EXHIBIT H
BIOLOGICAL ASSESSMENT
FISH

DEPARTMENT OF THE ARMY
PORTLAND DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2946
PORTLAND, OREGON 97208-2946

Reply to
Attention of:

July 27, 1999

Engineering and Construction Division

Mr. Rick Applegate
National Marine Fisheries Service
525 NE Oregon Street, Suite 500
Portland, OR 97232-2737

Dear Mr. Applegate:

This is a supplement to the Biological Assessment for the Columbia and Lower Willamette Rivers, Navigation Channel Improvement Study sent to your office on 5 April 1999. It is the result of the change in status of the proposed-to-be listed species to listed status and the addition of coastal cutthroat as a proposed-to-be listed species. All of these species except coastal cutthroat were evaluated in the Biological Assessment as if they were listed and consequently have already been assessed.

Coastal cutthroat has been evaluated and the impacts have been determined to be similar to the other species and runs of listed salmonids stocks. As a result, it has been determined that construction of the Channel Improvement Project may effect, but is not likely to jeopardize the continued existence of coastal cutthroat.

If you need any additional information please contact Mr. Kim Larson, of my staff, at (503) 808-4776.

Sincerely,

Howard B. Jones, P.E.
Chief, Engineering and Construction
Division

DEPARTMENT OF THE ARMY
PORTLAND DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2946
PORTLAND, OREGON 97208-2946

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Attention of:

APR 5 1999

Engineering and Construction Division

Mr. Rick Applegate
National Marine Fisheries Service
525 NE Oregon St Suite 500
Portland, Or 97232-2737

Dear Mr. Applegate

Enclosed is a Biological Assessment for the Columbia River Channel Improvement Project. The project involves evaluating several alternatives to improve the reliability of the channel for deep draft vessels. Alternatives ranged from physically deepening the existing channel to 43' to creating a regional Port at the River's mouth. A draft Environmental Impact Statement was issued for the project in October 1998.

Formal consultation is requested for the project. After evaluating the potential impacts of the project, a determination was made that the project may adversely effect but is not likely to jeopardize the continued existence of any of the listed stocks of salmon in the Columbia River.

Portions of the Channel Improvement Project may affect bird predation on juvenile salmon that is occurring in the lower river. It is anticipated that the bird predation issues will be resolved prior to the construction of the Channel Improvement Project and whatever measures are developed will be incorporated into the final design. If you need any additional information please contact Mr. Kim Larson, of my staff, at (503) 808-4776.

Sincerely,

for Howard B. Jones, P.E.
Chief, Engineering and Construction
Division

Enclosure

Biological Assessment
For
Columbia and Lower Willamette Rivers, Navigation Channel Improvement Study

Introduction

Portland District is studying the feasibility of improving the existing deep draft navigation channel in the Columbia and Lower Willamette Rivers. A detailed description of the project is provided in the recently released draft EIS (Corps of Engineers, 1998a) for the Project. The need for improvement of the navigation channel has been driven by a steady growth in waterborne commerce and the use by the industry of larger more efficient vessels to transport bulk commodities and containerized cargo, the major export tonnage shipped from the Columbia River. The increased use of deep draft vessels, have made the limitations posed by the existing channel dimensions occur with greater frequency. Ships with design drafts near or over the existing forty-foot channel depth can not fully utilize their carrying capacity. Existing channel depths also cause delays in shipping because of inadequate under keel clearance. Improving the existing channel will reduce transportation costs by allowing deep draft vessels to carry their full capacity and will also reduce delays waiting for adequate water depths.

Project Description

The study area includes the Federally authorized navigation channel which extends from RM 106.5-3.0 in the lower Columbia River and from RM 11.6 –0 in the lower Willamette River. The current channel in the Columbia River is authorized to a width of 600 feet and depth of 40 feet except for the reach from RM 106.5 to 105.5 which is maintained at a width of 500 feet and a depth of 35 feet. The channel in the Willamette River ranges from 600 to 1900 feet wide and is 40 feet deep. Maintenance of the existing channel is done using a combination of hopper, pipeline and clamshell dredges using both in-water and upland disposal sites. In-water sites include flow lane, beach nourishment and ocean sites. Flow lane sites are located in deep-water areas that are in or next to the channel margins. Beach nourishment sites are located long the shoreline in areas of active erosion. Sand is usually deposited annually at these sites to rebuilt beach areas lost during last year's high water. Ocean sites are located in the area offshore of the Columbia River in Environmental Protection Agency approved sites. Existing sites have reached capacity and a process is currently underway to identify some new sites. The area offshore has not been designated as critical habitat for listed stocks of salmonids so this process or the sites are not discussed in this BA. Maintenance of the channel usually occurs during the normal dredging season of March to October.

To improve the existing navigation channel a number of alternatives were evaluated including no action, non-structural, and structural.

No Action The no action alternative would involve not doing any improvements to the existing channel. It would remain at the current authorized depth and would be maintained using the methods described in the Dredged Material Management Plan (DMMP, Corps of Engineers, 1998b).

Non- Structural The non-structural alternative involves upgrading the existing river stage forecasting system (called *Loadmax*) to enable ships to determine navigational channel depths based on projected future and real-time tide and river stage information. The current system is not used to it's maximum because shippers feel that there are several limitations to the system. New technologies and better use of available data would allow upgrading the system to a level that would be more useful to the shippers. The benefits of upgrading this system though fairly large are still less than physically deepening the channel even to 41'. The channel depth would also be less consistent with *Loadmax* than by dredging the channel deeper.

Structural Several structural alternatives were considered including Regional Ports at Astoria, OR and at Longview, WA as well as deepening the existing channel to Portland to either 41', 42', or 43'. Deeper depths were not considered since the projects study authorization limited the evaluation to 43'

The regional port locations would both require less dredging than the full navigation channel, however, neither had the land based infrastructure for either a single stop or topping off facilities to handle the current as well as projected shipping. Construction of the necessary infrastructure would be extremely expense and have large environmental impacts, especially in the estuary. These impacts would be associated with the filling and clearing necessary to create the land area necessary to develop the facilities as well as improving transportation routes to the facilities. Most of the infrastructure needed is currently in place in at the Port's of Portland and Vancouver, consequently, the regional port alternative was not considered further.

Deepening the channel by either 41',42' or 43' were individually evaluated and it was determined that the 43' alternative had the greatest amount of net benefits while still being environmentally acceptable with appropriate mitigation. Consequently, this is the alternative that was chosen as the recommended plan and is the alternative discussed in this BA. A further discussion of the alternatives and the evaluation and selection process is given in the EIS.

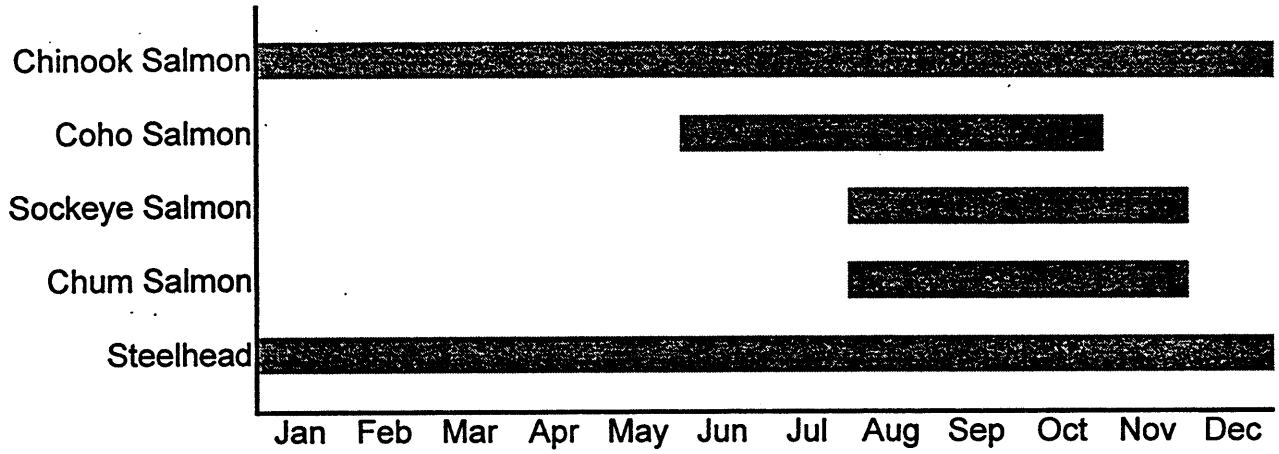
Listed Fish

There are currently six listed and six proposed for listing stocks of salmonids in the Columbia River. Listed stocks include the Snake River fall and spring/summer runs of chinook, Snake River run of sockeye, and the upper, lower Columbia and Snake river runs of steelhead, upper Columbia spring Chinook, lower Columbia and upper Willamette runs of chinook, chum below Bonneville dam, and mid-Columbia and upper Willamette runs of steelhead. Most of the runs proposed for listing are expected to be

listed during the construction or life of the project and are subsequently included in the Biological Assessment.

Adults and juveniles of both the listed and proposed runs are present in the lower river in the vicinity of the channel deepening project year around. (Figure 1). Adults use the lower river principally as a migration corridor to spawning areas in the upper basin and tributaries. They are actively migrating and normally do not spend any time in the lower river resting or feeding.

Figure 1. Run Timing of Adults of Listed and Proposed to be Listed Stocks of Salmonids in the Lower Columbia River.



Juveniles occur in the lower river during their out-migration to the ocean. Most juveniles have already become smolts (juveniles that are physiologically capable of migrating to the ocean) and are present in the lower river and estuary for only a short period of time. Studies have been done to determine the distribution of the fish in the lower river during their outmigration using hydroacoustics, a technique that uses sound waves to locate fish in the water column. Carlson (in press) indicated that most fish spent their time in the channel margins using the slope between the shallow water areas and the deeper channels as structure to orient to as they migrate downstream. He further indicated that the fish tended to move inshore when frightened rather than down into the deeper parts of the channel as was originally thought.

Juveniles that have not become smolts such as fall chinook subyearlings spend extended periods of time in the lower river and estuary, rearing. They normally remain in the lower river or estuary from late spring until fall or the following spring when they become smolts and then migrate to the ocean. They rear primarily in the shallow backwater areas where they feed on benthic invertebrates such as the amphipod *Corophium salmonids.* Juveniles are also prey for a variety of organisms include both birds and other fish species. Moralities of juveniles can be high depending on populations of predators. A large Caspian tern population that has developed on Rice Island, a dredged material

disposal island in the lower river has recently been shown to prey heavily on juvenile salmonids in the lower river. Efforts are underway to reduce this predation by these birds. Predation by other fish species such as Northern squawfish and large and smallmouth bass are also of concern especially around groins and pile dikes that may provide habitat for these species,

Impacts of the Proposed Alternative

Deepening the Columbia River navigation channel to 43' is not expected to have any greater impact to the listed and proposed stocks of salmonids than the existing maintenance dredging program for the 40' channel. Construction dredging will occur at the same shoal locations but over a larger surface area than the 40' channel. All dredging will be done at depths greater than 40 feet. Adult and juvenile salmon do not normally occur at these depths in any numbers. Recent studies using hydroacoustics have shown that the fish occur more along the channel margins and shallower slopes than at the bottom of the main channel, and therefore would be less subjected to entrainment during dredging. Studies done with the hopper dredge *Yaquina* have verified this with only two juvenile salmonids collected during 5 hours of sampling time. Samples could not be collected during actual dredging since the sediment size of the dredge material was too big to pass through the mesh of the collector. Consequently, samples were taken by running the dredge pump and skimming the draghead along the bottom. This methodology is not representative of what would actually happen during dredging and would in fact be a worse case, since fish would be more susceptible to entrainment with the draghead out of the sediment. The sampling does provide information on whether fish are in the area of the dredging and would be susceptible to being entrained. The two fish that were collected were hatchery fish that had recently been released from a lower river hatchery. Hatchery fish normally behave differently than wild fish because they are more accustom to rearing in a hatchery pond than under natural river conditions. It is unlikely that there behavior would be similar to up river fish that had been in the river for some time.

In water disposal impacts associated with construction of the channel deepening project will also be similar to that for the 40' channel maintenance dredging program. Flow lane disposal will be the principal method of in water disposal and will be done at depths below which adult and juvenile salmon normally migrate. Consequently, the impacts to the listed and proposed stocks are expected to be minimal. Material disposed of in the flow lane sites will disperse downstream in the main channel. Though the finer grain material may settle out in the shallow water areas it is not expected that the amount of material that will settle out will be large enough to have a significant impact on juvenile salmon rearing habitat downstream.

Shoreline disposal for the channel deepening project will decrease from existing practices but be slightly more than the DMMP when it is fully implemented. Two beach nourishment sites are proposed for use rather than the one proposed in the DMMP. The impacts, however, are not expected to be any more significant than the DMMP since the additional site proposed for use is highly erosive and currently does not provide any

substantial amount of juvenile salmon rearing habitat. Decreasing the number of shoreline sites that are used for beach nourishment disposal will cause the sites that are not used to erode back to the mud banks that occurred naturally in the Columbia River. this type of habitat is generally not very productive for benthic invertebrate species that are an important food source for rearing juvenile salmon. Consequently these areas may become less productive as juvenile salmon rearing areas.

Deepening of the Columbia River channel will allow ships to load to their full capacity and this will increase their outbound drafts. This increased draft could increase the wakes from the ships if they maintained the same speed. Concerns have been expressed that this increase in wake could increase erosion of shorelines and impact salmonid rearing habitat.

The amount of shoreline erosion that occurs in a given location depends upon the difference between the erosional forces such as river currents, wind waves and ship wakes and the resistant forces such as beach slope, material type, distance to the navigational channel and presence of erosion control structures. A study done on ship wake erosion in the Columbia River at Puget Island (Abbe 1990) indicated that ship wake amount to only 4-24% of the erosion that occurred at the site studied. The reason for this was that the other from of erosion, such as wind waves, are more persistent and long term than ship wakes which are more sporadic. Given this estimate of ship wake erosion, the effects from the increased draft of a projected number of ships is expected to be minimal. In addition, any impacts that may occur could be partially offset by the reduction in total numbers of ships transiting the river.

One of the ecosystem restoration projects proposed for the project is the construction of a pile dike field between Miller Sands and Pillar Rock islands to stabilize this area and create additional shallow water habitat for juvenile salmonid rearing. Construction of the pile dike field, in conjunction with dredged material disposal, would restore eroded areas from current depths of –25 to –30 feet CRD to a depth of –6 feet CRD. Benthic productivity of the shallower depths has been shown to be much higher than the deeper water areas.

It has recently become a concern, however, that pile dikes provide preaching habitat for birds that prey on juvenile salmonids. The pile dike fields also create an area where juvenile salmonids are delayed or congregate during migration, therefore making them more susceptible to predation. Preliminary information on avian predation associated with pile dikes shows that pile dikes are used by double-crested cormorants and to a lesser extent, Caspian terns, as loafing and sunning perches. They also forage downstream of the structures on ebb tides, since pile dikes slow the river's current velocity and divert flow, providing a more optimum foraging environment..

A similar pile dike field that was of concern after the avian predation study is the field located immediately upstream of Rice Island (D. Lyons, OSU, pers. comm., 1998) This field lies 1.5 miles downstream of the proposed Miller-Pillar field. This field was identified as a moderate use area for foraging double-crested cormorants and Caspian

terns. Since this field is a area similar to Miller-Pillar field, it is expected that a similar level of predation would occur at the proposed Miller-Pillar pile dike field unless a way to reduce predation was discovered.

Measures to reduce avian predation on juvenile salmonids in the Rice Island-Miller Sands Island reach of the Columbia River are still under discussion by the Avian Predation Working Group and the subject of talks between Portland District and NMFS. Initial discussions have centered upon means to preclude cormorants from the vicinity of pile dikes. These include the use of sound as a disturbance mechanism to preclude birds from an area, removal of structures to preclude nesting and/or perching, and physically altering pile dikes (i.e. perch obstacles, electric fencing) to render them unsuitable for perching by cormorants. As pile dikes are submerged during high tides/high flows, damage from drift logs and debris is likely for most features that could be attached.

Altering the nesting habitat of the double-crested cormorant colony at Rice Island does not appear to be a means to disperse the colony to other areas. Cormorants will nest in vegetation as they do at East Sand and Rice Island.

Providing shallow water habitat that would attract juvenile salmon that may be eaten by birds would not provide the benefits that were originally thought would occur. Consequently, this ecosystem restoration project is being put on hold until the methods to reduce juvenile salmon predation have been fully evaluated.

Concerns have also been expressed, recently, concerning the use of Rice Island as a disposal site. A large Caspian tern colony has developed on the island in recent years as a result of disposal practices requested by the resource agencies. Caspian terns prey heavily on juvenile salmon migrating through the estuary. Past disposal practices have allowed the development of the colony and it is now one of the largest in the world. Predation on juvenile salmon by the terns is large with estimates of 6-20 million juveniles consumed in 1998. A Corp funded interagency study is currently under way to evaluate the problem and determine potential solutions. One proposal is to relocate the colony downstream to the lower estuary where other fish species than juvenile salmon are available as food for the terns.

Rice Island remains an integral element of the disposal plan for the Channel Improvement Project. Decisions on the management of Rice Island as a disposal site will incorporate the recommendations of bird predation working group to reduce juvenile salmon predation. The attached report describes the bird predation study and the potential solutions to the predation problem.

Based on the above discussions, it has been determined that deepening the Columbia River navigation channel may effect but is not likely to jeopardize any of the listed or proposed to be listed stocks of salmonids in the Columbia River. This determination assumes that use of Rice Island as a disposal site will be done in manner to minimize the Caspian tern predation problem and that the construction of the Miller-Pillar pile dike

field will be delayed until a solution to the predation problem associated with pile dikes is developed.

Literature Cited

Abbe, T., 1990. Sediment Dynamics on the Shore Slopes of the Puget Island Reach of the Columbia River, Oregon and Washington, Masters Thesis, Portland State University, Portland, OR.

Corps of Engineers, 1998a. Draft Integrated Feasibility Report for Channel Improvements and Environmental Impact Statement, 1998. Portland District, Corps of Engineers, P.O. Box 2946, Portland, OR 97208

Corps of Engineers, 1998b. Final Dredged Material Management Plan and Supplemental Environmental Impact Statement, 1998. Portland District, Corps of Engineers, P.O. Box 2946, Portland, OR 97208

Report on Avian Predation on Juvenile Salmonids in the Columbia River Estuary at Rice Island

Avian predation on juvenile salmonids in the Columbia River estuary has become a significant issue in the last few years. Caspian terns, and to a lesser extent double-crested cormorants, have been the focus of concern as their nesting populations have increased. Nesting by Caspian terns in the Columbia River estuary was first observed in 1984 at East Sand Island. Prior to that, birds comprising the colony in the Columbia River estuary nested on islands in Willapa Bay and Grays Harbor (Roby et al., 1998). The colony moved to Rice Island in 1987 and has continued to nest there since then. The Caspian tern colony was estimated at 8,000 pairs in 1997 and 10,000 pairs in 1998 (Roby et al., 1998: Roby and Collis 1998). Double-crested cormorants nest at East Sand and Rice Island and on channel range markers. An estimated 5,271 pairs occurred in 1997 at East Sand Island; 1,221 pairs were present at Rice Island (Roby et al., 1998).

Diet of the Caspian terns nesting at Rice Island in 1998 was comprised of around 80% juvenile salmonids by number of prey items; a similar composition was determined for the 1997 nesting season (Roby et al 1998). The 1997 estimate of juvenile salmonids consumed by Caspian terns in the Columbia River estuary was 6-20 million; 1998 results are estimated to be as high or higher (Roby et al., 1998). Cormorants nesting at Rice Island consumed a much higher proportion of juvenile salmonids (~55%) than those nesting at East Sand Island (~10%) (Roby et al., 1998). Juvenile salmonid outmigrants

that pass through the estuary roughly number Approximately 50 million annually. Thus, avian predation may consume a significant proportion of the juvenile outmigrants.

The magnitude of avian predation on juvenile salmonids, coupled with the listing or proposed listing of numerous stocks of Columbia River and tributary stocks of salmonids has prompted requests from NMFS for management measures to resolve avian predation concerns. An Interagency Avian Predation Working Group was formed in May 1998 to seek resolution to these concerns. Preliminary proposals from the working group focused upon shifting the Caspian tern colony from Rice Island 15 miles downstream to East Sand Island. Shifting the tern colony to East Sand Island is intended to change the diet of the terns to other marine and estuarine fish species that are more abundant in the lower estuary, thereby reducing predation on juvenile salmon. There is a substantial difference in the percentage of juvenile salmon in the diet of cormorants nesting at East Sand Island then those nesting at Rice Island. This difference tends to support the value of this proposal.

Caspian terns forage primarily within 5 miles of the nesting colony with 90% of the birds foraging within 13 miles of the nesting colony. Shifting the colony to East Sand Island would place most tern foraging activity within the lower estuary and nearshore marine environment where food resources are abundant. Consequently, it is likely that they would move upstream to forage in the freshwater areas by Rice Island.

A combination of habitat manipulation at Rice and East Sand Island coupled with measures to attract terns to East Sand Island and dissuade them from Rice Island are contemplated. Through use of playback recordings of colony vocalizations and use of decoys, Caspian terns were attracted to and initiated nests at Miller Sands Spit in summer 1998 in a partial test of the methodology. Playbacks and the use of decoys, coupled with habitat development at East Sand Island for nesting Caspian terns, represents a means to attract and hold terns there. Terns can be dissuaded from use of Rice Island through habitat manipulation and harassment of terns from roosting/loafing at Rice Island prior to the nest initiation period.

The upstream end of East Sand Island is the logical place to develop nesting habitat for Caspian terns as it represents the location used by terns in 1984-86, contains only a small portion of the large gull colony present at East Sand, and is underlain by sand substrate. Scarification of vegetation and debris on approximately 8 acres of the upstream tip of East Sand Island will be done to expose a bare sand substrate preferred by nesting Caspian terns.

Rice Island, estimated at 228 acres, is primarily barren sand, a result of dredged material deposition. The island remains an important disposal site for material dredged from the navigation channel and will remain an important disposal component into the future. Although the Caspian tern colony has always been co-located at the western tip of the island with the double-crested cormorant and gull colonies, much of the rest of Rice Island contains what appears to be suitable nesting habitat for Caspian terns. The results from attempts to attract nesting Caspian terns to Miller Sands Spit also indicate that

suitable nesting habitat occurs at that location. Thus, habitat manipulation at Miller Sands Spit would also be necessary to discourage nesting by Caspian terns.

Habitat manipulation measures to discourage nesting by Caspian terns entail development of vegetative cover. Caspian terns prefer a barren, sandy substrate for nesting activities. Establishment of vegetative cover should thus preclude the birds from nesting at a given location. The movement of the Caspian tern colony from East Sand Island to Rice Island was probably in response to vegetative development. Dredged material disposal occurred on East Sand Island in 1983 and Caspian terns initiated nesting there in 1984. Material placed on East Sand Island originated from the Chinook Channel and contains a high percentage of silts. Vegetative development on silt soils is relatively rapid once winter rains leach the salt from the soil. The disposal site on East Sand Island currently supports a dense grass-forb community with shrub willows present on a portion of the area. Vegetative development is less dense near the outfall location for the pipeline dredge as coarser grained, sandy material settles there first. Mapping of the tern colony locations for 1984-86 provided by Collis (personal communication, 1998) indicate that the tern colony shifted locations from 1984-86 toward the outfall location which indicates vegetation was influencing their nesting location during that period. Currently, a finger of tansy ragwort and Oenothera in which the birds do not nest divides the colony at Rice Island.

Rice Island and Miller Sands Spit remain integral elements of the disposal effort for the Dredged Material Management Plan and for the Channel Improvement Study. The placement of dredged material on these islands would maintain barren habitat conditions on an annual basis without vegetative establishment efforts. It has been the concern of NMFS and other members of the Interagency Avian Predation Working Group that continued disposal without implementation of vegetation establishment would maintain the tern colony at Rice Island. In light of the estimated numbers of juvenile salmonids harvested by terns and their potential effect on listed or proposed stocks, retaining the tern colony at Rice Island was considered a potential take situation for ESA fish.

To avoid a potential take situation, the following conservation measures were proposed by Portland District.

Conservation Measure 1: Develop nesting habitat at East Sand Island for Caspian terns by scarification of vegetation to expose bare sand on approximately 8 acres at the upstream tip of the island.

Conservation Measure 2: Establish vegetative cover on dredged material disposal sites plus other unvegetated portions of Rice and Miller Sands in order to preclude nesting by Caspian terns. Establishment of vegetative cover would occur after each depositional event for the foreseeable future. Seeding operations would occur from February to March. It is proposed that winter (October - February) or spring (February - April) wheat be initially seeded on the islands. Once the wheat crop has attained a height of 6", a commercial grass seed mix would be interseeded with a spin spreader and would be protected by the wheat crop through germination and early growth. Grass would provide

long term ground cover whereas wheat would last approximately one year. Wheat can be planted 1-2" in depth and has a more robust seedling than grass, which will help still the wind at the ground surface. Thus, wind erosion is unlikely to expose the roots of the deeply planted wheat as it did to the last grass stand on Rice Island (grass is planted 0.25" in depth and has a hair-like seedling stage which does not still the wind).

Continuation of these measures, i.e. maintaining bare sand nesting habitat at East Sand Island and establishment of vegetation cover post-deposition at Rice Island and Miller Sands Spit would continue to occur through implementation and O&M of Channel Improvement features. Length of habitat management at these locations for Caspian terns is undetermined at this time but extends into the foreseeable future.

Literature Cited

Roby, D.D., D.P. Craig, K. Collis, and S.L. Adamany, 1998. Avian Predation on Juvenile Salmonids in the Lower Columbia River. 1997 Annual Report. Oregon State University, Corvallis, OR and Portland District Corps of Engineers, Portland,OR