exxon claimed in public press - almost 38 million gallons I understand is a closer calculation. I am not looking for 'zero-tolerance' as you put it, but rather an acceptance that this oil spill has left indelible psychological and abiding physical marks on the Sound ecosystem. As long as numbers are below pre-spill levels, the oil will remain a toxin in the Sound ecosystem. If after 100 years there are still species that have not reached pre-spill numbers, the EVOS Trustee Council will still be unable to call those species or the ecosystem recovered.

Craig Tillery commented that perhaps they could use the 'recovery unknown' catergory or more precise labeling that would maintain their credibility in the scientific community as well as to provide pubic education. I think this is very appropriate.

Bob Spies, chief scientist, asked "how precautionary should we be? Trustee council risks some credibility if it goes too far towards an extreme conservation definition." Conservation is preserving what has not yet lost integrity. Unfortunately, the Sound ecosystem has lost its pristine integrity forever. While problems are not apparent on the surface, they are exceedingly apparent under the microscope. This camera-view perspective has been a prevalent problem over the last 13 years and a problem which Exxon Corporation has capitalized on. Wherever possible, Exxon Corporation has portrayed a recovered version of the Sound. How can this be when our science clearly shows the contrary? It wouldn't be the case if money did not equal media angle.

So, to be precautionary, would be to honor the damage by continuing studies and distilling already published information about ecological damage in the Sound. It will prove time and again that oil is a hazardous substance dangerous to the

world in the form of emissions, risky to transport in our shared oceans, and toxic to oil industry workers, clean-up crews and plant and animal life in transport and restoration.

In terms of pollution, there's a lot of judgement that goes into this. "How clean is clean? ... Science toxicology can make connections between exposure and effects. We know low levels--sea otters--are getting continued exposure to oil." [then the paper says he said "but whether it's due to oil or others factors isn't clear"]. Dirty is never clean. And like chemicals in our households, oil clean-up chemicals make the environment less clean. Like household chemicals to children and pregnant women, oil response clean-up chemicals are dangerous, hazardous and devastating to even the strongest immune system as apparent from the lesions and internal bleeding displayed in the oil spill clean up worker community. I think cleanliness is a non-issue here because connections between exposure and effects on humans and animals favors an argument of a toxic, unclean scene.

Finally, I find the proposed changes too early considering new evidence of the intense and extensive lingering subsurface oil in intertidal areas of
western Prince William Sound (critical foraging areas for sea ducks and otters), coupled with toxicological evidence on the effects of chronic oil
pollution exposure to species and invertebrates that are dependent on intertidal habitats. There is an inconsistency between the scientific data on these resources and the proposed status upgrades.

Some monitored resources require down-listing status or "recovery unknown" reclassification, such as Intertidal Communities, Sea Otters, Clams,
Sediments, and Pacific Herring, until more studies are completed. Since much of the oiled sediments (surveyed last summer by the National Marine Fisheries Service) underlies productive nearshore habitats of the western Sound--home to mussels and clams and other intertidal life--the Intertidal Communities, their dependent predators and web of life, require more precautionary status such as "not recovered" or "recovery unknown".

I join Alaska Center for the Environment in requesting that Harlequin Ducks, Clams, Sea Otters--species and invertebrates dependent on
the productive lower and mid-intertidal habitats-- be recategorized as "Not Recovering". AB Pod Killer Whales, Pink Salmon, Black Oystercatchers
must remain classified as "Recovering", NOT recovered. Evidence on the toxicological effects of chronic oil pollution and lingering oil in the lower intertidal areas demonstrate the need for further monitoring and strict adherence to recovery standards established in 1984.

Thank you for the opportunity to share my comments and opinion.

Sincerely, Lauren Joy Padawer

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f) 907.424.5891
www.redzone.org

July 3, 2002

Exxon Valdez Oil Spill Trustee Council
441 W. 5th Avenue, Suite 500
Anchorage, AK 99501-2340

Dear Members and Staff of the EVOS Trustee Council:

I appreciate the opportunity to weigh in on your proposed changes to the status of recovery of species injured from Exxon's oil spill.

I strongly request that the AB Pod of Killer Whales remain classified as "Recovering", NOT recovered. Harlequin Ducks, Herring, Clams, Sea Otters--species and invertebrates dependent on non-contaminated, lower and mid-intertidal habitats-- be recategorized as "Not Recovering".

These decisions must take into consideration the injuries unanticipated at the time of settlement with Exxon. It is also imperative that the Trustee Council make determinations based on current peer-reviewed science and the Precautionary Principle when making recommendations for reclassifications. Public education about the status of species is an important responsibility of the Trustee Council and these recovery and lack-of-recovery findings must continue to be made available to the general public.

Thank you for the opportunity to comment.

Sincerely,

Maryellen Oman

Maryellen Oman
12951 Summer Circle
Anchorage, AK 99516-2629

Molly McCammon

From: Carol Hoover [hooves@redzone.org]
Sent: Wednesday, July 03, 2002 12:53 PM
To: molly_mccammon@oilspill.state.ak.us
Subject: Comment letter

Dear Molly:

I have been working in Cordova since 1994 - and am friends and associates with many who love, work and do science in the Sound.

It is NOT recovered. Many species that we know of, and many species sytems that are not listed may not be recovered. The Orcas are NOT - this is a fact. The
Harlequin Ducks, Herring, Clams and Sea Otters are NOT - this is a fact. There is oil on the beaches still polluting the environement. There are no herring. The people of the area are still suffering economic, pshycological and physical trauma from the spill. That is a fact.

The fact that the Council is even considereing giving these species and others in the Sound a recovered status is undeniably unsound, unwise, unfair and smacks of a strange sense of blind values. I feel that it will take courage to tell the truth in this situation and for some reason we are not aware of, there seems to be a push to declare theses species, and the Sound for that matter, as recovered.

As I am sure you may know, we know now that it is only one part per billion of oil pollution in salt water that causes harm to the reproductive abilities of salmon and other wildlife - NOT one part per million as was thought at the time of the spill. What else will we find out in the future about the harm that this disasterous spill has caused?

It is also imperative that the Trustee Council make determinations based on current peer-reviewed science and the Precautionary Principle when making recommendations for reclassifications. Public education about the status of species is an important responsibility
of the Trustee Council, these recovery and lack-of-recovery findings must continue to be made available to the general public.

Thank you.
Best regards,
Carol Hoover

--
Carol Hoover
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Molly McCammon

From: Udi Lazimy [ulazimy@hotmail.com]
Sent: Monday, July 08, 2002 4:45 PM
To: molly_mccammon@oilspill.state.ak.us
Subject: Recovery status comments

Dear Members and Staff of the EVOS Trustee Council,

I appreciate the opportunity to weigh in on your proposed changes to the status of recovery of species injured from Exxon's oil spill.
I strongly request that the AB Pod of Killer Whales remain classified as "Recovering", NOT recovered. Harlequin Ducks, Herring, Clams, Sea Otters--species and invertebrates dependent on non-contaminated, lower and mid-intertidal habitats-- be recategorized as "Not Recovering".

These decisions must take into consideration the injuries unanticipated at the time of settlement with Exxon. It is also imperative that the Trustee Council make determinations based on current peer-reviewed science and the Precautionary Principle when making recommendations for reclassifications. Public education about the status of species is an important responsibility of the Trustee Council, these recovery and lack-of-recovery findings must continue to be made available to the general public.

Thank you for the opportunity to comment.

Signed,

Udi Lazimy
Wisconsin resident