

November 26, 1997

Jean R. Belair, Jr.
Director, Office of Economic & Comm. Dev.
City Center Plaza
16 Cony Street
Augusta, ME 04330

Dear Mr. Belair:

The U.S. Fish and Wildlife Service (Service) has reviewed the proposed Housing and Urban Development (HUD) and Department of Economic and Community Development (DECD) Community Block Development Grant (CBDG) for the Tree-Free Fiber Company in Augusta, Maine. Tree-Free, formerly known as Statler Tissue Company, will utilize a CDBG grant to upgrade machinery within the existing facility. Your request for formal consultation was received on November 14, 1997. We acknowledged receipt of the request to initiate formal consultation in our November 24, 1997 letter, and indicated that all information necessary for the consultation had been previously provided to the Service.

This document represents the Service's biological opinion on the effects of the proposed HUD/DECD grant to the Tree-Free Fiber Company on the threatened bald eagle (*Haliaeetus leucocephalus*) in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended, (16 U.S.C. 1531 et seq.).

In addition to the bald eagle, the federally threatened Shortnose sturgeon (*Acipenser brevirostrum*) also occurs in the Kennebec River. This species was listed by the National Marine Fisheries Service (NMFS) in 1967. At that time, major threats to the species were identified as habitat degradation or loss (resulting from bridge and dam construction, channel dredging, and pollutant discharge), impingement on power plant intake screens and incidental capture in other fisheries (NMFS 1997). NMFS has primary responsibility for the shortnose sturgeon and will conduct Section 7 consultation with EPA during the upcoming review process associated with reissuance of Tree-Free Fiber Company's National Pollution Discharge Elimination System (NPDES) permit.

Two additional species within the Kennebec River system, Atlantic salmon (*Salmo salar*) and Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), are also of concern to NMFS and the Service. Both federal agencies are currently conducting a status review of the Atlantic sturgeon to determine if it should be placed on the Endangered Species list. In 1995, NMFS and the Service were petitioned to list the Atlantic salmon as an endangered species. Although the agencies concluded listing salmon in the Kennebec River was not appropriate at that time, the species was designated as a Category 2 Candidate species by both agencies in their March 17, 1995 12-month petition finding (60 FR 14410). Neither Atlantic salmon nor Atlantic sturgeon are addressed in this biological opinion. However, effects of the Tree Free Company's discharge into the Kennebec River with regard to these two fish species will be addressed during the NPDES review process.

This opinion is based in part on information contained in EPA's August 1990 NPDES permit (ME 0002224) and Fact Sheet for Statler Tissue, the February 1995 NPDES renewal application for Statler Tissue, and the May 1996 Maine Department of Environmental Protection (DEP) Waste Water Discharge License (#W000247-44-C-R) for Tree-Free Fiber Company.

CONSULTATION HISTORY

Information on the proposed action and its potential effect on the threatened bald eagle was exchanged during the informal and formal consultation process between our agencies.

September 3, 1997 - Letter from V. DiCara, Development Consulting Services, to L. Welch, USFWS, requesting Section 7 review of CBDG grant for Tree-Free.

September 12, 1997 - Letter from W. Neidermyer, USFWS, to V. DiCara, Development Consulting Services, requesting additional dioxin data from the Tree-Free Fiber Company.

September 15, 1997 - Letter from R. McElhaney, Tree-Free Fiber, to V. DiCara, Development Consulting Services, providing analytical results for dioxin sampling.

September 19, 1997 - Letter from V. DiCara, Development Consulting Services, to W. Neidermyer, USFWS, providing analytical results for dioxin sampling.

October 23, 1997 - Meeting at USFWS office in Old Town, Maine between L. Welch, USFWS, S. Levesque, DECD, R. McElhaney, R. Jackson, Tree-Free, V. DiCara, Development Consulting Services, and J. Cuddy, Sen. Collins Office regarding Section 7 consultation.

November 14, 1997 - Letter from J. Belair, Director, City of Augusta Office of Economic and Community Development, to M. Bartlett, USFWS, requesting formal consultation for CDBG grant application for Tree-Free Fiber.

November 24, 1997 - Letter from M. Bartlett, USFWS, to J. Belair, Director, City of Augusta, Office of Economic and Community Development, acknowledging request for formal consultation.

Biological Opinion:

The Service has geographically separated bald eagles in the lower 48 states into recovery populations termed Recovery Regions. Maine is part of the 24-state, Northern States Recovery Region (NSRR) for bald eagles. In developing biological opinions pursuant to section 7 of the ESA, Service policy provides for the evaluation of jeopardy to a vertebrate species such as the bald eagle, within its specific recovery region, rather than across the species' entire range within the coterminous 48 states.

For the purposes of this consultation, the scope of the effects of the action (the action area) is limited to those bald eagles nesting along the Kennebec River downriver of Augusta, and to those eagles that winter and consume prey in affected waters.

It is the Service's biological opinion that authorization of the CDBG grant for Tree-Free Fiber Company will not jeopardize the continued existence of the bald eagle. The action will not jeopardize the bald eagle because the anticipated adverse impacts, which will affect those eagles utilizing a portion of the Kennebec River, will not preclude recovery and appreciably reduce the survival of eagles in the NSRR. Critical habitat has not been designated or proposed for this species; therefore, none will be destroyed or adversely modified by the proposed action.

Description of the Proposed Action:

The proposed action is the approval of a CDBG grant to Tree-Free Fiber Company of Augusta, Maine. The grant would enable Tree-Free, formerly Statler Tissue, to upgrade machinery and increase production at the facility. The mill is an integrated pulp and paper mill that utilizes recycled (de-inked) fiber to produce household tissue products. The company currently operates under a 1990 NPDES Permit (#ME0002224) and a 1996 Maine Department of Environmental Protection Waste Water Discharge License (#W000247-44-C-R) allowing for the discharge of treated process wastewater into the Kennebec River. Currently, only one of the company's two paper making machines is operational, and the facility is producing approximately 40 air dried tons/day. Upon completion of the machinery upgrade, a second paper machine will be operable and Tree-Free anticipates a maximum production capacity of 100 air dried tons/day. The 1990 NPDES permit, under which the company is operating, allows the facility to release up to 3.2 pg/l dioxin equivalents [2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) and 2,3,7,8-tetrachlorodibenzofuran (TCDF)], resulting in an instream concentration of 0.013 pg/l dioxin equivalents (TCDD).

Tree-Free Fiber Company discharges into the Kennebec River approximately 2,000' upstream of the Edwards Dam. The availability and distribution of TCDD within the Kennebec River may be influenced by the presence of the dam. The section of the river below the Edwards Dam is tidally influenced and receives a greater degree of flushing compared to portions of the river upstream of the dam. However, the Federal Energy Regulatory Commission (Commission) has ordered that the Edwards Dam be removed. Concurrently, potential funding options for removing the dam are being examined.

The Service anticipates conducting a comprehensive Section 7 consultation with EPA for Tree-Free Fiber and other dischargers along the Kennebec River associated with reissuance of their NPDES permits. Due to the time constraints inherent in the CDBG process, we are providing this preliminary biological opinion to address the company's desire to upgrade their machinery as quickly as possible.

Species Account/Environmental Baseline:

In 1978, the bald eagle was listed pursuant to the Endangered Species Act as an endangered species in Maine and 42 of the other contiguous states, and as threatened in the remaining five states (USFWS 1979). At that time, environmental contaminants were shown to be affecting many of the eagle populations (Wiemeyer et al. 1972). Other factors contributing to the eagle's decline included human disturbance at nest sites, habitat loss, and shooting (Palmer 1988). In recognition of the recently improved status of bald eagles, in August 1995 the species was classified throughout the 48 coterminous states as threatened.

The bald eagle is listed as a threatened species under Maine's endangered species law (12 MRSA, section 7753). Maine legislation (12 MRSA, Chapter 713, and Ch. 8.05) allows eagle nests to be designated as essential habitat. Although this legislation protects the eagle from human disturbance and destruction of habitat, it was not intended to regulate point or nonpoint pollution and other indirect causes that may lead to reproductive failure.

Current Status:

Although the Maine bald eagle population has experienced a gradual but steady increase in the number of occupied nest sites in recent years, the population continues to exhibit reduced reproductive rates. In approximately 30 years of population monitoring, Maine eagles have never reached the production level of 1.00 young/occupied nest, a rate regularly surpassed by healthy eagle populations (Sprunt et al. 1973; Newton 1979). In 1997, bald eagles in Maine occupied 178 nest sites and produced 175 eaglets for a mean production rate of 0.98 young/occupied nest. The ten year mean production rate for the statewide population is 0.81 young/occupied nest. The statewide average productivity is

influenced by the productivity of estuarine and marine eagles, which make up a significant component of the statewide average and which generally demonstrate higher productivity than eagles nesting in other habitat types.¹

¹ A nesting pair is considered successful if the eaglet has survived until Maine Department of Inland Fisheries and Wildlife (MDIFW) conducts a final production survey when the young are approximately 10 weeks old.

Six pairs of eagles currently nest along the Kennebec River, with the closest pair nesting approximately 10 miles downstream of the discharge from Tree-Free. However, the portion of the river currently used by the eagles for nesting is considered part of the Kennebec River estuary, and contaminant concentrations in prey species may be influenced by marine conditions and the daily exchange of water within the estuary.

The Maine eagle population is the stronghold for the species in the Northeast, representing approximately 95% of the eagles nesting in New England. The continued health and expansion of the Maine population is crucial to the recovery of the species in the northeastern United States.

Ecology of Maine Bald Eagles:

Diet composition and a reproductive life of 20-30 years (Stalmaster 1987) may significantly influence the bald eagle's exposure to environmental contaminants. Eagles generally form breeding pairs and establish nesting territories when they sexually mature at about five years of age. Bald eagles demonstrate extreme loyalty to a nesting territory, and will continue to use the same territory throughout their lives. An individual territory may contain several alternate nests that are constructed over the years of territory occupancy. During the winter months in Maine, eagles nesting in the interior sections may travel to areas of open water to access prey, while coastal-nesting eagles remain on their territories year round. On average, nesting females will lay between one and three eggs. Nesting is generally initiated in mid-March to April, and is followed by a 35-day incubation period. Eaglets fledge from the nest at approximately 12 weeks of age, although they may remain in the nesting territory for an indefinite period of time.

Bald eagles represent top level predators, and therefore have increased risk of exposure to contaminants that biomagnify within food chains. In Maine, eagles consume high percentages of piscivorous avian species, which may further increase their exposure to environmental contaminants (Todd 1979, Tillitt et al. 1991a, Welch 1994). Eagles nesting in estuarine habitats in Maine were reported to consume a diet of 63% birds, 28% fish, and 9% mammalian prey (Welch 1994). The Service believes that the mainstem of the Kennebec River constitutes the major foraging area for eagles nesting along the river. Bald eagles are regularly observed foraging along the river and little information is available to indicate that the eagles forage outside the system during the nesting season (C.Todd, MDIFW, pers. comm.).

Although nesting eagles are distributed throughout the State during the breeding season, several areas have been identified as significant concentration areas for eagles wintering in

Maine. These include Frenchman and Cobscook Bay, the lower Penobscot River and Bay, and Merrymeeting Bay (Kennebec/Androscoggin Rivers). Contaminant concentrations in the prey from wintering areas may significantly affect the ability of female eagles to lay viable eggs following their return to nesting territories. The females' body condition and the availability and quality of prey items early in the season may also influence the contaminant burdens in the eggs (Grier 1974).

Contaminants:

Investigations conducted on Maine bald eagles between 1970 and 1990 identified elevated levels of environmental contaminants (Wiemeyer et al. 1984, 1993). Some of these contaminants have been significantly correlated with reduced reproductive rates in bald eagles. Recent contaminant analyses conducted on blood and feather samples from nestling bald eagles and unhatched eggs demonstrated that the Maine population continues to be exposed to elevated levels of PCBs, mercury, DDTs, and dioxin equivalents (TCDD-EQ) (Welch 1994). Although it appears that the reduced reproductive rates of the Maine eagle population are associated with elevated contaminant concentrations, little is currently known regarding the effect that TCDD and TCDF may be having on the population.

In 1992, 12 addled eggs and blood samples from six nestlings were analyzed for TCDD-EQ using the H4IIE bioassay method (Tillitt et al. 1991b). The unhatched egg collected from the nest in Bowdoinham contained 2,137 pg/g TCDD-EQ. This concentration of TCDD-EQ is over 2,000 times the No Observable Adverse Effect Level currently recognized by the Service. At the time this sample was analyzed, this TCDD-EQ level constituted the highest concentration recorded in any biological sample (Tillitt, USGS, National Fisheries Contaminant Research Center, pers. com.).

Additional known discharges of Dioxin into the Kennebec River:

Maine DEP has identified and monitored several other potential TCDD discharges to the Kennebec River system. These include: the S.D. Warren's bleached kraft mill in Skowhegan, the Scott Paper Mill in Winslow, and the Kennebec Sanitary Treatment District's discharge in Waterville. All three facilities participate in the Maine DEP dioxin monitoring program. In addition, the EPA has recently initiated a watershed based review for reissuance of NPDES permits for all authorized dischargers within the Kennebec River system. The Service anticipates that we will initiate Section 7 consultation with EPA for Tree-Free Fiber, and the above mentioned facilities within the next several months.

Direct and Indirect Effects on Listed Species:

TCDD is considered to be the most potent animal carcinogen known, and since 1985, has also been considered a probable human carcinogen (USEPA 1993). Effects of TCDD exposure include enzyme induction, immune suppression, increased nestling mortality, reproductive toxicity, developmental toxicity, and carcinogenicity (Tillitt et al. 1991a, Nosek et al. 1993, USEPA 1993).

There are currently limited data on TCDD and TCDF concentrations in Kennebec River bald eagles and non-piscine prey species. However, available analytical results indicate that TCDD and TCDF are being biomagnified in the Kennebec River food chain (Table 1, Maine DEP 1995 and Maine DEP 1996), and are accumulating in Merrymeeting Bay/Kennebec River bald eagles. Proposed machinery upgrades and the resulting increase in production at Tree-Free could result in additional discharge of TCDD and TCDF to the Kennebec River. Although fish samples were collected from the Kennebec River in 1996 and 1997, the analytical results are not yet available (B. Mower, MEDEP pers.comm.).

Table 1: Concentrations (pg/g) of 2,3,7,8-tetrachlorodibenzo-<i>p</i>-dioxin (TCDD) and Dioxin Toxic Equivalents (DTE) in Kennebec River Fish					
Location	Species	1994		1995	
		TCDD	DTE	TCDD	DTE
Sidney	Smallmouth Bass	0.3	0.4 - 1.3		
	White Sucker	2.3	3.0 - 4.0	1.2	1.7 - 2.5
Augusta	Smallmouth Bass	1.0	1.3 - 3.7		
	White Sucker	2.3	4.0 - 5.8		
	Brown Trout			1.0	1.3 - 3.5

The Service acknowledges that there are several sources of TCDD upstream of Tree-Free Fiber that contribute to the TCDD levels observed in the fish sampled from Augusta. However the data presented in Table 1 indicates that TCDD levels in smallmouth bass are three times higher below the Tree-Free facility compared to fish sampled upstream of Tree-Free. TCDD concentrations in white suckers were similar between the two sampling locations.

In order to address the potential effects of TCDD and TCDD-like compounds on Kennebec River bald eagles, we used a hazard assessment model (Appendix A) developed by the Service for assessing TCDD effects to eagles nesting along the Columbia River in Oregon and Washington (USFWS 1994). This hazard assessment model has also been utilized in the formulation of the Service's biological opinion on the Lincoln Pulp and Paper NPDES permit (USFWS 1996), and in a biological opinion addressing the effects of the Great Lakes Water Quality Guidance on six listed species, including the bald eagle (USFWS 1995). The model provides an estimate of the dietary concentrations necessary

to achieve a "no observable adverse effect level" (NOAEL) for concentrations in eagle eggs.

The use of the hazard assessment model is necessary because current analytical procedures are not sensitive enough to detect TCDD in the water of the Kennebec River. Therefore, we must rely on estimates of TCDD concentrations based on effluent dilution (239:1) at harmonic mean flow. The current NPDES permit limits TCDD discharge from Tree-Free Fiber to 3.2 pg/l or 0.013 pg/l TCDD at harmonic mean river flow. Results of the hazard assessment model indicate that an instream concentration of 0.0001 pg/l is necessary to protect nesting eagles. Although fish exhibit elevated levels of TCDD from an Augusta sampling location that is within a tidally-influenced reach of the Kennebec River, it is difficult to predict TCDD concentrations in prey species further downriver.

Cumulative Effects:

Under the ESA, cumulative effects are those effects of future non-Federal (State, local governments, or private) activities on endangered or threatened species or critical habitat that are reasonably certain to occur within the action area of the Federal activity subject to consultation. Future Federal actions are subject to the consultation requirements established in Section 7, and therefore, are not considered cumulative to the proposed action.

No future non-federal actions potentially resulting in cumulative effects were identified during this consultation.

Incidental Take:

Sections 4(d) and 9 of the ESA, as amended, prohibit take (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such activity) of listed species of fish and wildlife without special exemption. Harm is further defined to include "significant habitat modification or degradation that results in injury or death to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering". Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant.

The Service has concluded that approval of the CDBG application, resulting in an increase in production at Tree-Free Fiber Company, may result in the incidental take of bald eagles due to exposure to TCDD and TCDF. However, the Service anticipates conducting section 7 consultation with EPA on the reissuance of NPDES permits within the Kennebec River watershed, and we believe that this will be the most appropriate time to address our concerns regarding take. This consultation will allow EPA and the Service to address the

cumulative effects of all Kennebec River dischargers on all of the federally listed species within the river system.

Conservation Recommendations:

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

In accordance with the goals of the Clean Water Act, HUD/DECD and EPA should work towards the elimination of TCDD and TCDF from all discharges into the Kennebec River. Until that point in time, the Service recommends that the Tree Free Fiber Company participate with EPA and the Maine DEP in establishing a Total Maximum Daily Load (TMDL) for the Kennebec River system. A TMDL would address the multiple contaminant discharges that are permitted throughout the watershed, and would consider the cumulative effects of these actions. The Clean Water Act [CWA 303(d)(1)(C)] indicates that a margin of safety, that takes into account any lack of knowledge that may affect effluent limitations and water quality, must be incorporated when establishing TMDLs and water quality standards.

Conclusion:

This consultation has considered as the affected population only the six nesting pairs of eagles nesting downstream of Augusta, Maine. However, for several months each year, eagles wintering along the Kennebec River are also exposed to the contaminants present in the system. Exposure to dioxins and furans may affect the reproductive capabilities of a number of eagles nesting elsewhere in Maine; however the extent to which this may be occurring is unquantifiable.

Although this opinion did not consider the potential for this action to adversely affect the endangered Shortnose sturgeon, we anticipate that NMFS will consult on this species during the NPDES permit process. Both federal agencies are concerned about potential threats to Atlantic sturgeon and Atlantic salmon from continued TCDD and TCDF discharge into the Kennebec River. Concerns for both these species will also be addressed during the consultation with EPA regarding the NPDES permits for all discharges in the system.

This formal consultation on the proposed CDBG for the Tree-Free Fiber Company, Augusta, Maine concludes that the bald eagle will not be jeopardized but that incidental take may occur as a result of Tree-Free's continued TCDD discharge into the Kennebec

River. The Service will address the potential for incidental take of bald eagles in a more comprehensive biological opinion with EPA that considers all TCDD dischargers into the Kennebec River. At that time, we will inform you and Tree-Free Fiber Company of the possible need to reinitiate formal consultation on this matter.

If you have any questions regarding this opinion, please contact Linda Welch at 207-827-5938.

Sincerely yours,

Michael J. Bartlett
Supervisor
New England Field Office

CC: Robert McElhaney, Tree Free Fiber
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Reading File

ES: MAmaral/LWelch:11-26-97:207-827-5938

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Appendix A

Hazard assessment model used to calculate no effect level (NEL) for water:

Step 1: Target Dietary Concentration = $\text{NOAEL}_{\text{egg}} / \text{BMF}_{\text{prey-egg}}$

Target Dietary Concentration is the concentration of TCDD in the diet that would be protective of bald eagles.

NOAEL is the concentration of TCDD in an egg that produces no observable adverse effects (1.0 pg/g).

Biomagnification Factor (BMF) is the ratio of TCDD in eagle egg to TCDD in eagle prey (226).

Step 2: No Effect Level_{water} = $\frac{\text{Target Dietary Concentration}}{\text{BAF}_{\text{prey}}}$

No Effect Level is the concentration of TCDD in water that would not be hazardous to bald eagles.

Bioaccumulation factor (BAF) is the ratio of TCDD in a prey item to TCDD, originating from contaminated food, water, and sediment (31,200 and 42,467).

BAF: Frakes et al. (1993) reported estimated field bioaccumulation factors for six rivers in Maine, including the Kennebec River. They determined the BAF as:

$$\text{BAF} = (\text{Cf}/\text{Cr}) \times 1000$$

where

BAF = bioaccumulation factor (liter/kg)

Cf = TCDD concentration measured in brown trout (fillet)
or white sucker (whole body)

Cr = nominal concentration of TCDD in river water (pg/liter)

1000 = conversion from pg/g to pg/kg

The diet composition for eagles nesting in Maine is based on recovery of prey items at the nest sites. However, species with easily digested skeletal structures (smallmouth bass and trout) tend to be entirely consumed, and therefore are underestimated in prey remains. Frakes et al. (1993) reported that BAFs for white suckers (*Catostomus commersoni*), sampled in the Kennebec River between 1988 and 1990, ranged from 20,400 to 42,000 0 (\bar{x} = 31,200). As a bottom-dwelling fish species, white suckers may have increased exposure to TCDD-contaminated sediments that can increase subsequent wildlife exposure, resulting in increased concentrations throughout the aquatic food chain (USEPA 1993). The BAFs for brown trout (*Salmo trutta*) filets were multiplied by two (Branson et al. 1985) to convert to whole body BAFs. The BAFs for brown trout ranged from 18,000 to 65,400 (\bar{x} = 42,467). Although these BAFs are somewhat higher than values reported for other aquatic systems, we believe it is important to use data specific to the Kennebec River.

The BAF values reported by Frakes et al. (1993) were calculated from estimated water concentrations to observed tissue levels. However, the TCDD concentrations in the fish represent exposure to contaminated water, food, and sediment. Within Maine, TCDD is generally not detected in fish sampled from water bodies that do not receive paper mill discharge or other industrial effluent (Frakes et al. 1993). The Service recognizes that Tree-Free and other TCDD dischargers within the Kennebec River system have dramatically reduced their discharge of dioxin through voluntary process improvements implemented at the facilities. Nonetheless, the Service believes that even the reduced levels of dioxin in present discharges will bioaccumulate in fish and exceed levels necessary to protect bald eagles. The BAF values reported above represent mean concentrations in the fish, and thus they take into account the fact that TCDD concentrations may vary throughout the river.

NOAEL: Limited data exist regarding the effects of TCDD on the bald eagle. Because of its status as an endangered species (1978-1995) and a threatened species (currently) in the lower 48 states, no controlled studies have been conducted to determine actual effect levels for the species. However, research has been conducted on the effects of TCDD in other birds, and these data can be extrapolated to the bald eagle. Recent section 7 biological opinions have used a NOAEL of 1.0 pg/g TCDD-EQ for eggs of eagles nesting along the Penobscot River (USFWS 1996), the Columbia River (USFWS 1994), and the Great Lakes (USFWS 1995).

BMF: Due to the eagles position as a top of the food chain predator, the biomagnification factor must reflect magnification of TCDD through each level of the food chain. As a result, BMFs may vary greatly based on the eagles consumption of piscivorous species. Eagles nesting in Maine have been found to consume higher percentages of avian prey than reported for eagles nesting elsewhere in the United States (as noted in Todd 1979 and Welch 1994). Within Maine, diet composition varies among habitats, reflecting variable food supplies and seasonal availability of dietary items. This information indicates that eagles nesting within estuaries in Maine are consuming a diet of 63% birds, 28% fish, and

9% mammals. Using data from Braune and Norstrom (1989), and the formula developed during the Columbia River consultation (USFWS 1994), the Service applied the following equation to calculate a BMF value for estuarine nesting eagles:

$$BMF_{(total)} = F_{(f)}[BMF_{(f)}] + F_{(fb)}[BMF_{(f)}][BMF_{(b)}] + F_{(nfb)}[BMF_{(f)}]$$

$F_{(f)}$ - frequency of fish in the diet

$F_{(fb)}$ - frequency of fish-eating birds in the diet

$F_{(nfb)}$ - frequency of nonfish-eating birds in the diet

$BMF_{(f)}$ - biomagnification factor from forage fish to egg

$BMF_{(b)}$ - biomagnification factor from forage bird to egg

$BMF_{(total)}$ - combined biomagnification factor

therefore:

$$BMF_{(total)} = [0.28(21)] + [0.315(21)(32)] + [0.405(21)]$$

Based on the available prey remains data, and assuming that half of the birds consumed were piscivorous, the resulting BMF for estuarine nesting eagles in Maine is 226. Using the values given above, the hazard assessment model is as follows:

$$\text{Target Fish Concentration} = \text{NOAEL}_{\text{egg}} / \text{BMF}_{\text{prey-egg}}$$

$$= 1.0 \text{ pg/g} / 226$$

$$= 0.00442 \text{ pg/g or } 4.42 \text{ pg/kg}$$

In 1995, concentrations of TCDD reported for Kennebec River fish at the Augusta monitoring station ranged from nondetectable to 1.41 pg/g in brown trout fillets (Maine DEP 1996). Although no smallmouth bass or white suckers were analyzed in 1995, results from 1994 were 1.98 & 2.7 pg/g in whole white suckers and 0.633 - 1.33 for smallmouth bass fillets (Maine DEP 1995). These concentrations exceed the target dietary concentration of 0.00442 pg/g of TCDD-EQ necessary to protect bald eagles nesting and foraging along the Kennebec.

$$\text{No Effect Level}_{\text{water}} = \text{Target Fish Conc.} / \text{BAF}_{\text{prey}}$$

$$= 4.42 \text{ pg/kg} / 42,467 \text{ (brown trout)}$$

$$= 0.00010 \text{ pg/l}$$

$$= 4.42 \text{ pg/kg} / 31,200 \text{ (white sucker)}$$

$$= 0.00014 \text{ pg/l}$$

In other words, the Service calculated that instream concentrations of TCDD need to be substantially (0.00010 pg/l brown trout, 0.00014 pg/l white sucker) lower than 0.013 pg/l in order to protect nesting bald eagles. Both values are similar to the NEL_{water} of 0.0002 pg TCDD-EQ/l recommended by Giesy (1994) for the protection of eagles. Neither value compares favorably to the level of 0.013 pg/l recommended for the Columbia River and the target instream concentration in the NPDES permits for the Kennebec River. The