From:	Ross Barkhurst
To:	Lubliner, Nathan (ECY)
Cc:	rone brewer; AGR MI Noxious Weeds; Commission (DFW)
Subject:	FW: latest pieces of the puzzle
Date:	Monday, February 10, 2014 3:52:34 AM

Nathan, please add this to my testimony on the draft EIS and NPDES for imazamox. Much of this is also applicable to the scoping input for imidacloprid for Willapa Bay and Gray's Harbor. The paper googled is An Analysis of the Commercial Pacific Oyster Industry in Willapa Bay, WA: Environmental History, Threatened Species, Pesticide Use, and Economics by Emily Sanford, April 2012. This is my attempt to further pull together a warning about where Ecology is proposing we might go. Things are worse than the author proposes because the white sturgeon have finished crashing now and they ate a lot more burrowing shrimp than green sturgeon did. Further attempts to spray our way out of this will add waterfowl to the chain reaction list/ death spiral if we continue to let another shellfish market shift dictate the unmitigated fate of two formerly environmentally healthy bays. The widgeon eat the japonica tops and the pintail and mallard eat its rhizomes and the fauna in it. A lot of it. The Brant eat the z marina which would perish with japonica. Imazamox will kill the grass and imidacloprid will kill the fauna. The mud flats were never bare. They used to have large oyster reefs on them. The big picture is now much more complete, thank goodness in time to start over. An eyes wide open redo is mandatory.

Ross P. Barkhurst, 151 N. Nemah Rd West, South Bend, WA 98586

From: rp.barkhurst@hotmail.com
To: nwducks@frontier.com
CC: commission@dfw.wa.gov
Subject: latest pieces of the puzzle
Date: Mon, 10 Feb 2014 05:58:32 -0500

Google Willapa River Salinity ranges. Got down to 5th item, pdf- An analysis of the commercial Pacific Oyster----.
It confirms the conclusion I was coming to about what happened to the Bone River flats. It was harrowed, as was an area off Pickernel Creek closer to home here. Knew they harrowed for eelgrass. Did not realize the extent to which they harrow to turn up shells and singles out of the mud and bust up live clusters. And to do "leveling." That is the perfect description of how Bone River flats was transformed from the largest waterfowl foraging area I knew of to a well manicured vegetation free and duck free zone in 2012 or 2011. This paper also does a fair job of describing all fauna that is killed by carbaryl, and would be by imidacloprid. In combo with the shift away from reef culture of oysters, to singles and clusters all over the bottom, burrowing shrimp have become a bigger problem, whether they increased or not. Hatchery reared smolt go quickly to sea, and both sturgeon species are in big trouble. Lack of predators. So spray is all that is left to protect scattered bottom culture of oysters. As the eelgrass is knocked back, it no longer helps suppress shrimp, etc, etc. That

before we get to spraying to maybe boost clam meat per ft squared. Even less grass, more room for shrimp to roam unmolested. Sounds like a death spiral to me, fueled by market shifts and overfishing and eelgrass reduction, with waterfowl caught in the middle.
We have the big picture here and it is not pretty. The ducks have escaped, living on japonica until now. If we do not get imazamox without limits mitigated, they are next. The headlines could be, " A Failed Unsustainable Market
Takes Two Bays With It (enabled by overly cooperative WA state agencies). This can be turned around with what I encouraged at the first "working meeting" on Japonica in Olympia with Ecology in 2011. What I encouraged was a look at cumulative effects. The death spiral above would be the poster child for cumulative effects. Not too late to turn this aircraft carrier around.

PS--note it turns out Willapa and Gray's Harbor are the only two bays in the US where carbaryl was allowed, and Ecology confirmed they would be the only place in West coast where imidacloprid would be used, now that EPA has delisted carbaryl. Amazing!
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From:	Ross Barkhurst
To:	Lubliner, Nathan (ECY)
Subject:	FW: pdf
Date:	Wednesday, February 12, 2014 3:13:59 PM
Attachments:	Untitled 2.pdf

Please consider this part of my testimony re the draft EIS and NPDES for imazamox control of zostera japonica. The pdf has my original critque of the Waterfowl Risk Assessment portion of an Environmental Risk Assessment done by Patten and Environ. Patten did the waterfowl portion. It contained some of the misleading statements which have found their way into the drafts. I pointed out several fatal flaws in the waterfowl assessment, but they still show up as justification for the claim that the same waterfowl that eat out Boundary Bay come down here and eat very little z japonica, or any thing else for that matter. The "senescing" excuse is perhaps the most egregious. WDFW surveys done after his claim show birds arriving on a schedule matching the disappearance of japonica, which I have observed for many years. It is also misleading because as you have acknowledged, japonica functions as a perennial and maintains its rhizomes until the next season. The risk assessment assumes waterfowl only eat tops. Aerial surveys by WDFW show the birds concentrated over japonica beds when they are available, as is also well documented in Baldwin and Lovvern 1994.Your own staements show it also branches all Fall. This belies any senescing claims. The beds in Cell 3 and 4 are frequented when tides are right until exhausted and then the birds leave in December. I refer you to my Noxious Weed Control Board testimony for pictures and details of this. Kham was given this critique and should have used it in critical thinking.

The assessment gives no description of how Patten's birds survive eating almost nothing during their migration stop in Willapa Bay.

From: rp.barkhurst@hotmail.com
To: cc1480@staplescopycenter.com
Subject: pdf
Date: Wed, 5 Dec 2012 17:13:38 -0500

From:	Ross Barkhurst
To:	Lubliner, Nathan (ECY)
Subject:	FW: pdf
Date:	Wednesday, February 12, 2014 3:17:21 PM
Attachments:	Untitled 2.pdf

In case pdf did not come through.

From: rp.barkhurst@hotmail.com
To: cc1480@staplescopycenter.com
Subject: pdf
Date: Wed, 5 Dec 2012 17:13:38 -0500

Questions for Dec. 6 public meeting in Raymond with WA dept. of Ecology

1.Under the proposed NPDES permit for controlling zostera japonica (duckgrass) with imazamox, what are the monitoring requirements for: impacts on waterfowl, salmonids, sturgeon, and raptors?

2.Who will do the monitoring, and who will pay for it?
3.How many acres of public tidelands are there in Willapa Bay, how many are currently leased for aquaculture, and how many acres of public tideland contain duck grass?
4.Under the precautions and limitations you plan, and under a regime of continued leasing, how much of public tideland could ultimately be defoliated? 5. Do you accept the conclusions of the Risk Assessment regarding waterfowl use of duckgrass in Willapa Bay? We have observations, numbers, and pictures showing that these conclusions fall far short. Are you interested in hearing these findings? 6. What would be the reduction in carrying capacity for waterfowl in our bay under your draft permit? 7.We feel if 6. cannot be answered in well founded manner,we cannot have an acceptable NPDES permit or EIS. Do you agree? 8. Was there test spraying or spraying of imazamox or Clear Cast on the East side of the bay during last three years? Was this in the area of the Bone River flats? Have reports been given you on all test spraying in the bay re: imazamox? Have you read them and factored them into a draft NPDES permit? Is anyone here today aware of test spraying of imazamox in the Bone River flats area? 9.Has carbaryl been sprayed on public tidelands in the last ten years? If so who gave permission for this and was there followup? Does lease spraying require permission and if so from whom? 10.Do you accept Dr. Patten's assumption that "only 2,00 to 3,000 acres of zostera japonica where it is the worst pest would be sprayed?" Do you have built in limitations that would limit the acres defoliated to these numbers? If not then this would be a meaningless statement, would it not? 11.The Shoreline Management Act requires public tidelands to be managed for the benefit of all WA citizens. What provisions of your drafts are designed to accomplish this goal and how would they achieve it? 12.In the February working meeting we suggested independent monitoring of a spraying program. It also came to light that state agencies have done no formal monitoring of the no net loss requirement placed on aquaculture in reference to zostera marina for many years. Fig 1. in a paper of May 2011 shows distribution of both kinds of eel grass where it no longer exists today. This figure comes from a paper by Dumbald and Wylie-Echeviera of 2003. Areas where zm and zj existed then were subsequently sprayed with imazapyr for spartina. a)did self-monitoring report the loss of eel grass in these areas? b)if so were corrective actions taken per WA law? c)If an NPDES permit were now issued to spray duck grass in these areas, a ratcheting effect would take place where zostera marina could never return, and two back to back spraying permits would generate a permanent loss of zostera marina , which is still prohibited. How do you plan on preventing this? How could zm ever return under such an approach? Whose responsibility is it to enforce these requirements? d)WDFW has said in testimony before the State Weed Control Board that Willapa Bay has not returned to normal following the Spartina spraying. This is readily observable. In addition to the above there are massive spartina root systems/humps where neither eel grass can currently succeed. Where have these and other lingering effects been taken into account in your draft NPDES permit? Do you see them addressed in the Risk Assessment? 13.What do duck grass rhizomes look like and what color are they? 14.Has your proposal been subjected to critical thinking outside the pro-aquaculture publicly funded community? We do not think it could survive initial contact with critical thinking. 15. Have you read the testimony before the state weed control board with regards to making zostera japonia a noxious weed, and now a noxious weed everywhere? If not why not? If so what have you taken into account from the statements by R. P. Barkhurst and Rone Brewer of Washington Waterfowl Association? Have you read the testimony this Nov. from WDFW to the state weed control board, and if so where have you factored that into your draft NPDES permit? 16. The Risk Assessment was done by a person who testified a year ago that he "could find no significant uptake of zostera japonica by waterfowl in Willapa Bay. In his

sampling he did not check content of duck gizzards. He claimed most zj is gone or senesced at the onset of the waterfowl Fall migration. In fact there were 33,000 to 94,000 ducks in Willapa Bay while the zj was disappearing this year, and they were the cause of it going away. He considers it gone when the tops are gone. In fact these birds grub out the rhizomes by the ton. We brought pictures of this today. His Risk Assessment ignores this fact of waterfowl carrying capacity, even though it has been previously well documented. Further, his sampling did not even include Dusky Canada geese or Pacific Brant both of which eat zj. The question is have you assumed these erroneous findings to be true, if not where are the conservation measures which do recognize these realities to be found? Also how could we expect self monitoring to work if conducted by personnel already on record testifying there is no problem to monitor for? 17. Do you feel it appropriate to not check gizzard content when sampling the eating habits of ducks? 18.How might you go about getting input not biased in favor of the permit requesting industry? Do you intend to pursue such input?19. Have qualified waterfowl biologists reviewed and commented on the industry sponsored risk assessment? If so may we see those comments?20. You (Ms Hamel) are a plant specialist. Dr Patten is a plant specialist. How did you get input related to animal impacts of zj elimination?
21.Do you have written analysis and opinions from qualified persons independent from the aquaculture industry on the impacts of your proposed permit? 22. Do you consider Rone Brewer and Rob Kavanaugh to be qualified reviewers of this situation? Do you plan on taking their input into account? 23. How much of an increase in wildlife burden on the food supply in Willapa Bay would it take to cause a crash in that food supply? What would be the secondary effects at that point? Are you aware that USFWS at the Willapa National Wildlife Refuge has underway a program of eliminating fresh water marshes and associated food supplies in the area? How much of a shift of waterfowl burden would it take from Willapa Bay to other marine areas to cause a crash there?

24. Has WDFW reviewed and concurred with the draft you are proposing? Has WA Dept of Natural Resources? 25.. Why has Willapa Bay been left out of Marine Spatial Planning in our state? 26. Are Ecology or WDFW feeling pressure on their budgets should they advise against this NPDES permit? 27.Are payments still being made to the shellfish industry to control spartina in Willapa Bay? Do you accept the Risk Assessment assumptions relative to waterfowl in Willapa Bay? If not, which ones need further study? Would you accept such input from Washington Waterfowl Association and Delta Waterfowl? 28.How did you take cumulative effects of imazamox spray in Willapa Bay into effect in your draft permit? Example areas of concern would be forage fish, predator fish, waterfowl feeding areas and carrying capacity, and waterfowl public and private hunting areas, waterfowl viewing areas, and food supply for raptors. 29. How did you account for impacts of fresh water elimination in Willapa Bay, Gray's Harbor, and the Nisqually Delta? 30. Every Fall, Winter, and Spring, Willapa Bay hosts hundreds of thousands of waterfowl. What do you assume they are eating? 31. What do you calculate the reduction in carrying capacity for waterfowl and salmonids to be from your proposal? 32. Does your proposal comply with the provisions of the North American Waterfowl Management Plan? Two key provisions of this plan are to manage waterfowl to meet their goals as far as numbers and to grow the number of hunters and birdwatchers. Do you feel obligated to contribute to these goals? How does the EIS or the draft NPDES permit contribute if it does?

From: Ross Barkhurst
To: Lubliner, Nathan (ECY)
Subject: Testimony re draft EIS/NPDES for imazamox on japonica
Date: Wednesday, February 12, 2014 4:11:36 PM

Your backup documents quote a claim from our Ag extension agent that waterfowl migrating through Willapa Bay only need to eat a max of 2,000 acres or less of zostera japonica here. Previously we have seen a tabletop mathematical study by him that purports to demonstrate this.

The calculations took one approach that a duck here is worth half a brant in Humboldt Bay and come up with a number not worth following further. Of course in attempting to write off duck forage mathematically it does not address Pacific Brant and that is another problem. I will proceed to the math study.

The main problem with the assumption here is that it does not incorporate a cross check with the real world, or empirical data. Before anything like this were used to justify the removal of unrestricted forage, such independent checks would be essential. This tabletop exercise cannot survive such checks, which would have been taken into account under the application of critical thinking which the proposals deserve. Some examples follow:

1. The math study leaves out all other deductions from the zj inventory other than ducks eating the tops. Other deductions in actuality include a large % broken loose in wind and waves, some % removed each year by clam bed preparation mechanically, some removed by dredging and harrowing for shellfish, some removed by clam harvest, for example. Generally the clam bed removal does and would come from shallower areas which waterfowl also prefer because of availability. Holdup tides cover much japonica during feeding hours in regular cycles during migration. As an aside, your backup literature mischaracterizes japonica tide zone occurence as lower to mid tide range. It is better described as mid to upper tide range, where it is most available, and where 2012 WDFW aerial surveys show the presence of up to 99,000 dabbling ducks for all surveys before most leave in December. Baldwin and Lovvern show 50% of tops eaten, 38% washed up on the beach, and about 12% left when optimum forage efficiency was lost for a peak of 80,000 birds. This was the conditon of 9,500 acres of japonica in Boundary Bay, B.C. after feeding by the same species of birds that frequent Willapa Bay. In addition 43% of the rhizomes were eaten there. There is no explanation as to what else these birds might eat here, nor does it show up in extension agent sample of gullets from ducks which were obviously not eating when harvested, or in the case of samples provided by this author, not properly accounted for. They were full of japonica. It is just not credible that 25% more birds stack up here over a three month period, the tops are already senesced, and they do not eat rhizomes. In reality they are refueling for the next leg of migration, and japonica is the main fuel.

(contd)

From: Ross Barkhurst
To: Lubliner, Nathan (ECY)
Subject: p 2 of Feb 12 imazamox/japonica tstimony
Date: Wednesday, February 12, 2014 5:02:38 PM

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2. The guesses as to how much japonica is in Willapa Bay are just that. Based on numbers from 2006 in the middle of a spartina spray campaign, this would not be an adequate baseline. It was one year, after some had been killed. Even so today there are areas where z marina shown in 2006 still has not returned. Some of this was around clam beds in 2006. Recovery as a clam bed by imazamox control now would ensure a net loss of marina, which is not allowed, and should not be. Some of this is in brant Spring staging areas. 'Nuff said.

3. As has been confirmed in the 2013 study by Hannum, japonica is thickest in shallower locations than marina, right where ducks are shown in the aerial surveys. This mirrors the statement in Baldwin and Lovvern, 1994, which gives a tide level above which almost no birds are eating, and below which almost all birds are eating. Having timed my hunts from my blinds to this phenomenon over a 35 years period, I can vouch for its accuracy. Some of this is on public tidelands in Willapa Bay, but afforded no more protection than private clam beds. Some applicants still imply in public that it all should be removed, and that public funds should be incorporated to do so. Subject draft documents have no provisons preventing this, or taking of marina along with it, with regular repeated spraying, permanently. A Wilson and Atkinson study on brant and z marina in Willapa Bay and Dungeness addresses how this needs to be prevented.

4. The claim that a peak of 99,000 birds in Willapa Bay would eat an order of magnitude less than a peak of 80,000 birds in Boundary Bay can be further examined with a mathematical cross-check. 12,000 acres of japonica here is 1.26 times the acres of japonica in Boundary Bay when studied. Our 96,000 birds in 2012 were 1.2 times as many as their 80,000. This is as good a correlation as we can get. Pictures I have shown of Willapa Bay in referenced State Weed Board testimony show most of it eaten in December. This is where empirical data shows the shortcomings of a table top exerise alone. It works out to .13 acres per bird, where the extension agent tabletop study would say .01 acres. This is not a safe assumption! The same birds do not come here and eat thirteen times less of their dominant forage. Cumulative effects of such removal are not addresed but obvious. Let us not allow this to go forward in this manner.

From:	Ross Barkhurst
To:	Lubliner, Nathan (ECY)
Subject:	FW: pictures of eelgrass restoration
Date:	Wednesday, February 12, 2014 5:05:50 PM
Attachments:	IMG_1863.JPG IMG_1836.JPG IMG_1851.JPG Wilson and Atkinson 1995.pdf

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Testimony re imazamox on japonica--see fourth pdf on Wilson and Atkinson

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From: jfjohannes4@msn.com
To: rp.barkhurst@hotmail.com
Subject: FW: pictures of eelgrass restoration
Date: Mon, 18 Nov 2013 14:47:54 -0800

Ross--

Have you seen the attached study by Wilson and Atkinson?

Jerry

From: JEFFREY.GAECKLE@dnr.wa.gov
To: jfjohannes4@msn.com
Subject: pictures of eelgrass restoration
Date: Mon, 18 Nov 2013 20:48:55 +0000

Jerry,
Great to speak with you today. Thanks again for the encouraging comments on our recent manuscript. We have some great hypotheses about what will happen next in Willapa as a result of spraying or controlling Z. japonica. Something is bound to happen to all of the carbon and nitrogen stored in the above- and belowground biomass. Will ulvoids become more abundant and suddenly be the next nuisance?

Anyway, here are some photos taken at the Amsterdam Bay eelgrass (Zm) transplant site on 20 Aug 2013.
1836 – photo of shallow Zm transplants
1863 – photo of the light sensor and ulvoids
1851 – photo of deep Zm transplants

I also attached the Wilson and Atkinson (1995) manuscript. The change in the brant

distribution and habitat use is supported by this manuscript – basically, the waterfowl will go where there is food. Enjoy.

Best,
Jeff

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The Condor 97:91–98
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BLACK BRANT WINTER AND SPRING-STAGING USE AT TWO WASHINGTON COASTAL AREAS IN RELATION TO EELGRASS ABUNDANCE[1]

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Abstract. We monitored numbers of Black Brant (*Branta bernicla nigricans*) in Washington from fall 1980 through spring 1992 at Willapa Bay, and from fall 1986 through spring 1993 in the Dungeness area. We estimated brant use by converting the counts into use days. Coincidentally we also monitored variations in the extent of eelgrass (*Zostera marina*) beds by remote sensing techniques. At Willapa, brant use was positively correlated with the total extent of eelgrass beds and negatively correlated with the extent of oyster beds that were located within eelgrass beds, and where eelgrass had been removed by mechanical means. A 52% decline in brant use was associated with a 22% decline in eelgrass. At Dungeness there was a significant negative trend in spring-staging brant use. Overall a 63% decline in brant use coincided with a 31% decline in eelgrass. The Dungeness eelgrass beds may have declined because of natural factors. In both areas, brant use during the spring-staging period was more related to eelgrass extent than brant use during the winter months. These results suggest that Black Brant use in coastal Washington is limited by eelgrass availability. Immatures averaged 10.4% of the population at Willapa and 9.9% at Dungeness and are amongst the lowest reported. A shortage of eelgrass during the critical spring-staging period may have led to reduced endogenous reserves and associated low reproductive success of Black Brant that staged in coastal Washington. The shortage of eelgrass may have contributed to the observed southward shift to Mexico by wintering brant.

Key words: Black Brant; eelgrass; age composition; remote sensing; oyster culture; human disturbance; Washington.

INTRODUCTION

The Black Brant (*Branta bernicla nigricans*), one of two North American brant races, typically winters and stages on the west coast of North America (Bellrose 1976). In Washington, Black Brant arrive in the fall after migrating non-stop from staging areas at Izembek Lagoon, Alaska (Dau 1992), and then spend the winter and spring in traditional coastal areas (Reed et al. 1989). There is considerable evidence that a major southward shift to Mexico in wintering quarters of Black Brant has occurred since the 1950s (Ball et al. 1989). While the reasons for this change in distribution are unknown on the Pacific coast, similar changes documented on the Atlantic coast (Erskine 1988, Kirby and Obrecht 1982) have been linked to changes in food availability. The preference and dependence of brant on eelgrass (*Zostera marina*) as a major food source are well known (Cottam et al. 1944, Charman 1977, Einarsen 1965). Because there have been no studies relating changes in brant use patterns and eelgrass abundance at key Black Brant wintering and spring-staging areas, we investigated this subject on the Washington coast.

METHODS

We studied two principal Black Brant use areas in Washington, Willapa Bay and the Dungeness Bay area. Willapa Bay (46°30′N, 124°W), on the Pacific coast of southwestern Washington, is the state's largest and most pristine bay. With a total size of 300 km^2, 66% of which are exposed intertidal flats at low tide, the bay has extensive beds of eelgrass and supports large numbers of wintering waterfowl. Many of the bay's intertidal areas are under intensive aquaculture use by numerous oyster companies. Willapa Bay was open to brant hunting for 18 days during the fall of 1980 and 1981, for five days during the fall of 1989 and 1990, and for 11 days in the fall of

[1] Received 22 April 1994. Accepted 23 August 1994.

1991. Hunting pressure during these periods was low, and only rarely did we witness any associated disturbance to the birds.

The Dungeness Bay area (48°10′N, 123°09′W), on the shore of Juan de Fuca Strait on the northern Olympic peninsula, extends from the base of Dungeness Spit east-southeast to Grays Marsh. Approximately 28 km^2 in size, about half the area is exposed intertidal flats at low tide. The area supports numerous eelgrass beds and a relatively small oyster industry. Brant hunting was not allowed during this study. The brant at Dungeness, however, were subjected to more human disturbance than the birds at Willapa, primarily due to the area's high recreational use and more developed shoreline.

We collected data on brant use by counting the birds from observation points (Willapa $n = 10$, Dungeness $n = 5$), located along the shorelines of the study areas. Surveys were conducted from late October 1980 through early May 1992 at Willapa Bay, and from late October 1986 through May 1993 at Dungeness. The 1985/1986 and 1990/1991 survey years were excluded from the Willapa data set because too few surveys were conducted for assessing brant use. The average number of surveys each survey year at Willapa was 18 (Range = 15–26), and at Dungeness was 19 (Range = 14–22). Observations from 1980/1981–1982/1983 were made with a Bausch and Lomb SR60 spotting scope equipped with a 20× eyepiece, while all subsequent observations were made with Questar Field Model spotting scopes equipped with 16 mm and 24 mm (magnification 50×–130×) eye pieces. Because considerably more brant were seen with the Questar scope, it was necessary to adjust the previous brant estimates for comparisons. During the 1983/1984 survey year we obtained 67 duplicate counts using both scopes. By tallying the birds counted with each scope over the survey year, we determined that on average we saw 1.692 more brant with the Questar scope than with the Bausch and Lomb scope. We therefore corrected earlier counts by multiplying them by 1.692. We estimated brant use days (UD) by multiplying the counts by the number of days before the next census, and by tallying the results over time. Thus, brant UD are essentially a histogram approximation of the area under the curve obtained by plotting census counts over time. To assess the reproductive success of brant using the two areas, we determined the percentage of immatures during January and February. Immatures (<12 months) are easily distinguished from older birds by the presence of white-edged greater and middle wing coverts (Bellrose 1976).

We employed remote sensing to determine the extent of the eelgrass beds within the two study areas. Because of the large size of Willapa Bay, an eelgrass sample area was selected, based on knowledge of eelgrass distribution and brant use patterns. The area selected extends from Goulter's Slough, on the Long Beach Peninsula, south to Long Island's Jensen Point, with its easterly boundary being a line running north from Long Island's most northerly point. This area covers approximately 44 km^2 (15%) of Willapa Bay. An examination of 1974 aerial photographs suggested that this area contained approximately 40% of the bay's eelgrass beds. Four of the 10 brant observation points covered this area. The entire Dungeness Bay area was surveyed for eelgrass. Remote sensing involved photographing the eelgrass beds (Holz 1973, Kelly 1978) during July or August at low tide when there was little or no surface wind and when the horizontal sun angle was between 30° and 50°. A 23 × 23 cm aerial mapping-camera and regular color film was used. The scale of the photos was 1:24,000 at Willapa, and 1:18,000 at Dungeness. Eelgrass beds were photographed at Willapa in 1981, 1982, 1984, 1989, and 1991, and at Dungeness in 1987 and 1993 by the Washington Department of Transportation photogrammetry branch. To assure reliable identification of eelgrass beds, numerous sites at Willapa were visited at low tide each survey year. During 1982 and 1991, we also checked the beds from a Cessna 172 at low level with the photos in hand. Because the Dungeness beds were considerably more fragmented, the entire area was checked at low tide with the photos in hand from a Hughes 500D helicopter at an altitude of 10–300 m. Because of the high quality of the aerial photographs, we estimated the potential error in the size of the eelgrass beds at <5%. We distinguished between dense beds (>75% coverage) and patchy beds (<75% coverage). At Willapa, we were also able to identify and measure oyster beds located within eelgrass beds. The eelgrass beds were in stark contrast to the square shapes of the oyster beds, where eelgrass had been removed by mechanical means. Maps were later prepared from the photos and accompanying notes, and the total extent of eelgrass calculated with a polar planimeter.

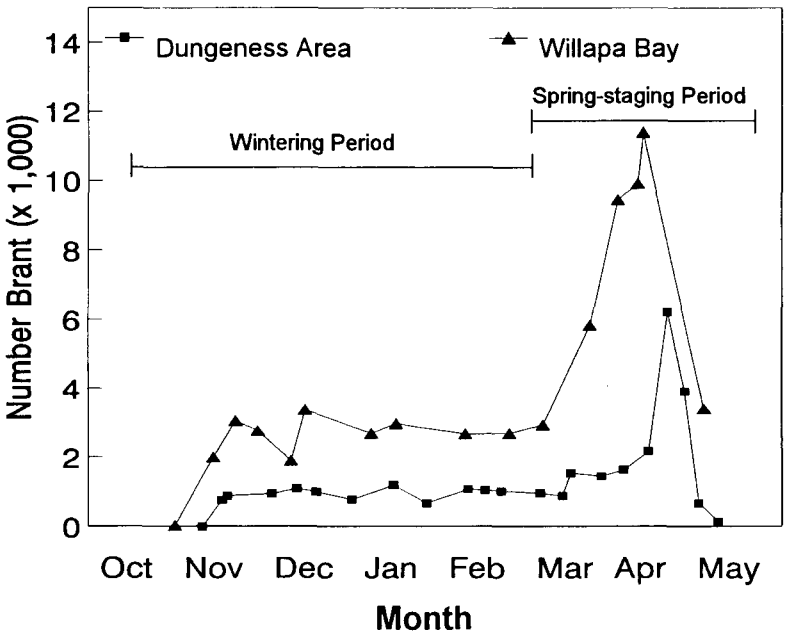

FIGURE 1. Typical Black Brant use pattern at Willapa Bay and the Dungeness Bay area, Washington (data are from the 1989/1990 season).

RESULTS

Brant arrived between late October and mid November, and numbers usually remained relatively constant through February (Fig. 1). During March, the numbers began to increase gradually with the arrival of north-bound migrants. Peak numbers during staging typically occurred during the last week of April, and by mid May only a few stragglers remained in the area. We named October through February the "wintering period," and March through May the "spring-staging period."

Black Brant use at Willapa Bay varied considerably over the study period (Fig. 2). Peak total UD occurred during the 1981/1982 season (874,226 UD), then declined until 1984/1985 (415,621 UD). Beginning in 1985/1986 brant use increased again to 771,715 UD in 1989/1990. Brant use during the spring-staging period followed the same pattern, and accounted for the majority of UD in seven out of the 10 years studied. However, brant use during the wintering period varied less between years. Over the entire period there was no significant trend with time in total UD, spring-staging UD, or wintering UD (Spearman rank correlation, $n = 10$: $r_s = -0.006$, $P > 0.5$; $r_s = -0.176$, $P > 0.5$; $r_s = -0.091$, $P > 0.5$, respectively).

The Pacific flyway brant population index varied irregularly between 103,153–194,197 birds during 1981–1992 (U.S. Fish and Wildlife Service unpubl. data). There was no significant correlation between these estimates and Willapa's total UD, spring-staging UD, and wintering UD (Spearman rank correlation, $n = 10$: $r_s = 0.273$, $P > 0.2$; $r_s = -0.042$, $P > 0.5$; $r_s = 0.333$, $P > 0.2$, respectively).

The total extent of eelgrass at Willapa varied in a fashion to that of total UD and spring-staging UD (Fig. 2). During 1981–1984, eelgrass beds declined from 1,383 ha, to 1,081 ha, and then increased again to 1,372 ha in 1989. The extent of dense beds varied similarly, and accounted for most of the beds (Fig. 2). Patchy beds at Willapa were located around the edges of dense beds, and their total extent varied approximately inversely with the extent of the dense beds. Oyster beds, located within eelgrass beds, varied between 233 and 69 ha during the five years examined (Fig. 2). Oyster beds were negatively correlated with the extent of total and dense eelgrass beds (Spearman rank correlation, $n = 5$: $r_s = -0.900$, $P = 0.05$; $r_s = -0.900$, $P = 0.05$, respectively), and

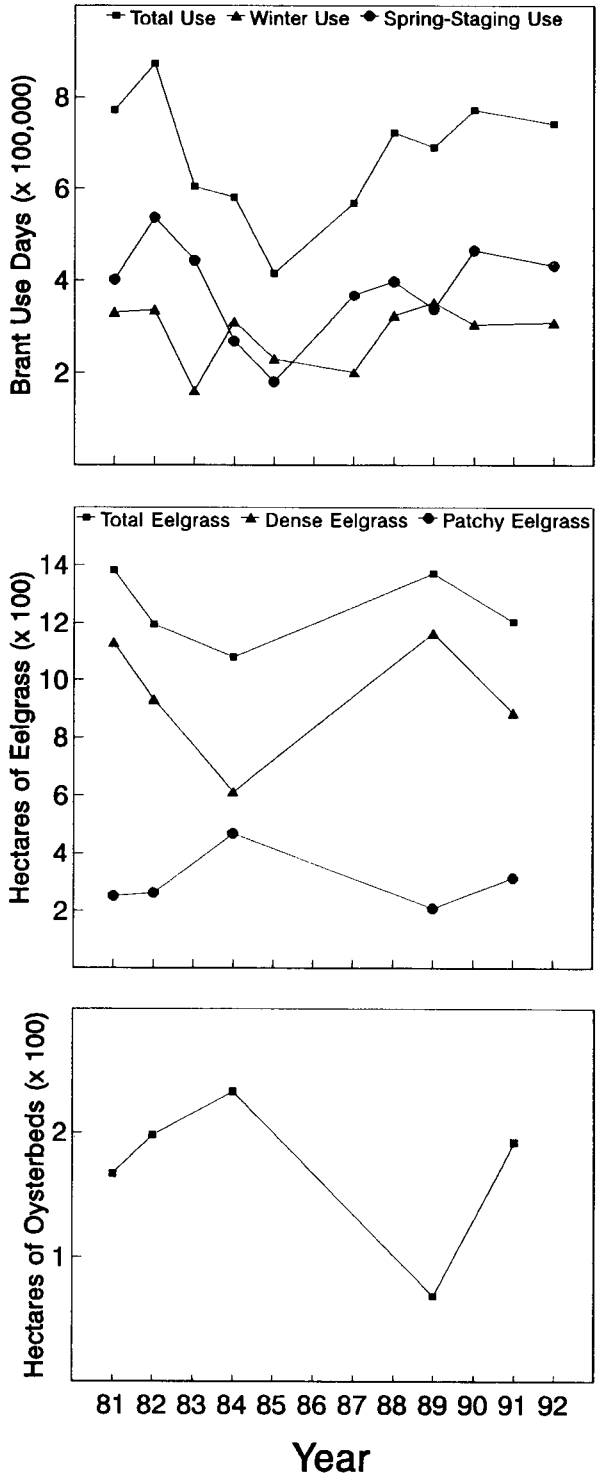

FIGURE 2. (Top) Black Brant total, winter and spring-staging use days at Willapa Bay, Washington, 1980/1981–1991/1992. (Middle) Extent of total, dense and patchy eelgrass beds at Willapa Bay, Washington, 1981–1991. (Bottom) Extent of oyster beds, within eelgrass beds at Willapa Bay, Washington, 1981–1991.

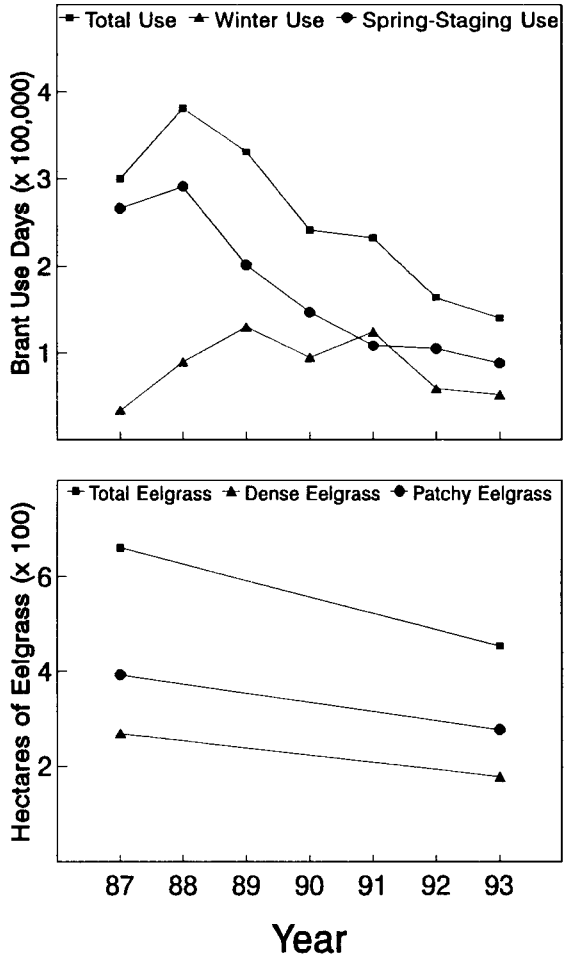

FIGURE 3. (Top) Black Brant total, winter and spring-staging use days at the Dungeness Bay area, Washington, 1986/1987–1992/1993. (Bottom) Extent of total, dense and patchy eelgrass beds at the Dungeness Bay area, Washington, 1987 vs. 1993.

positively correlated with the extent of patchy beds (Spearman rank correlation, $n = 5$, $r_s = 0.900$, $P = 0.05$).

At Willapa, Black Brant total UD were positively correlated with the total extent of eelgrass beds (Spearman rank correlation, $n = 5$, $r_s = 1.000$, $P = 0.01$), and negatively correlated with the extent of oysterbeds (Spearman rank correlation, $n = 5$, $r_s = -0.900$, $P = 0.05$). Black Brant spring-staging UD were also positively correlated with the extent of total and dense eelgrass beds (Spearman rank correlation, $n = 5$: $r_s = 0.900$, $P = 0.05$; and $r_s = 0.900$, $P = 0.05$, respectively). On the other hand, wintering UD were not significantly correlated with the extent of eelgrass. Overall, a 52% decline in brant UD coincided with a 22% decline in the area of eelgrass beds.

At Dungeness, Black Brant total UD declined from a peak of 381,148 in 1987/1988 to 139,898 in 1992/1993 (Fig. 3). Spring-staging UD followed the same pattern and accounted for most of the use except during 1990/1991. Similar to Willapa, brant UD during the winter varied less between years. There was a significant negative trend in time of total UD and spring staging UD (Spearman rank correlation, $n = 7$: $r_s = -0.893$, $P < 0.05$; $r_s = -0.964$, $P < 0.025$, respectively). There was no significant correlation between the Pacific flyway population index and Dungeness' total UD, spring-staging UD, and wintering UD (Spearman rank correlation, $n = 7$: $r_s = 0.429$, $P > 0.2$; $r_s = 0.286$, $P > 0.5$; $r_s = 0.679$, $P > 0.1$, respectively). During the study period, the total extent of eelgrass at Dungeness declined from

TABLE 1. Comparisons of Black Brant age composition counts, Willapa Bay and Dungeness Area, Washington vs. Izembek Lagoon, Alaska, 1983/1984–1992/1993.

Year	Willapa Bay % Immatures (*n*)	Dungeness Area % Immatures (*n*)	Izembek Lagoon* % Immatures (*n*)
1983/1984	14.5 (1,148)	–	24.0 (8,096)
1984/1985	8.8 (2,856)	–	13.7 (10,950)
1986/1987	8.8 (2,111)	5.2 (1,222)	15.3 (18,444)
1987/1988	16.4 (1,193)	16.6 (1,846)	31.2 (25,293)
1988/1989	13.6 (1,351)	16.8 (1,677)	19.2 (19,985)
1989/1990	8.2 (1,070)	9.4 (2,463)	23.9 (17,935)
1990/1991	3.4 (684)	4.2 (2,101)	19.2 (29,965)
1991/1992	9.6 (1,315)	11.9 (1,036)	27.8 (43,559)
1992/1993	–	5.2 (885)	16.5 (66,839)

* Data supplied by Izembek National Wildlife Refuge, Alaska.

660 to 454 ha (Fig. 3). Both dense and patchy beds declined although, in contrast to Willapa, patchy beds accounted for most of the observed eelgrass. At Dungeness, there were no signs of oyster culture disturbance to the beds. Overall, a 63% decline in brant use coincided with a 31% decline in the area of eelgrass beds.

Immature brant varied between 5.4 and 16.4% of the population at Willapa, and 4.2 and 16.8% at Dungeness (Table 1). The counts of both areas were correlated (Spearman rank correlation, $n = 6$, $r_s = 0.886$, $P = 0.025$), and were not significantly different (Mann Whitney U-test: $U = 15$, $P > 0.2$), suggesting the same stocks of Black Brant used both areas. There was no significant correlation between percent immatures at Izembek Lagoon, Alaska, and those at Willapa and Dungeness (Spearman rank correlation: $n = 8$, $r_s = 0.578$, $P > 0.05$; $n = 7$, $r_s = 0.564$, $P > 0.1$, respectively). The percent immatures of the Willapa and Dungeness brant populations were significantly below those of Izembek Lagoon (Mann Whitney U-test: $U = 60.5$, $P < 0.001$; $U = 38$, $P < 0.01$, respectively).

DISCUSSION

Results at both Willapa and Dungeness indicate that in Washington Black Brant use is limited by the extent of eelgrass beds. Because >90% of the beds were accessible to brant at low tide, the extent of the beds presumably determined how much eelgrass was available to the birds. While this study represents the first quantitative assessment of the effect of eelgrass on the distribution of Black Brant outside the breeding season, the brant/eelgrass relationship has been reported previously (North America: Bellrose 1976, Cottam et al. 1944, Moffitt 1941; Europe: Charman 1977, Jepsen 1984, Ogilvie and Matthews 1969, Prokosch 1984). Madsen (1989) and Summers (1990) also demonstrated that variations in salt marsh vegetation and beds of green algae were responsible for seasonal variations in brant numbers.

The positive correlation of spring-staging brant UD with the extent of eelgrass beds, and the lack of correlation between winter UD and eelgrass indicate that the demands on eelgrass are greatest during spring. Because brant use during spring-staging accounts for the majority of brant UD during most years, a positive correlation between total brant UD and eelgrass extent was also realized in the Willapa data set. During spring-staging, brant increase their food intake considerably in order to build up energy reserves important for migration and breeding success during the coming summer (Boudewin 1984, Bruns and Thoren 1988, Prokosch 1984, Vangilder et al. 1986). Large flocks of arriving spring migrants rapidly deplete *Zostera* stocks (also observed by Goss-Custard and Charman 1976), that may already have been reduced by the grazing of wintering brant and other waterfowl, or that have suffered from the impacts of winter storms. Thus, on the Washington coast, brant use during the winter period appears to be less limited by eelgrass extent than during the critical spring-staging period.

The negative correlations at Willapa between brant use and extent of oyster beds, and between the sizes of oyster beds and extent of eelgrass beds, emphasize the adverse impact the oyster industry has on brant, and may explain why a 22% decline in eelgrass coincided with a dispro-

portionate 52% decline in brant use. Within the Willapa eelgrass study area oyster beds were usually located in the shallower areas of the eelgrass beds. These areas are critical to brant because they are most frequently exposed at low tides.

At Dungeness a 31% decline in eelgrass coincided with a 63% decline in brant use. While the reasons for this decline in *Zostera* are unknown, the fragmented nature of the beds indicate possible damage by winter storms. The Dungeness area is located along the southern shore of Juan de Fuca Strait, and thus is exposed to large storm waves. These waves are most damaging to *Zostera* beds located in the more shallow intertidal flats, which, because of their more frequent exposure during low tides, are also the most important brant feeding areas.

Other factors that may have influenced brant use on the Washington coast include flyway-wide population fluctuations, periods of low breeding success, and human disturbance. The lack of correlation between the Pacific flyway population index and brant use at Willapa and Dungeness however, points to a more local cause. This is also supported by the significant difference and lack of correlation in the percent immatures, between Izembek Lagoon, Alaska, and the two Washington areas. Since hunting at Willapa only occurred at a low level in the fall of some years, and at Dungeness was absent, it is unlikely that the observed brant use patterns were influenced by it. Other types of human disturbances were rare at Willapa, but were more frequent at Dungeness.

The percent immatures averaged 10.4% at Willapa and 9.9% at Dungeness, and were considerably below the 21.2% average determined at Izembek Lagoon during the same time span. The estimates for the Washington coast are also lower than those reported in the literature. For the Pacific coast, Jones (1970) gave a range of 18–40% (average 24.7%), while averages for Atlantic brant were 39% (Bellrose 1976), and 26% (Kirby et al. 1985). Studies from Europe also indicate higher proportions of immatures. Madsen (1984) gave an average of 15%, Ogilvie and Matthews (1969) an average of 22%, and the considerable data base of Prokosch (1984) an average of 21% (range 0–52%). While brant populations with few immatures are frequently associated with problems on the breeding grounds (Anthony et al. 1991, Barry 1962, Bellrose 1976), the quality of the wintering and spring-staging areas also influences brant breeding success. Ebbinge et al. (1982) found brant that were heavier on the spring feeding grounds in Europe had a greater probability of returning with offspring the following fall, and Teunissen et al. (1985) showed that pairs that used plots enhanced in biomass and protein content in spring were accompanied by more young in autumn. The *Zostera* stocks of Willapa Bay and the Dungeness area may be so limiting as to adversely affect the breeding success of brant that winter and stage on the Washington coast. If this were the case when eelgrass declined in Washington, brant may have been forced to shift their wintering quarters to Mexico where eelgrass may be more available. The Pacific coast situation may be similar to the Atlantic coast where brant apparently changed their migration patterns in response to changes in availability and distribution of food resources (Erskine 1988, Smith et al. 1985).

The historical brant use of the two study areas was undoubtedly much higher. The numbers of brant counted during mid-winter waterfowl surveys in Washington during the past averaged 23,393 birds during 1936–1960, 19,513 birds during 1961–1970, 8,779 birds during 1971–1980, and 11,708 brant during 1981–1990 (U.S. Fish and Wildlife Service, unpublished data). If Washington Black Brant are currently limited by the extent of *Zostera* stocks, then eelgrass abundance was likely much higher in the past, in order to have supported their numbers. Phillips (1984) mentioned dredging and filling as the most severe negative human impacts on eelgrass, but also stated that sedimentation and turbidity brought about by logging are major limiting factors of eelgrass growth. The watersheds of Willapa and Dungeness have been extensively clearcut, perhaps explaining vast areas that are devoid of eelgrass at Willapa, and the unusually patchy and fragmented nature of the beds at Dungeness.

Data on the historical extent of eelgrass are virtually nonexistent, and current monitoring and conservation efforts are inadequate. As Kelly (1978) pointed out, we need a better understanding of the ecology of eelgrass, which requires knowledge of its distributional patterns. Since transplanting of eelgrass is not feasible on a large scale (Phillips 1984), we need to better protect our remaining eelgrass beds from the ever-increasing industrial demands on coastal and estuarine environments. To what degree Black Brant will be part of Washington's coastal avi-

fauna in the future may well depend on the success of resource managers in conserving *Zostera* stocks adequate for the birds' support.

ACKNOWLEDGMENTS

We wish to thank Jim Bartonek for supplying the historical mid-winter waterfowl data, Chris Dau for providing age composition data for Alaska, Don Kraege for information on hunting seasons, and Giesela Sommer for sharing her 1991 Willapa Bay age composition counts. The helpful comments of Jim Bartonek, A. J. Erskine, Louise Vicencio, Sandy Wilbur and one anonymous reviewer are appreciated. Special thanks also to Mike McMinn for assisting with computer graphics, and to Refuge Managers Bill Hesselbart, Jim Hidy, Jack Kincheloe and Joe Welch for their support.

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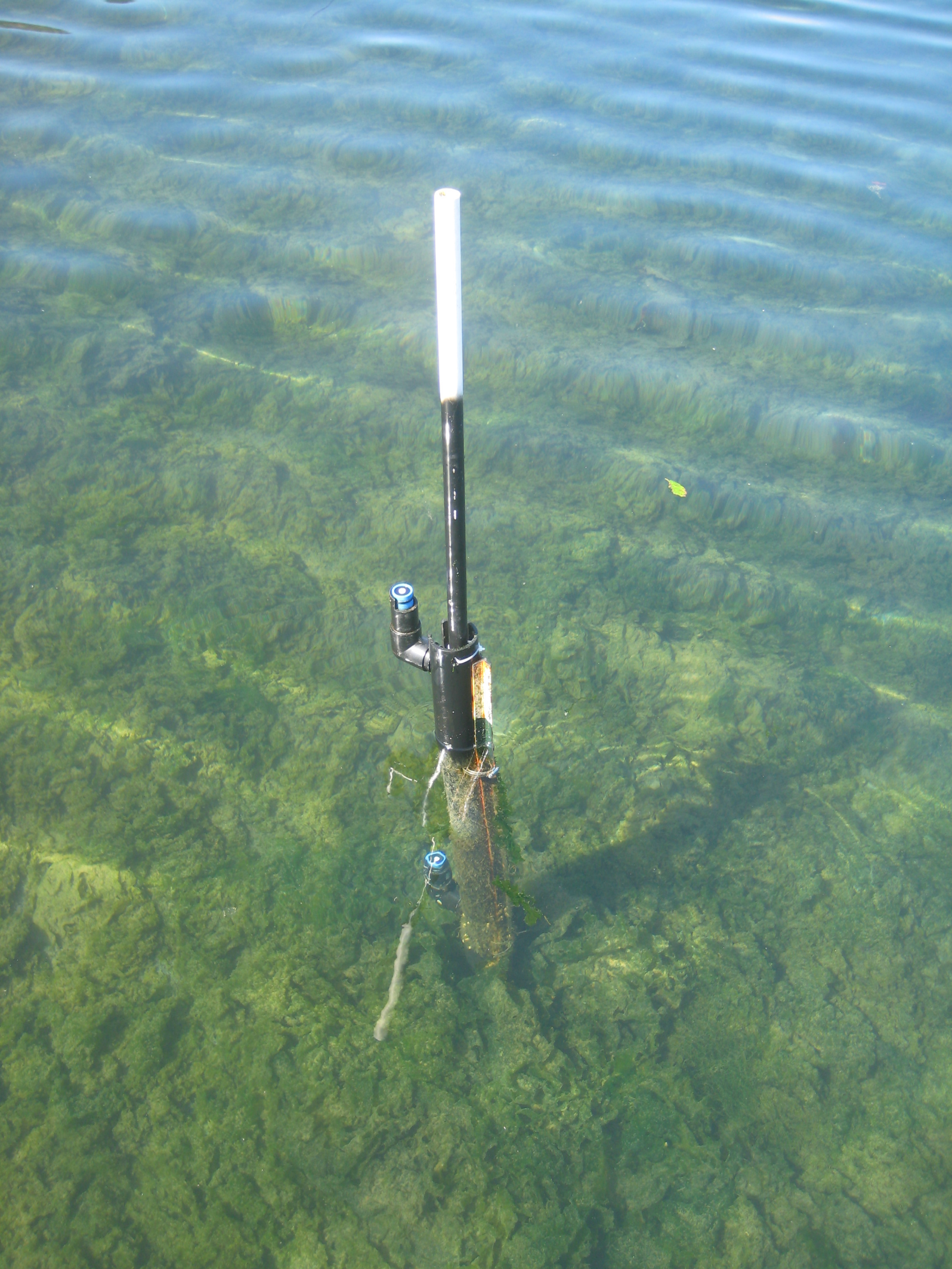

From: Ross Barkhurst
To: Lubliner, Nathan (ECY)
Subject: FW: Willapa Waterfowl Data
Date: Wednesday, February 12, 2014 5:11:58 PM
Attachments: Willapa Bay Waterfowl Survey Results_2012.pdf

The final showed this to be accurate as duck numbers actually went up a bit. It shows the birds over their food, and japonica beds run through it. Next pdf will show the match with 2006 eelgrass maps. Have seen no re-look of the whole bay since then, but brant wintering areas shown are right on top of mixed beds shown by overlaying these figures.

From: nwducks@frontier.com
To: rp.barkhurst@hotmail.com
Subject: Willapa Waterfowl Data
Date: Mon, 28 Jan 2013 16:37:03 -0800

Ross,

This is draft data and we have not met to determine how WDFW would like to use them…so please keep to yourself for now. I have a meeting with WDFW on the 6th to discuss these data and how best to use them.

Not sure about letter to DNR. How much land do they have that could be leased for commercial shellfish?

You know…if the land can be leased for commercial shellfish growing, I wonder if we could lease it for hunting access?

Rone

Washington Waterfowl Association - NW
Habitat, Hunting, Legislation, Legal, Research – Heritage
NWDucks@frontier.com
206.595.7481

From: Hoenes, Brock D(DFW) [mailto:Brock.Hoenes@dfw.wa.gov]
Sent: Friday, January 25, 2013 2:13 PM
To: nwducks@frontier.com; Kraege, Don (DFW); Cope, Mick (DFW); Michaelis, Warren A (DFW)
Cc: Skriletz, Jeffrey K (DFW); Schirato, Greg (DFW)
Subject: RE:

All,

I was able to get most of the survey data summarized from this year's effort and thought I would go ahead and pass it along so we can discuss at our meeting on the 6th. Joe Evenson was the second observer during the October 1 survey and he still hasn't sent us his transcribed data. If the same trend that occurred during all other flights holds, his numbers should increase October 1 estimates by 20–30%. If by chance I get that data before our meeting and have the time, I will update the numbers and send out a new copy.

There is no text with the attached, just tables and figures. But, I think that alone does a good job of telling the story. Because general text that describes methodology is lacking I would prefer this document not be widely distributed.

Thanks and see everyone on the 6th.

Brock Hoenes
District Wildlife Biologist
Pacific and Grays Harbor Counties
Washington Department of Fish and Wildlife
48 Devonshire Road
Montesano, WA 98563
Phone: (360)-249-4628 ext. 238
Email: Brock.Hoenes@dfw.wa.gov
Fax: (360)-249-1229

From: Hoenes, Brock D(DFW)
Sent: Tuesday, January 15, 2013 8:24 AM
To: 'nwducks@frontier.com'; Kraege, Don (DFW); Cope, Mick (DFW); Michaelis, Warren A (DFW)
Cc: Skriletz, Jeffrey K (DFW)
Subject: RE:

We will be in Room 635 of the NRB for our meeting on February 6th, from 1–3.

Thanks to everyone for being so flexible on this.

Brock Hoenes
District Wildlife Biologist
Pacific and Grays Harbor Counties
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48 Devonshire Road
Montesano, WA 98563
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Fax: (360)-249-1229

From: Hoenes, Brock D(DFW)
Sent: Monday, January 14, 2013 3:55 PM
To: 'nwducks@frontier.com'; Kraege, Don (DFW); Cope, Mick (DFW); Michaelis, Warren A (DFW)
Cc: Skriletz, Jeffrey K (DFW)
Subject:

Okay, I have spoken with everyone and our meeting is going to be changed to Wednesday, February 6th from 1–3 in the NRB. I will send out another email after finding a room.

Thanks,

Brock Hoenes
District Wildlife Biologist
Pacific and Grays Harbor Counties
Washington Department of Fish and Wildlife
48 Devonshire Road
Montesano, WA 98563
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Email: Brock.Hoenes@dfw.wa.gov
Fax: (360)-249-1229

*****Note: Data from the October 1 survey is incomplete and does not include data collected by the second observer. Once the second observer data is added values are expected to increase by 20–30%.*****

Table 1. The number of dabbling ducks (dabbler), divers, Canada geese, and black brant observed during Willapa Bay aerial waterfowl surveys, October 2012–January 2013. Results are presented by species and survey date.

	Survey Date				
Species	**October 1**	**October 18**	**November 2**	**November 16**	**January 13**
Mallard	4,097	4,578	9,806	9,221	2,645
American Wigeon	19,701	50,606	65,502	42,007	614
Northern Pintail	3,052	11,893	16,177	18,936	636
Teal	5,854	7,584	3,239	1,373	146
Gadwall	9	100	2	4	36
Northern Shoveler	0	0	0	0	133
Unknown Dabbler	7,202	18,917	4,271	3,100	668
Total Dabbler	**39,915**	**93,687**	**98,997**	**74,641**	**4,878**
Scaup	0	30	73	40	36
Bufflehead	0	0	269	643	833
Common Goldeneye	0	0	0	3	71
Unknown Goldeneye	0	0	0	0	53
Redhead	0	0	0	0	33
Canvasback	0	0	0	0	0
Ring-neck Duck	0	0	0	0	45
Unknown Diver	0	0	7	60	61
Total Diver	**0**	**30**	**349**	**749**	**1,132**
Canada Goose	637	782	954	1,730	1,627
Black Brant	0	0	23	80	439

Table 2. The number of dabbling ducks observed in each survey block during Willapa Bay waterfowl surveys that were completed October 2012–January 2013. Also included is the long-term monthly mean (Mean) as estimated from historical survey data collected from 1980–2002 (see Table 3).

	October			November			January	
Block	**Oct. 1**	**Oct. 18**	**Mean**	**Nov. 2**	**Nov. 16**	**Mean**	**Jan. 13**	**Mean**
Cell 1	4,196	17,547	23,912	23,359	16,764	17,181	766	1,862
Cell 2	0	8,545	6,675	7,506	7,598	6,355	205	371
Cell 3	32,375	30,271	10,762	27,424	21,952	8,667	1,495	1,855
Cell 4	3,237	37,134	13,854	40,683	20,614	11,839	2,326	1,724
Peninsula	107	190	196	25	7,713	283	86	165
Total	39,915	93,687	55,302	98,997	74,641	44,230	4,878	5,962

Table 3. The number of dabbling ducks observed during historical Willapa Bay waterfowl surveys, 1980–2002. Data is presented by month, year, and cell. 1 = cell 1, 2 = cell 2, etc., P = Peninsula Lakes, and Tot = Willapa Bay Total.

	October						November						December						January					
Year	**1**	**2**	**3**	**4**	**P**	**Tot**	**1**	**2**	**3**	**4**	**P**	**Tot**	**1**	**2**	**3**	**4**	**P**	**Tot**	**1**	**2**	**3**	**4**	**P**	**Tot**
1980	..	..	..	..	..	..	47060	18282	16705	33086	..	**115133**	8090	1698	19223	7165	..	**36176**	..	..	..	..	..	..
1981	14714	6872	12485	13040	..	47111	1540	549	1836	4682	..	8607	2044	974	2615	3576	..	9209	3545	541	3166	1287	..	8539
1982	19105	100	5768	5850	..	30823	8188	7990	4232	8315	..	28725	..	..	..	..	..	..	1348	420	2705	4225	155	8853
1983	31333	15845	17233	37485	..	**101901**	2633	349	2059	1247	..	6288	..	..	..	..	..	..	853	319	2096	97	..	3365
1984	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	297	192	1479	298	15	2281
1985	14226	1704	8084	6348	195	30557	13442	3265	1534	11332	10	29583	4174	1010	10123	3595	7	18909	1201	327	1,017	1101	66	3712
1986	15749	1972	10299	8516	4	36540	23750	6261	10471	13,225	395	54102	3262	492	8396	2176	40	13771	2169	331	1,880	559	50	4989
1987	30828	5041	15971	5216	..	57056	41849	5029	14552	18515	80	**80025**	1133	608	4383	2933	198	9255	1159	207	2603	1535	5	5509
1988	27339	4200	8050	23337	..	**62926**	6841	5531	13195	11,378	73	37018	1270	475	5837	3656	5	11243	505	125	839	929	35	2433
1989	19598	6595	5999	20126	..	52318	..	..	..	..	..	..	7844	3816	7646	5557	30	**24893**	106	168	317	1551	35	2177
1990	13180	4950	8388	7737	65	34320	6204	10360	7889	5,688	59	30200	1706	765	1506	955	125	5057	490	117	1629	930	74	3240
1991	25693	3624	10935	19562	224	**60038**	20234	9379	9737	14,209	794	54353	1628	728	5078	5066	178	12678	3471	1987	2751	1661	339	**10209**
1992	15592	1355	6679	4628	328	28582	17197	4174	6718	8,635	634	37358	858	611	2,930	3493	334	8226	665	480	666	1329	231	3371
1993	28280	7142	10197	9251	..	54870	17228	5,090	15077	11,759	218	49372	..	..	..	..	..	..	1027	425	1620	1463	114	4649
1994	34279	2748	20057	13464	553	**71101**	..	..	..	..	..	..	..	..	..	..	..	..	1702	256	1034	3670	187	6849
1995	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2199	787	3261	2754	620	9621
1996	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	139	54	260	61	63	577
1997	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	430	70	1438	251	423	2612
1998	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	732	7	1004	979	325	3047
1999	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	886	210	1897	1626	299	4918
2000	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	716	30	704	509	19	1978
2001	44857	31300	10529	19393	0	**106079**	..	..	..	..	..	..	..	..	..	..	..	..	12310	184	4802	7757	158	**25211**
2002	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5014	925	3647	3346	94	**13026**
Mean	**23912**	**6675**	**10762**	**13854**	**196**	**55302**	**17181**	**6355**	**8667**	**11839**	**283**	**44230**	**3201**	**1118**	**6774**	**3817**	**115**	**14942**	**1862**	**371**	**1855**	**1724**	**165**	**5962**

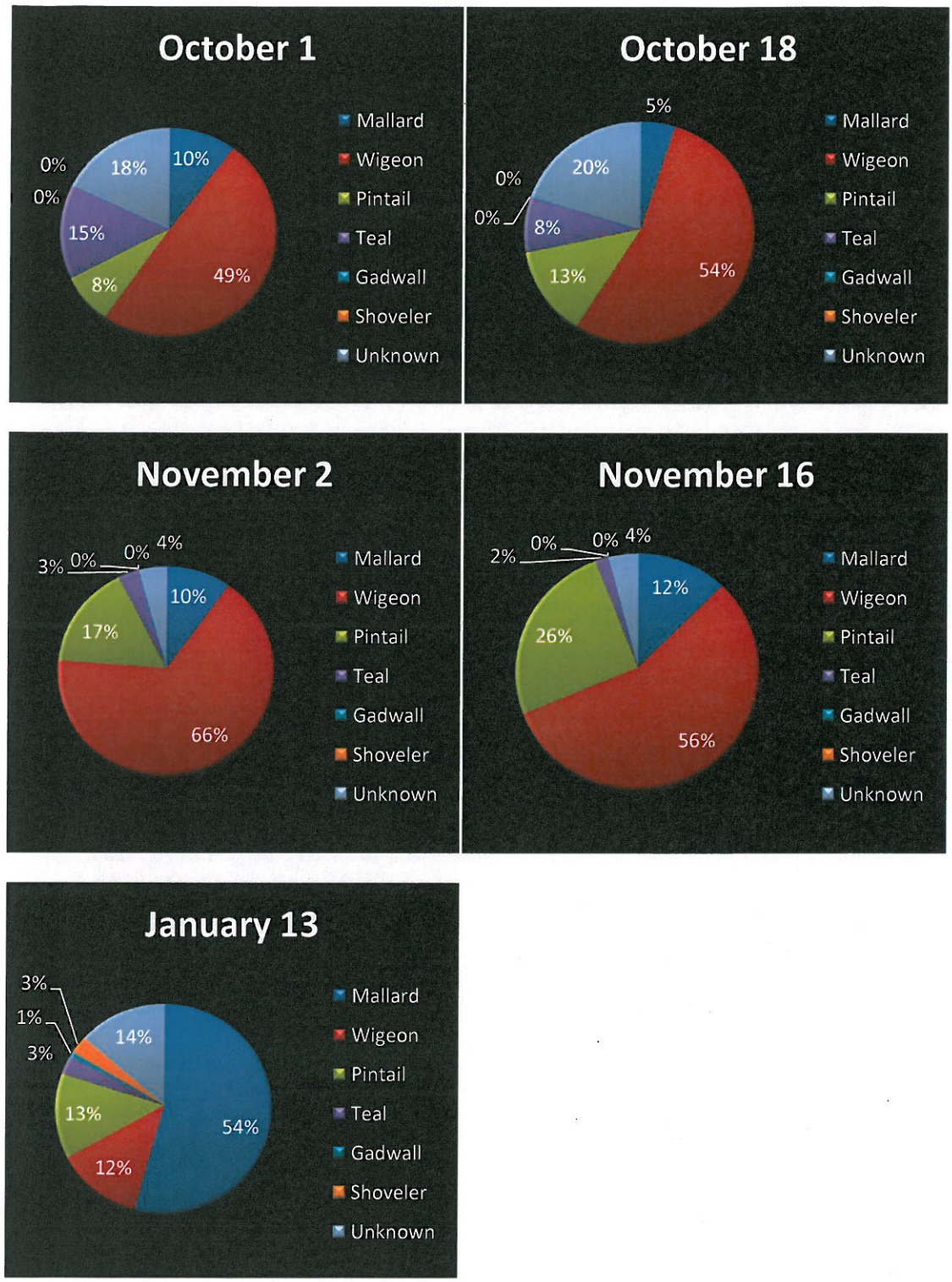


Figure 1. Species composition of dabbling ducks observed during Willapa Bay waterfowl survey flights, October 2012–January 2013.

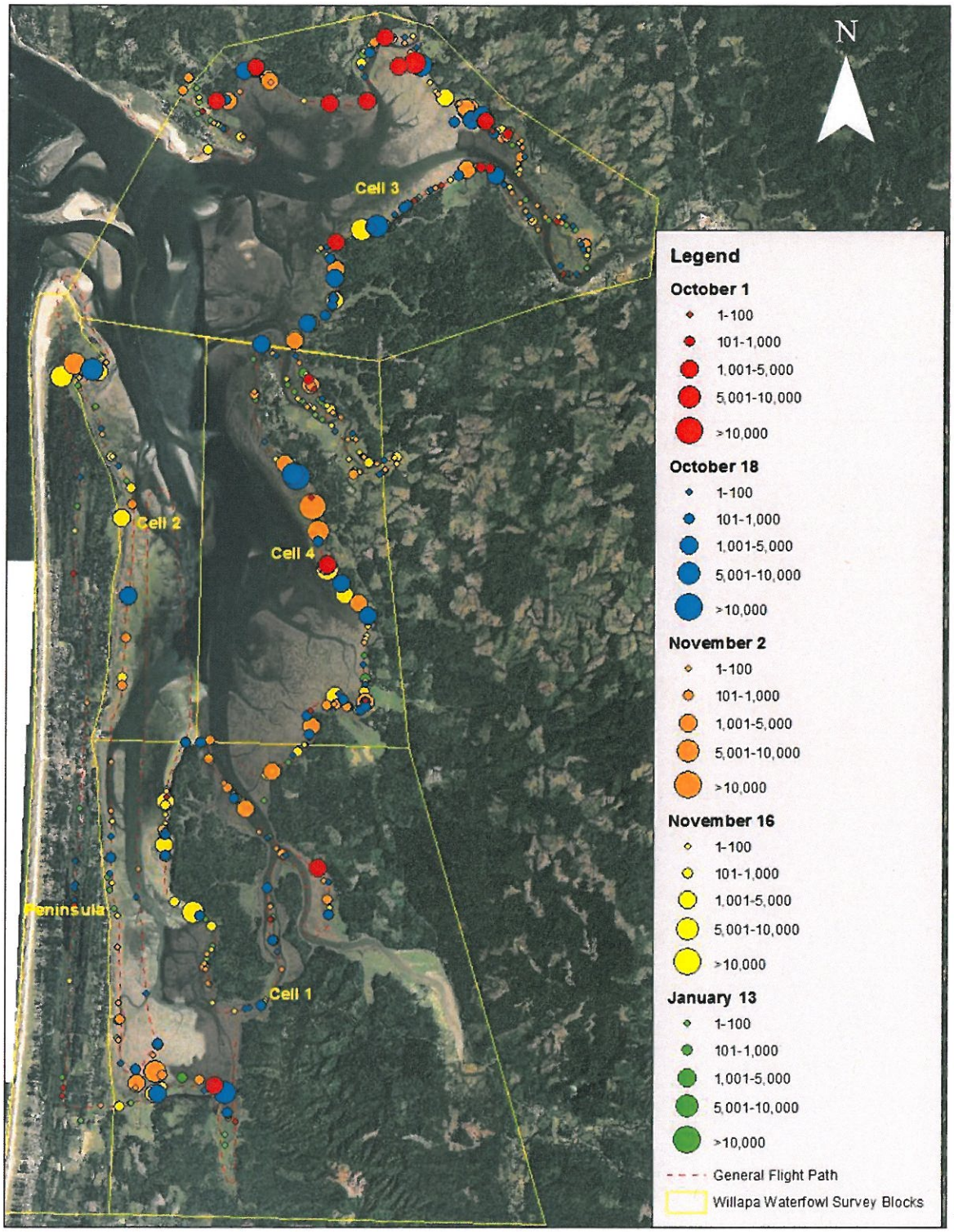


Figure 2. Image depicting the distribution and size of dabbling duck flocks observed during Willapa Bay aerial waterfowl surveys, October 2012–January 2013. Also included is the general flight path and boundaries of historical USFWS survey cells.

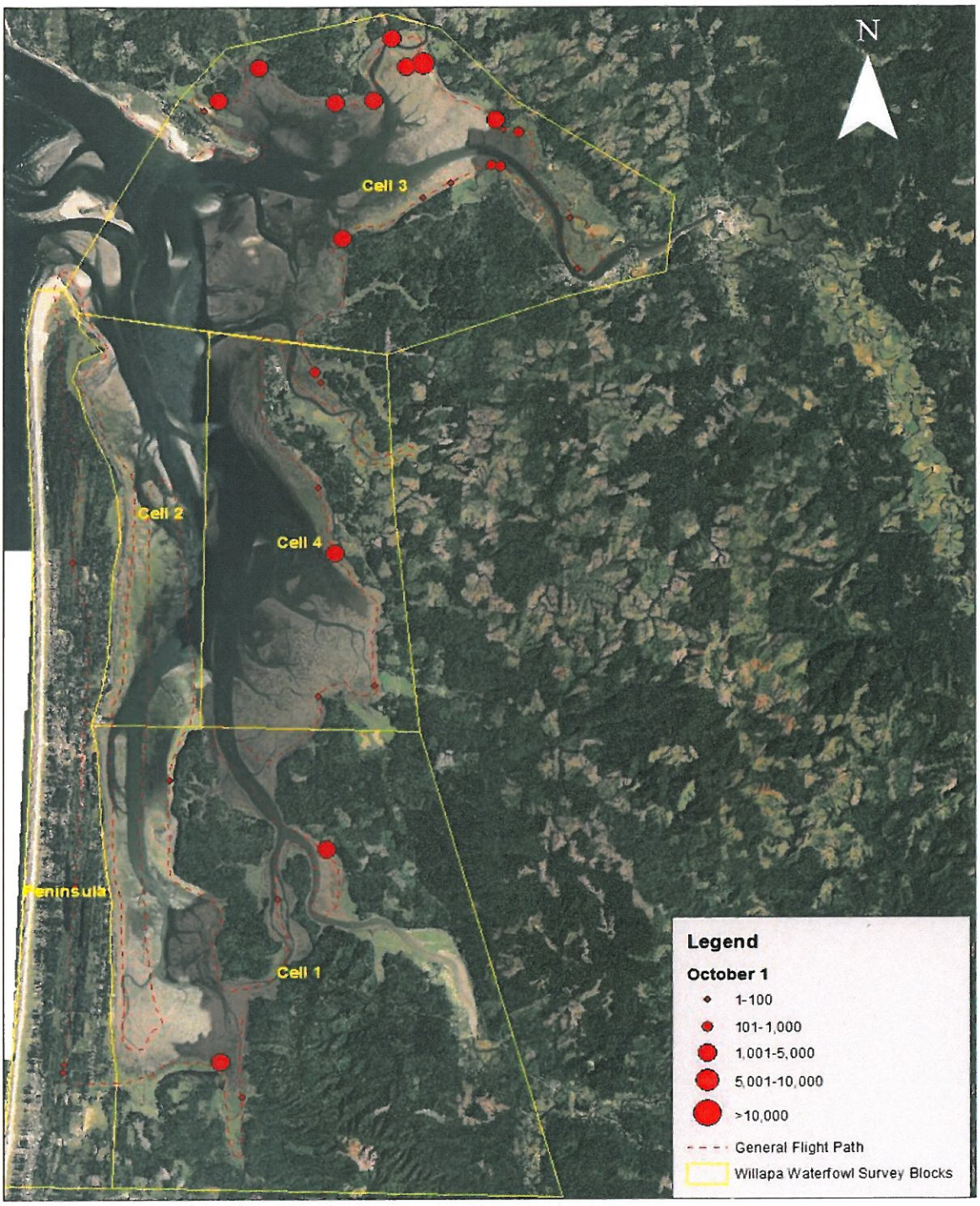


Figure 3. Image depicting the distribution and size of dabbling duck flocks observed during Willapa Bay aerial waterfowl surveys that occurred on October 1, 2012. Also included is the general flight path and boundaries of historical USFWS survey cells.

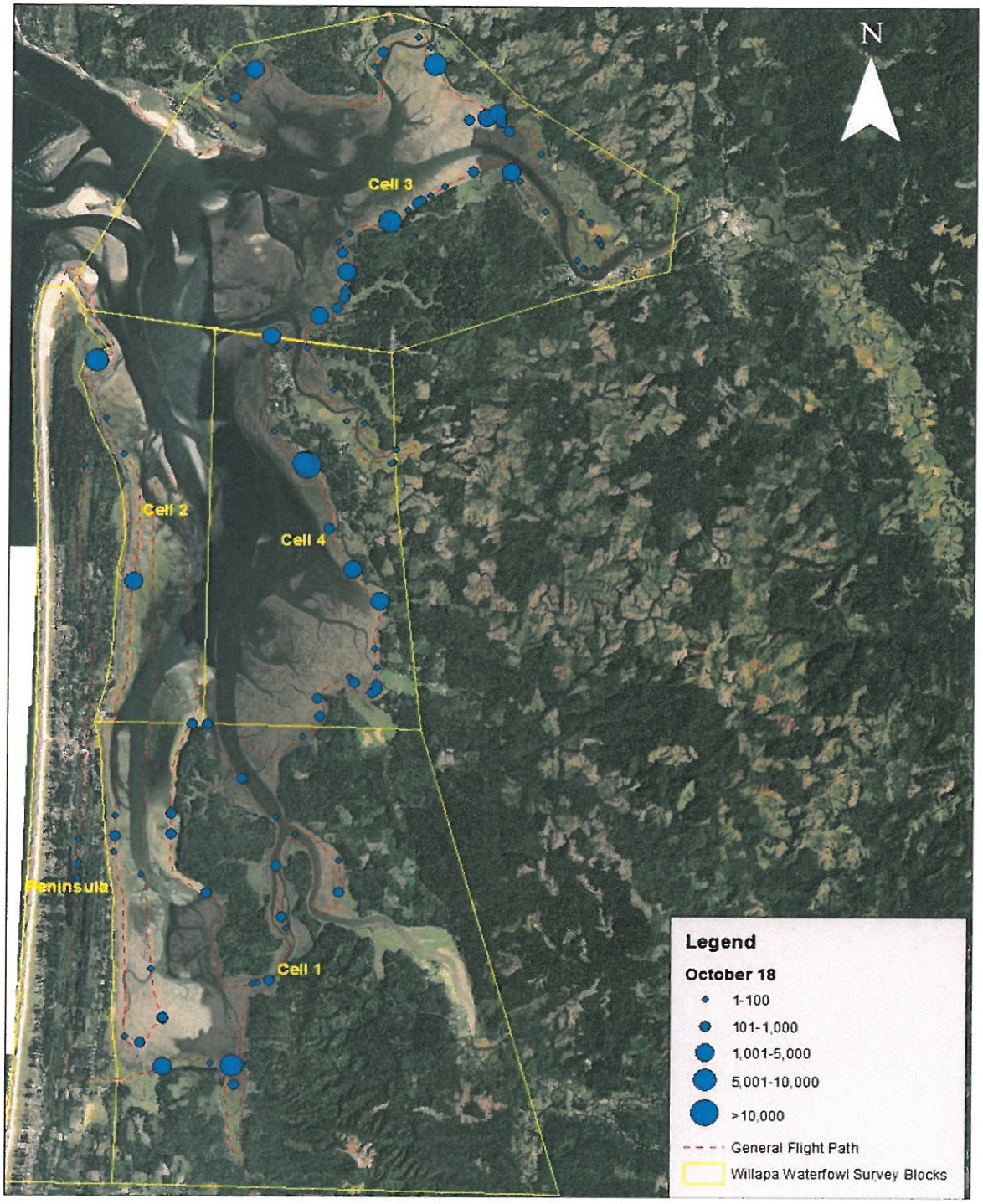


Figure 4. Image depicting the distribution and size of dabbling duck flocks observed during Willapa Bay aerial waterfowl surveys that occurred on October 18, 2012. Also included is the general flight path and boundaries of historical USFWS survey cells.

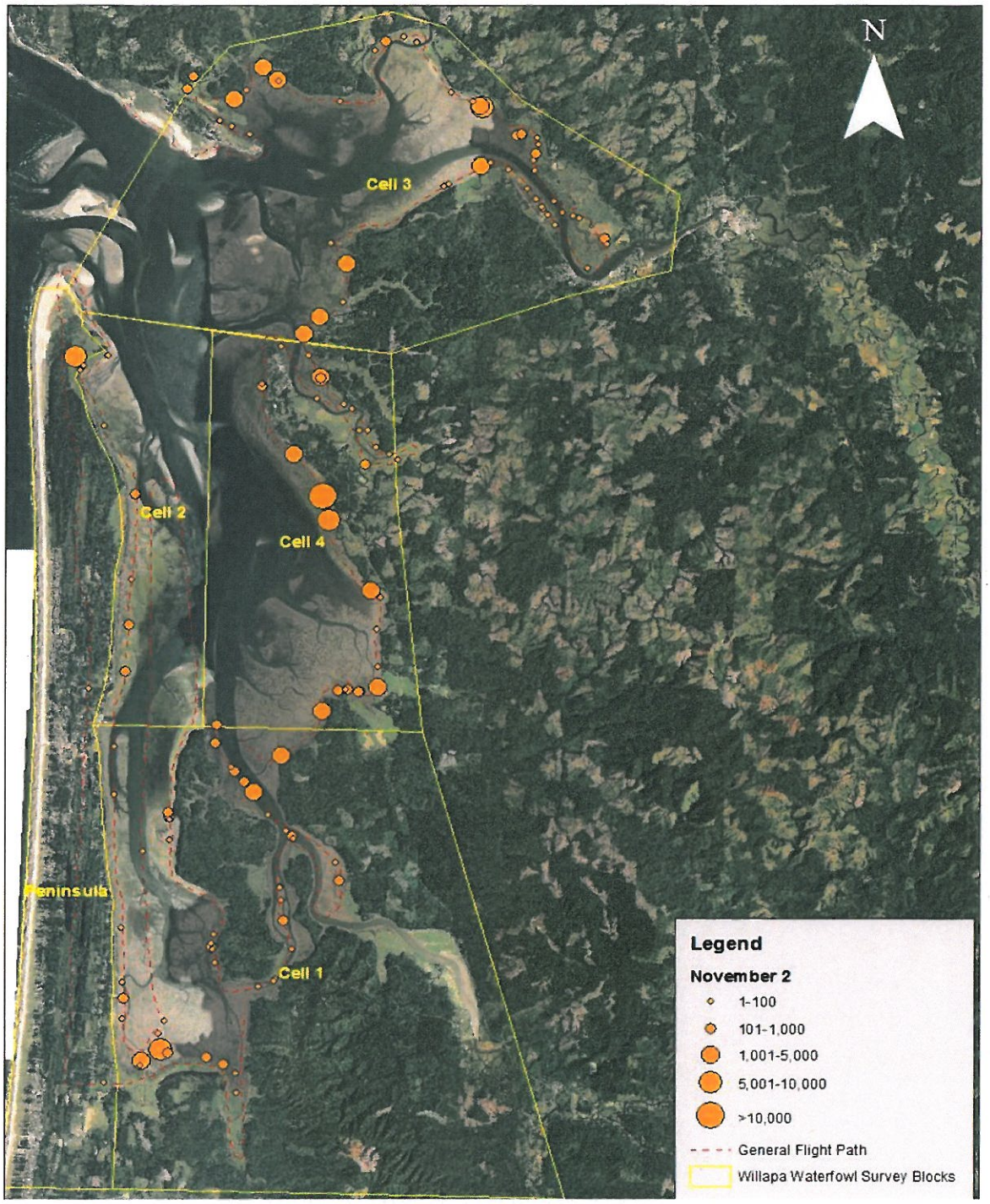


Figure 5. Image depicting the distribution and size of dabbling duck flocks observed during Willapa Bay aerial waterfowl surveys that occurred on November 2, 20112. Also included is the general flight path and boundaries of historical USFWS survey cells.

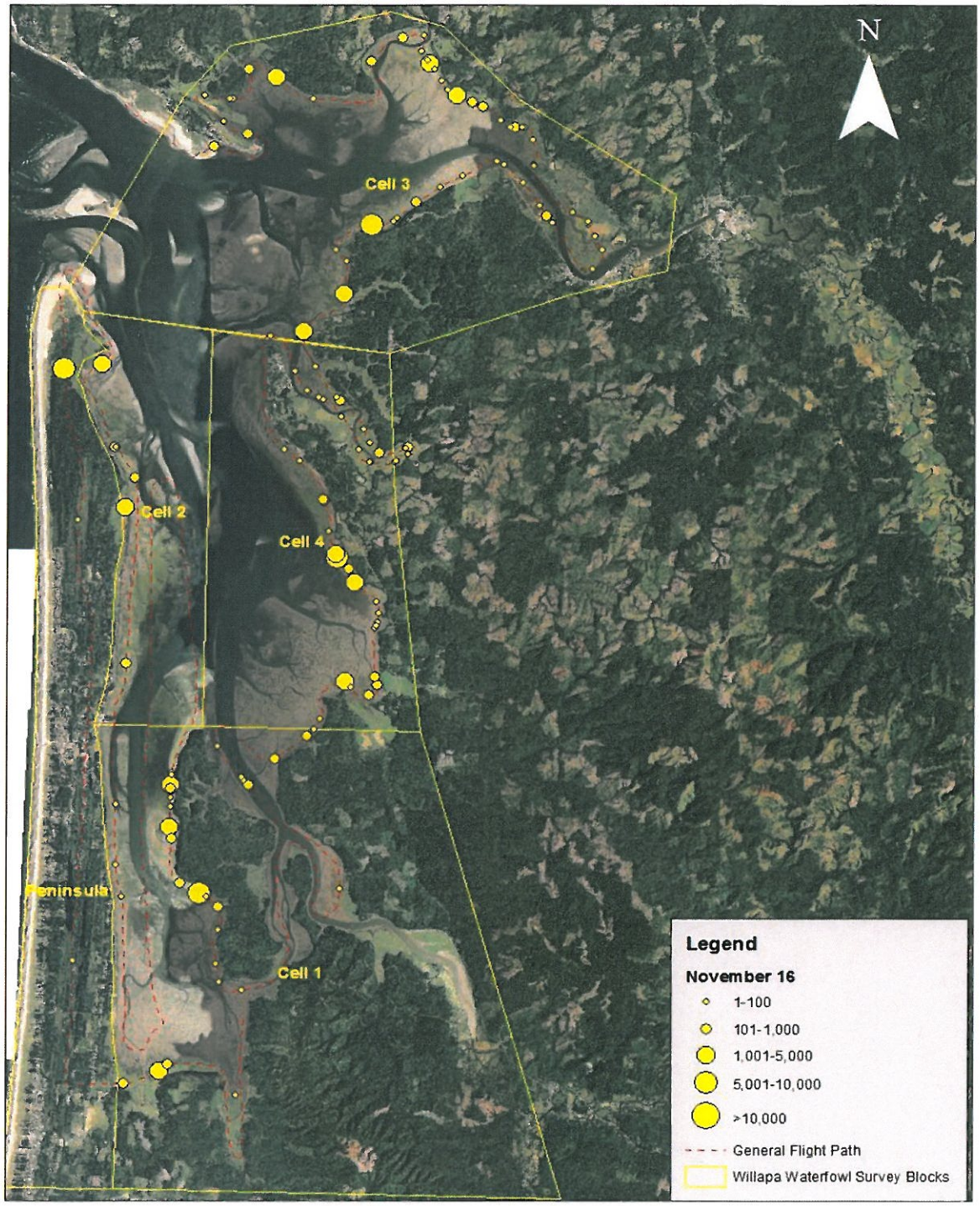


Figure 6. Image depicting the distribution and size of dabbling duck flocks observed during Willapa Bay aerial waterfowl surveys that occurred on November 16, 2012. Also included is the general flight path and boundaries of historical USFWS survey cells.

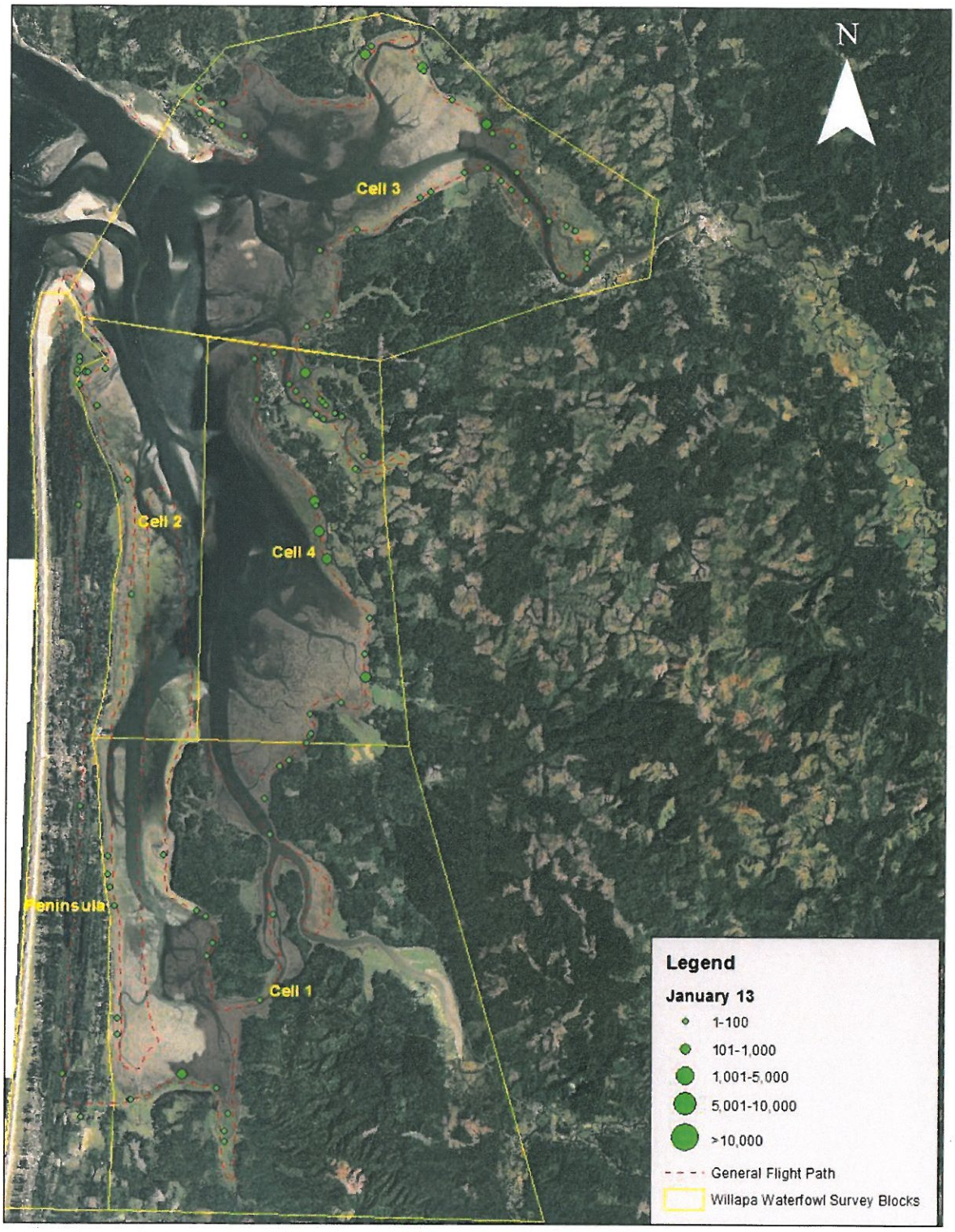


Figure 7. Image depicting the distribution and size of dabbling duck flocks observed during Willapa Bay aerial waterfowl surveys that occurred on January 13, 2012. Also included is the general flight path and boundaries of historical USFWS survey cells.

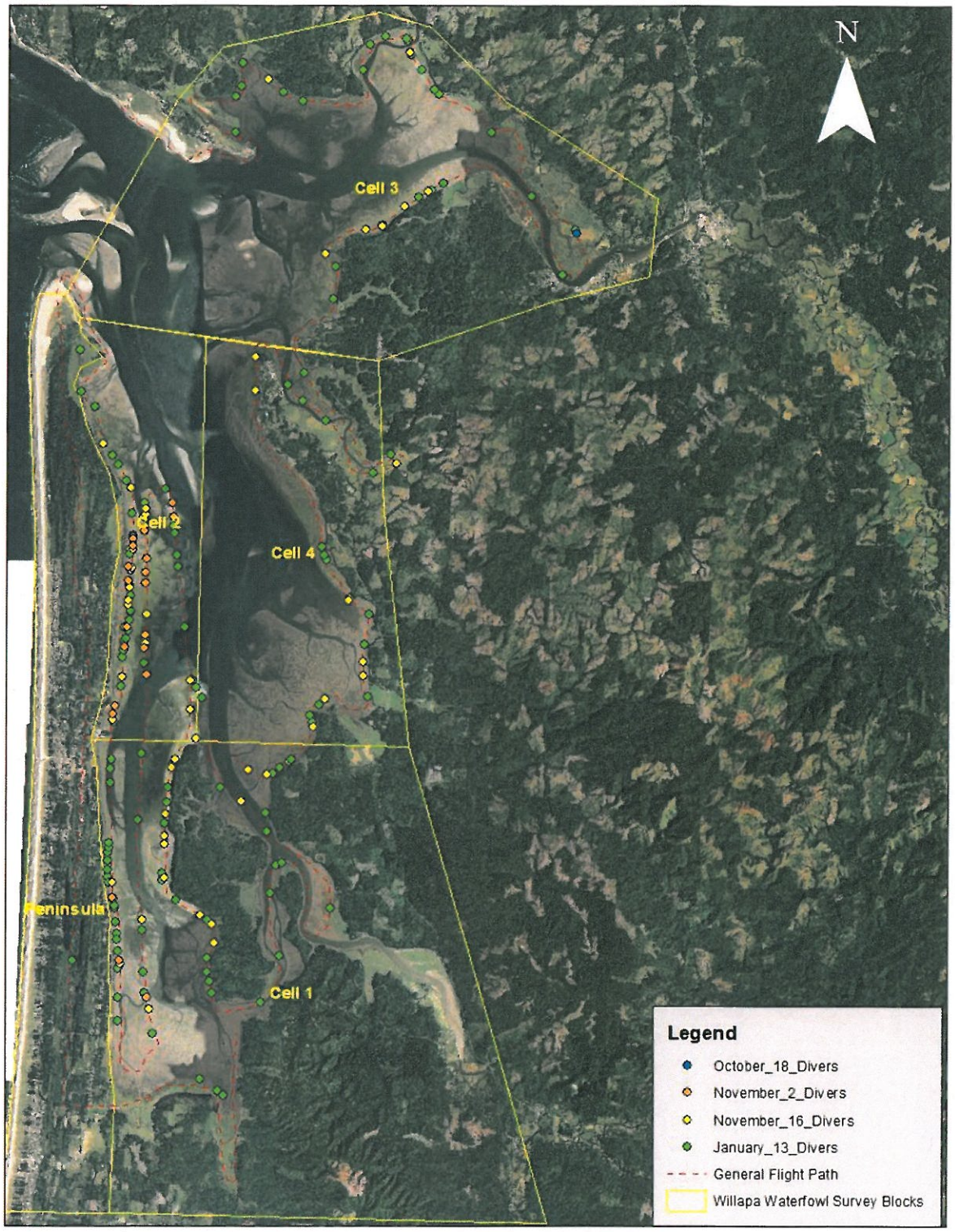


Figure 8. Image depicting the distribution and size of diver flocks observed during Willapa Bay aerial waterfowl surveys, October 2012–January 2013. Also included is the general flight path and boundaries of historical USFWS survey cells.

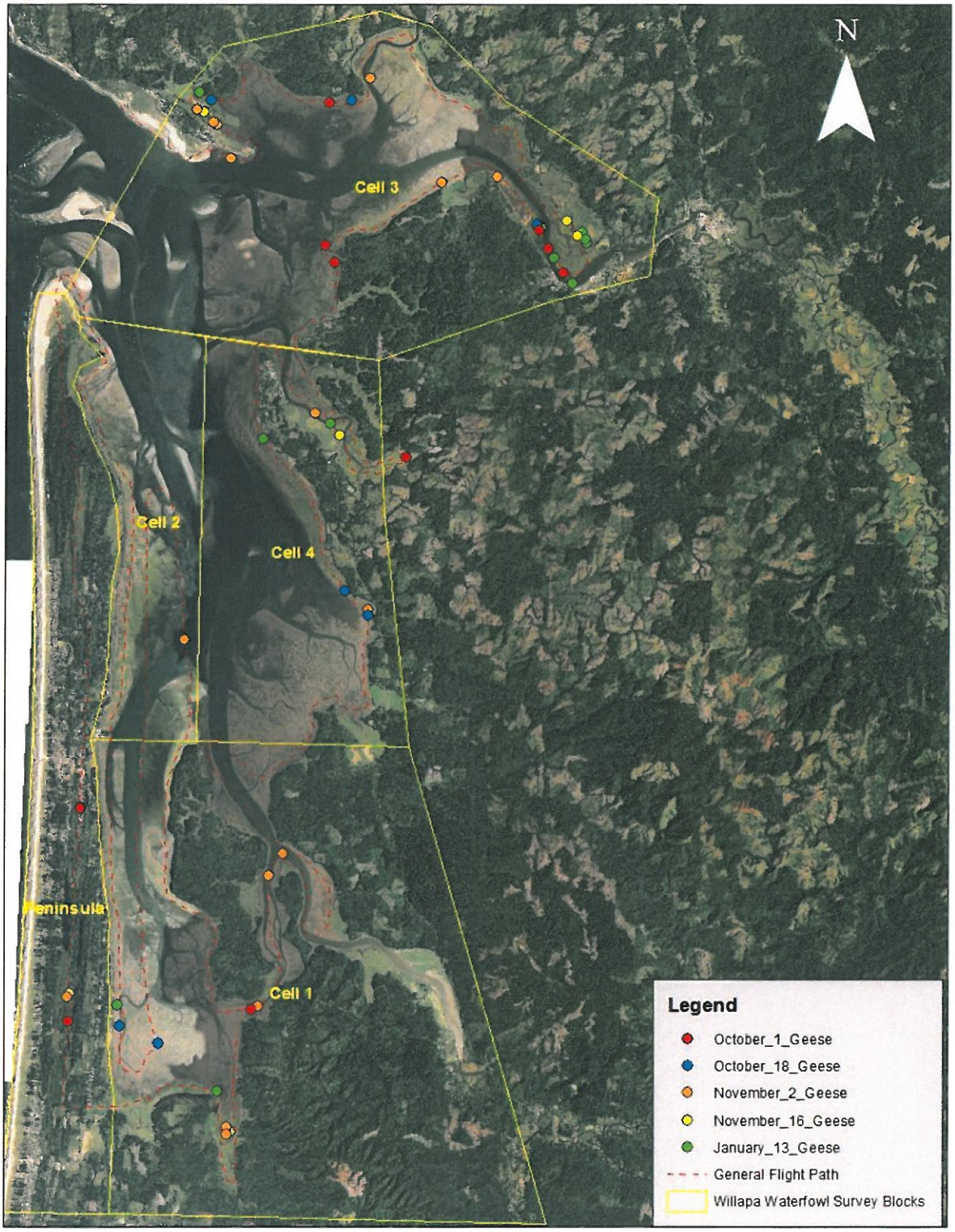


Figure 9. Image depicting the distribution of Canada goose flocks observed during Willapa Bay aerial waterfowl surveys, October 2012–January 2013. Also included is the general flight path and boundaries of historical USFWS survey cells.

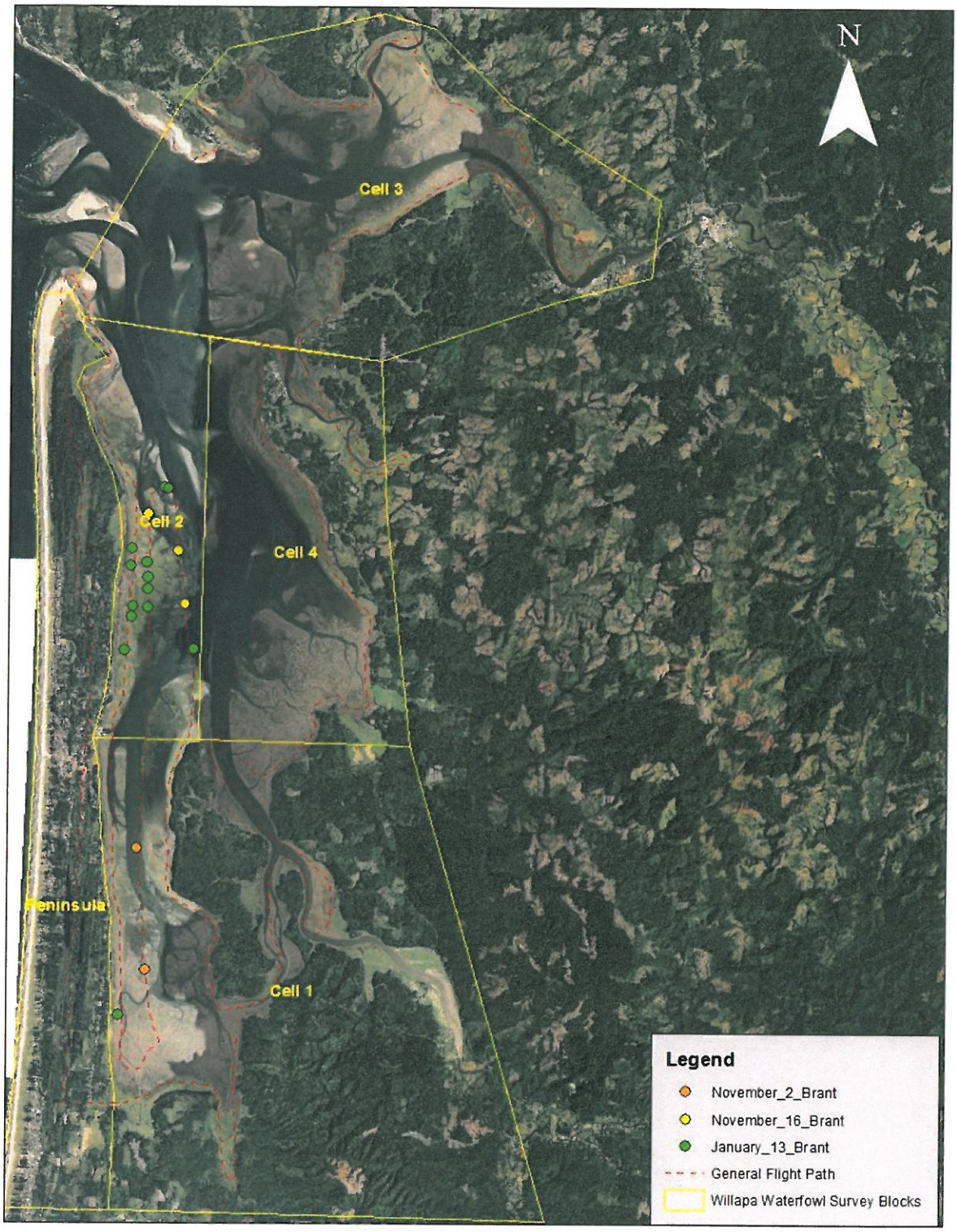
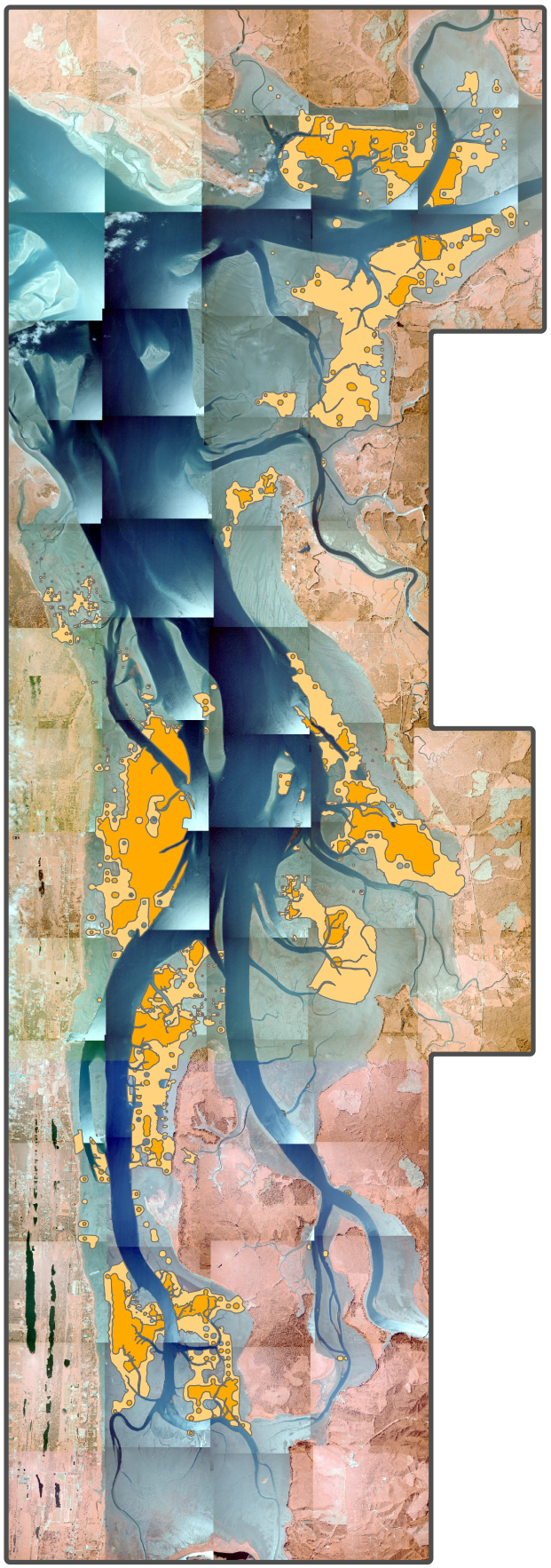


Figure 10. Image depicting the distribution of black brant flocks observed during Willapa Bay aerial waterfowl surveys, October 2012–January 2013. Also included is the general flight path and boundaries of historical USFWS survey cells.

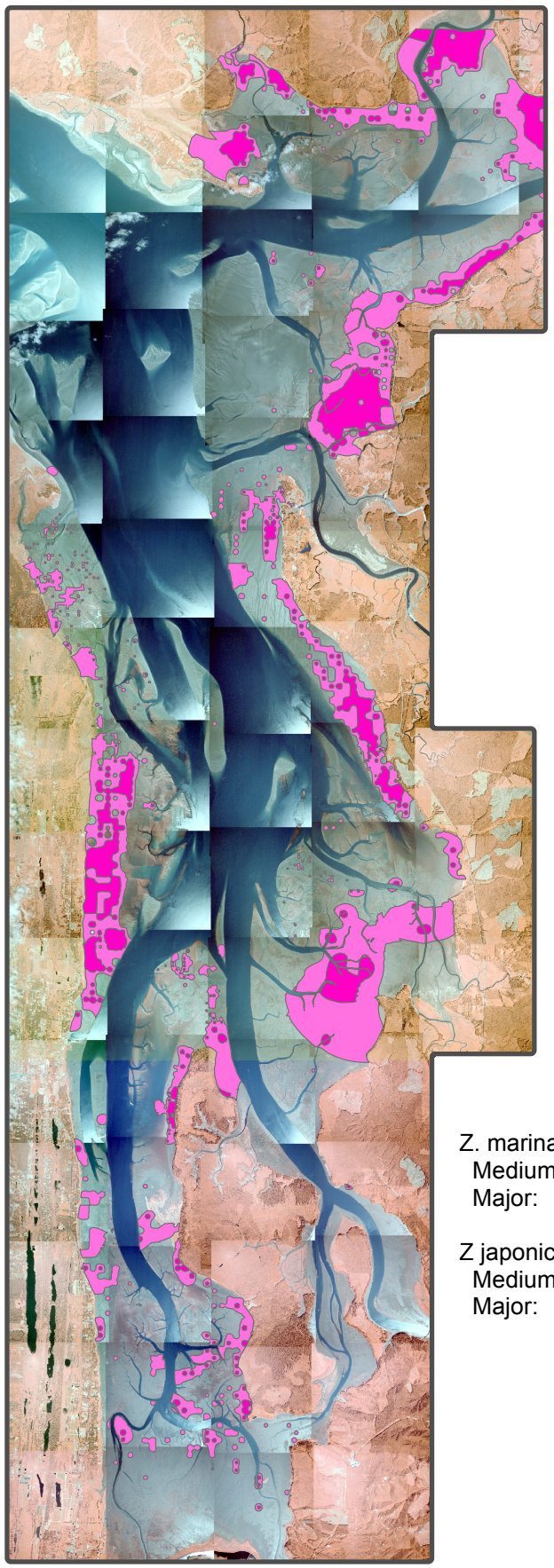
From: Ross Barkhurst
To: Lubliner, Nathan (ECY)
Subject: FW: eelgrass map
Date: Wednesday, February 12, 2014 5:24:16 PM
Attachments: ZosteraLevelsFromSurvey.pdf

2006 bay wide eelgrass map of Willapa Bay. Note overlap with brant in Jan aerial/winter survey. Note presence of both sp eelgrass in close proximity. Note brant eat both. note z marina is protected, except in the draft NPDES.
Note Nov and Dec ducks all over japonica in cells 3 and 4. Note draft would not accomodate nature here, even on public land. If EIS did not take public tideland losses of habitat into account, it will not fly. Only protections would be in EIS, and there are none.
> From: nwducks@frontier.com
> To: rp.barkhurst@hotmail.com
> Subject: eelgrass map
> Date: Thu, 20 Dec 2012 13:30:48 -0800
>
>

Zostera marina



Zostera japonica



Z. marina
Medium: 8774 Acres
Major: 4988 Acres

Z japonica
Medium: 8944 Acres
Major: 3239 Acres

Present - Medium

Present - Major

Present - Medium

Present - Major

Interpolated Zostera marina& Zostera japonica density and distribution from 2006/2007 grid survey by USDA of 4238 points throughout Willapa Bay, WA.

From: Ross Barkhurst
To: Lubliner, Nathan (ECY)
Subject: FW: pdf please?
Date: Wednesday, February 12, 2014 6:32:44 PM

More testimony re imazamox on japonica. The first two pdfs are mostly mine. The third has others mixed in but they are public documents and since the WA State Noxious Weed Control Board took the position that much of this is not its concern, you have hopefully been looking at such input along the way. We have had no opportunity to participate in the drafting process or in workshops where a thorough exchange of facts, studies, and observations could take place. The three minute rule does not accomodate, but the ability to submit does, in an impersonal manner I suppose. Washington Waterfowl early on took the position that protection of public tideland eelgrass beds, and or acreage limits, would be a good start. That was my suggestion on my own in the 2011 Weed Board hearing. Since then I have seen the total failure to include any meaningful precautions and limitations, let alone a look at cumulative effects. These drafts contain no benchmmarks that could be used to enable any useful adaptive management, already needed for six or more species frequenting Willapa Bay. As a result I personally cannot support any eelgrass control under anything resembling the one-sided approach of these unsalvageable drafts. That is why I suggested a do over in the South Bend Feb 8 hearing. Please be advised that I oppose chemical control of z japonica and z marina in any form resembling your draft EIS and NPDES. It would be an unmitigated uncontrolled fast moving disaster dictated soley by market forces and use of our tidelands as purely a source of industrial economic output. Please advise the acting Water Quality Manager and Director of Dept. of Ecology of these conclusions of mine.

Ross P. Barkhurst 151 North Nemah Road West South Bend, WA 98586

From: NWeeds@agr.wa.gov
To: rp.barkhurst@hotmail.com
Subject: RE: pdf please?
Date: Mon, 3 Feb 2014 21:25:19 +0000

Hi Ross,

We scanned and grouped your testimony together. The following links will take you to downloadable PDFs that should be mostly – if not entirely – your testimony. I think this is what you are looking for. http://www.nwcb.wa.gov/siteFiles/Zjtestimony2.pdf , http://www.nwcb.wa.gov/siteFiles/Zjtestimony3.pdf , and http://www.nwcb.wa.gov/siteFiles/Zjtestimony4.pdf

Sincerely,

Alison

From: Ross Barkhurst [mailto:rp.barkhurst@hotmail.com]
Sent: Monday, February 03, 2014 11:44 AM
To: AGR MI Noxious Weeds

Subject: pdf please?

Apologize if you already sent this to me. Lost to the East if you did. Do you have a pdf with just my written testimony, all of the several submittals, for the Nov 2013 hearing? If so would appreciate if you could send asap. thanks--hope you are well.

From: Ross Barkhurst
To: Lubliner, Nathan (ECY)
Subject: Draft EIS/NPDES testimony (p 1 of 2)
Date: Saturday, February 15, 2014 9:49:41 AM

I would like to make two more points which have not yet been well enough emphasized.

1. The discussion on herring spawning and claim that spraying would only be done after the spawning period are misleading. They miss the point of protecting habitat, not just activity. Your input notes known spawning activity in eelgrass beds west of Long Island. Should a permittee desire to "improve" or create a clam bed here, he must only wait until April 15 of any year, then remove the eelgrass. If z japonica is present he can do this to it all. As drafted, he can do this on public land as well as private. A permitee has no economic motivation to do this for one year. As long as his actions seem beneficial economically, it would continue. The only herring spawning bed you have identified in the whole bay would be eliminated if economically beneficial. No acceptable EIS would ever allow this. Pacific herring was a major forage fish which crashed years ago and are struggling to slowly return. After one more spawning period, you would remove the next five to twenty periods, by design. Since Dept of Ecology would actually hold the permit and we growers would just work under it, we can see the newspaper headline, " Washington State Department of Ecology removes last known spawning area for herring in Willapa Bay."

2. My second point addresses the claim of "no federal nexus" to this proposed permit. We can start by expanding the headline above. The headline could actually read " Washington State Department of Ecology Removes Willapa Bay's last known herring spawing area, including that inside a USFWS Refuge." When asked how this could happen, the Ecology spokesperson said, "we could do this because there was no federal nexus". Presumably the Willapa National Wildlife Refuge Manager was unavailble for comment.

If the claim for no nexus really depends on the federal governmment not having spent money on threatened, endangered, or other species of concern in Willapa Bay, it cannot be valid. A cursory review of the recent Final
Comprehensive Conservation Plan and Environmental Impact Statement shows otherwise. Plenty money was spent on producing this final plan alone. Since then several hundred thousand dollars have been spent removing dikes under this plan. I would include section 1.6.1 as clear indication of the purpose of the refuge, and its specific

specific reference to eelgrass, waterfowl, and black brant among others. One of the listed purposes of dike removal is to restore estuarine habitat in general and eelgrass in particular. The USFWS has purchased additional acreage over the years, with eelgrass again as a justification. Much of this vegetation has already been lost south of Long Island, and the potential for bringing it back is discussed as justification under the selected Alternative 2 on p. 4-69 among others. We have spent millions over the years to preserve and protect eelgrass on federal land here and there seems to be enough nexus to go around.

The refuge plan referenced lists numerous species as threatened, listed, and of concern. A long list of Pacific Chinook salmon strains alone is cause for concern. They were big foragers of herring when it was common. Many dip in Willapa Bay for forage. Green sturgeon are mentioned, as are marbled murrelet. This detailed plan locates marbled murrelets on the shores of Willapa Bay and has a major expenditure for acquisition of thousands of acres more for their long term habitat and increase. The Ecology documentation claims their closest nesting site is the Olympic Peninsula, whereas the former assistant refuge manager has told me personnaly some were nesting near her parking lot at headquarters. In this case I believe her. Benefits are claimed for the whole bay by adding estuary and upland habitat next to it. The refuge includes Ledbetter Point, where eelgrass and burrowing shrimp abound, so it is clear that green sturgeon habitat is present whether they make it down to Porter Point any more or not. Federal money has been spent and much more is justified in the Final Plan for the next ten years. Let us not keep spending money to expand habitat and range of species on one hand while the state prepares to remove it with the other.

It is no accident that the beautiful cover of the Willapa National Wildlife Refuge contains pictures of Pacific Brant and chum salmon. These are at the top of the lists of salmon and waterfowl benefitting directly from eelgrass of both species. This is well documented earlier in references in my testimony, along with many others needing adaptive management to keep them off these lists, and already chronically underperforming to management goals. The subject drafts overlook current shortcomings and propose an unestimated unmonitored major chunk of the food web for all be eliminated. Such drafts cannot become final.

(9)

DATE 2/1/14

WASHINGTON STATE DEPARTMENT OF ECOLOGY

ATTENDANCE REGISTER

NAME ROSS P. BARKHURST
Please Print

ADDRESS 151 W. NEMAH RD WEST

CITY S. BEND STATE/ZIP WA 98586

ORGANIZATION WA WATERFOWL ASSN.

If you would like to make public comment, please indicate. [X]

ECY 010-32 (4/92) E-mail address: _____

(9)

DON'T WASTE WILLAPA WILDLIFE-DRAFT NPDES UNSAT

Waterfowl and Salmon would bear the brunt

SMA-shoreline management act- Willapa Bay is a shoreline of statewide significance**

Flawed Process*

Flawed Result (DRAFT EIS and NPDES)

All Major Incorporated Inputs by Industry Acolytes*
WA State Noxious Weed Control Board
Dept of Ecology authors from Ag Dept
Ag extension agent and applicant as fact and conclusion checkers

Inputs from WDFW, DNR(natural resources), citizens, Washington Waterfowl organization ignored
Impacts on Salmon omitted, but obvious. SMOLT HABITAT!

This team as constituted not capable of fixing the flaws---CANNOT SELF-REPAIR
Drafts need a redo--not patchable-- Albert Einstein quote- "A problem cannot be solved through the conscience that created it". Expand this or drop it.

The unbalanced approach of the SMA means **Willapa would become just a Shoreline of Pacific County Aquaculture, including Public tideland

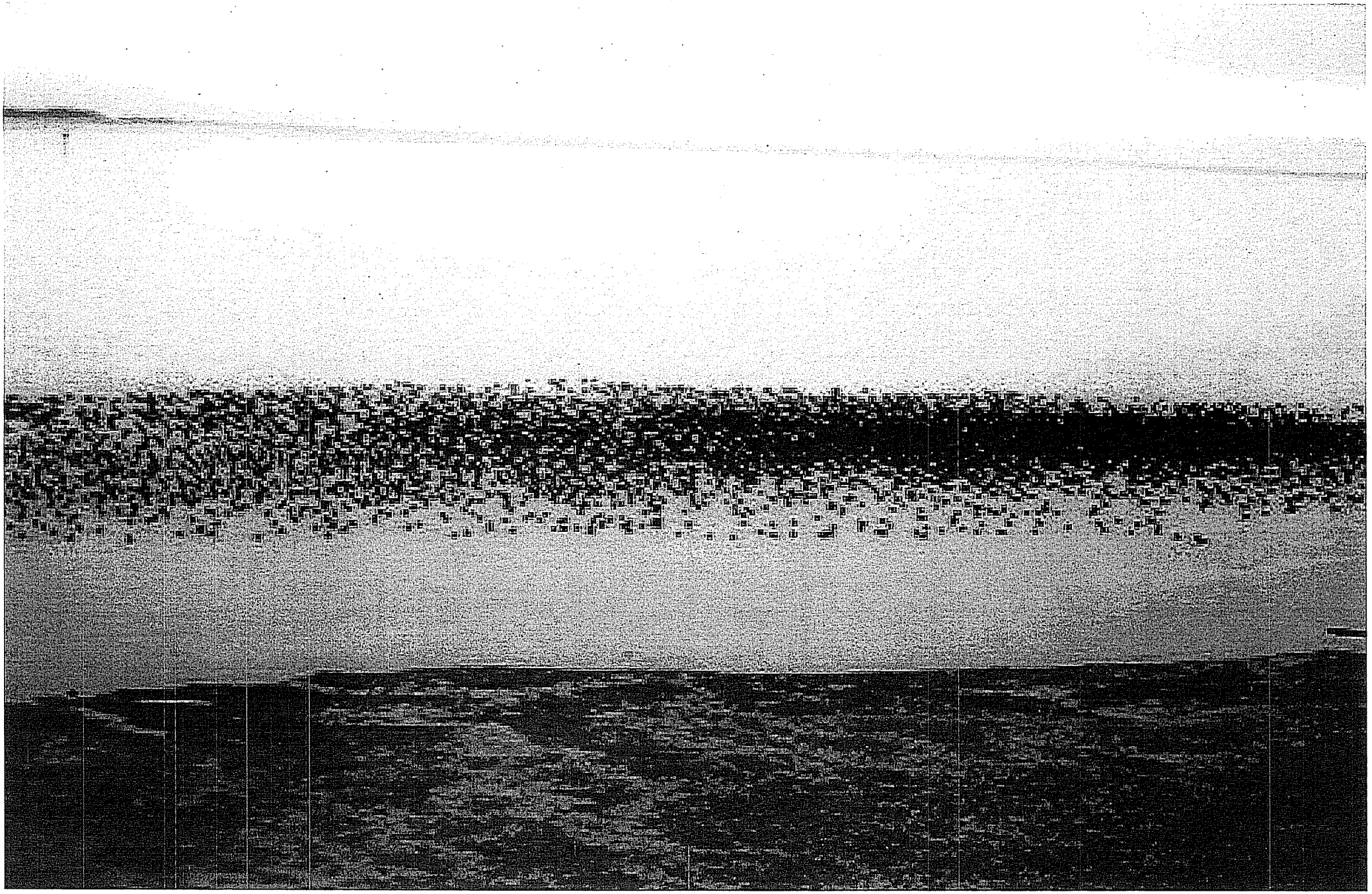
~~Wildlife Conservation~~

~~Cumulative Effects~~ MISSING!

~~Public Interest~~

Fatal Flaws

1. Pacific Brant Wintering Grounds to be sprayed
2. Pacific Brant Spring Staging Grounds/mating grounds to be sprayed while birds are present
3. Preferred chum salmon habitat to be sprayed while smolts are present
4. No critical locations protected, public or private
5. No collateral damage prevention to native eelgrass, a protected vegetation
6. Ratcheting back of native eelgrass encouraged, no pre spartina baseline developed, no net loss? no checks!
7. Connectivity for smolts from spawning streams ignored---no buffers, public or private
8. "duckgrass" denied as a major waterfowl forage, when it has been demonstrated repeatedly otherwise
9. Misleading statements used as justification for the unjustifiable ie " no mallards from the refuge had any zostera japonica(duckgrass) in them"
10. No Environmental Monitoring included--no baseline for habitat or fauna that inhabits it, no periodic measurements, no goals or alarm points, no corrective action specified when reached (will not know), even for species seldom meeting management goals
11. Loss of carrying capacity for many species, including listed green sturgeon, unestimated, unmeasured before spraying, unlimited by precautions or checks, and totally deniable afterwards.
12. Definition of controllable areas expands them-possible 75% to 90% or more of tidelands, public and private.

R P Bachhuber

2/1/14