Boards Support Section
Alaska Department of Fish and Game
P.O. Box 115526
Juneau, AK 99811

PC41

November 14, 2022

Subject: BOF Record Comments - **Kvichak Setnetters' Association**

Dear Board of Fish Member,

The Kvichak Setnetters' Association (KSA) is an organization that was developed to represent set net fishermen of the Kvichak section of the Naknek/Kvichak district. Our mission is to present a unified voice for our members, especially at Board of Fisheries meetings. We work to ensure that set net fishers in the Kvichak section are given fair access to sockeye bound for the Kvichak River. Due to the nature of our district and our location at the end of Bristol Bay, we have unique needs and perspectives on the effective management of our salmon.

Our specific comments on the proposals before you are listed in the table below for your convenience. Please consider our opinions as you consider making regulatory changes that govern our fishery.

| Proposal | KSA Opinion | Comments/Notes |
|---|---|---|
| 33 | Support | While this proposal does not specifically impact our members in the Kvichak River, we share common issues with bank erosion and giant mudflats that would inhibit set net fishing in areas where set net fishing is limited to within 600-1000 feet from the 18ft. high water mark. We support consideration to extend setnet fishing boundaries that are impacted by erosion and fill-in mud. |
| 34 | Support | We share the concern of our Ugashik set net colleagues, and will address the issue in the similar proposal 35 (below) which directly concerns the Naknek-Kvichak District. |
| 35 | Support | The KSA Board supports this proposal mainly for safety and to prevent economic loss. Set nets often have screw anchors in deep water outside that are difficult to adjust except during a handful of minus tides every two weeks. This means if a large drift boat with 200 fathoms of net drags into an outside set net buoy with power it will either break or pull the anchor. This can render an outside set for a set net site unfishable for weeks (up to 25 tides). One incident could do tens of thousands of dollars of economic loss not to mention the immediate safety concerns an incident of this nature poses. It's true that with more powerful shallow draft jet boats these encounters will become more frequent unless the buffer between said gear types is increased. |

| | | |
|---|---|---|
| 36-38 | Support | We support these three proposals which attempt to limit towlines to a reasonable maximum length. Excessively long towlines pose navigational safety hazards, increased likelihood of drift gear becoming entangled in setnet gear, and primarily are used to allow driftnets to fish with one net dry on the mud which is in violation of current regulations. |
| 39 | Comment Only | Setnetters with shore leases that have no buffer between their neighbor's site (300 feet apart) can far too easily be in conflict with their neighbors if their anchors are aligned at a different azimuth. Following the exact azimuth as provided by the Department of Natural Resources and directly in the center of the leased tract is the best way to avoid this all too common conflict. |
| 40 | Support | The KSA board supports this proposal for increased opportunity for set netters due to bank erosion, mud filling in and flattening out of our near shore fishing territory. Particularly on the West side of the Kvichak district, the main channel has been moving further and further offshore, creating thousands of feet of nearly unfishable mudflat between the shore and the prime fishing channel. We believe that the regulation 5 AAC 06.331(m)(5) of 1000' from the 18ft high water mark OR cork dry at time of opener should be extended to all the Kvichak district for ease and consistency of enforcement. |
| 44 | Oppose | We strongly oppose a single drift permit holder increase of net from 150 to 200 fathoms. An increase of gear in the water would negatively impact set net catches in all districts. |
| 45 | Oppose | This proposal is too complicated to enforce and does not have a clear benefit. |
| 49-53 | Oppose | Any proposal attempting to establish a general district is strongly opposed by the KSA board. A general district is an intercept fishery that does not support ADF&G's intent to have terminal fishery districts within Bristol Bay. The district lines are drawn as is to provide the salmon the opportunity to be harvested in the district of which those salmon are returning and equal opportunity for all gear types to harvest those salmon. A general district would significantly impact the setnet fleet of the Naknek-Kvichak which is reliant on fish passing around the Ugashik and Egegik districts to reach our sites near the mouth of the Kvichak river. |
| 57 | Oppose | KSA asks the Board to investigate the claims of this proposal, especially the false claim that the set net harvest has been as high as 47% in the Naknek-Kvichak district. The allocation program was established as a management tool for fisheries biologists to provide equal opportunity between set and drift fishermen. The current allocation was created based on historical data and deliberated upon extensively when this regulation was created. Fisheries biologists use this tool to balance harvest through alternated openings and ensure an equitable season for all gear types. The last several years |

| | | |
|---|---|---|
| | | have not been as close as previous years due to abnormally high returns in the Nushagak district which has skewed the drift fishing effort in the Naknek-Kvichak District. The historical data used in establishing the allocation is based on a substantial number of the fleet fishing this district. If the modern mobile drift fleet is fishing in other districts, the fisheries biologist must make necessary adjustments to the allocation to prevent over-escapement. Our current biologist Travis Ellison has done a fantastic job of maintaining a sustainable fishery while creating equal fishing opportunity for both gear types in the district using this management tool. It should absolutely not be repealed. |
| **58** | **Oppose** | The Naknek River Special Harvest Area is exactly that, a special harvest area intended for special situations. Its creation was based on preventing interception of Kvichak fish during years of low return. The reason there has been over escapement in the Naknek River is closely associated with the reduced fishing effort in the Naknek Kvichak District by the drift fleet due to abnormally large returns in the Nushagak District. Fish are not "sneaking" into the Naknek River, there just aren't as many nets as usual to stop the large pushes of escapement. With a more normal projection for 2023, a more spread out fleet Bay wide should return that balance. A Special Harvest Area should not be opened concurrently in the district at any time. |

Thank you for your time and consideration of our comments.

Corey Arnold

*President*
**Kvichak Setnetters Association**
Kvichaksetnetters@gmail.com
503-853-2050

PC42

**Name:** Alexus Kwachka

**Community of Residence:** Kodiak, Alaska

**Comment:**

Proposal 46-47

I oppose both of these proposals with all of me. If the Board of Fish wants to consolidate and drive up permit value and decrease entry opportunity then these are the proposals to do it.

Permit stacking will lead to more consolidation and out migration of permits to the lower 48. These proposals are not in the best interest of the State of Alaska and it's residents.

Fishing is volatile and one persons failure is another persons gain. I bought my permit when the market was down and built a business plan based on 40 cents a pound. The fishery has come a long way since then. We are at another peak and value is sky high. Despite the cost to entry I have seen a wave of young people buying permits and jumping on as a D permit. Two of my crew members have done this and made the transition the boat ownership. The D option provide opportunity for someone to enter and not have to buy a boat straight away. This lessons the financial burden while building equity to allow financing of a boat.

Permit stacking will lead to other fisheries being stacked. This will allow for large fishing families to stack in multiple areas and fisheries hypothetically and receive benefit while not participating in the fishery. This is my fear. This scenario goes 100% against the thoughts and practice of limited entry.

Please appose these two proposals

Proposal 36

Tow lines have become more of an issue in the last few years and I think it's time to put something in regulation. I came up with 100 feet by measuring all the towline I have on my boat and this was the max I had onboard.

The main. Issue I have with 1000 foot plus tow lines is the preemption of fishing grounds and quality.

We have seen a huge increase in jet boats over the last five years. The practice I'm seeing is running in on step setting the net and running out to deep water where they don't get stuck. The net may or may not be drifting at this point but the boat can hold position. The distance between the net and boat by these long towlines is basically cut off from other boats fishing. If someone is running fast they may or may not see the tow line. Safety issue.

Final insult to injury is the boats are dragging the nets and fish out of the shallows. Quality goes down by all the tension on the net and dragging them through the mud.

I personally do not have a problem with people fishing shallow and catching fish, but if that's your preferred fishing style don't preempt me from drifting by and get in there and personal with your own net.

I support limiting tow line to 100 feet

Proposal 52

I support the concept of a general district after escapement is met on the Eastside. When enforcement starts winding down at the end of the season. We are seeing a fair amount of over the line fishing going on. The vast majority of BB fishermen play by the rules. If escapement is not an issue I'm not really sure the need for lines?

If I have one concern, it would be to get input from setnetters on this concept. We do not want to exacerbate inequity between the two user groups. I do not know if it would be an issue, but should be discussed and thought about.

I support the concept and think it has merit.

Thank you for your time and consideration,

Alexus Kwachka

PC43

**Name:** Chase LaMorena

**Community of Residence:** Stanwood, WA

**Comment:**

Prop 43 and 44 strongly oppose,

Stacking removes 50 fathoms per permit.

Lowers carbon foot print in the fishery.

Improves revenues of all vessels bolstering crew shares for the dual holder as well as the deckhands.

Prop 47, 48,49, 51,52 ,53, 54, and 55 stongly approve

PC44

Togiak River Lodge

River Mile 6

Togiak AK, 99678

Comment for PROPOSAL 29 5 AAC 67.022

Dear Alaska Board of Fisheries Members,

We strongly disagree with proposed rule changes outlined in proposal 29 5 AAC 67.022. As the primary user group of sport anglers on the Togiak River, and also the only permanent structure camp on the whole drainage, this proposal, if accepted, would greatly hinder our ability to target other species of salmon in the Togiak River, without accomplishing the stated goals in the proposal. We feel that the state currently has adequate tools at its disposal, and clear communication with user groups such as ourselves, to effectively manage Togiak King Salmon for selective, and most importantly, sustainable harvest in river.

Beyond King Salmon, the anglers that visit our lodge spend a great deal of time targeting other species of salmon, trout and char, with and without the use of bait. Sockeye Salmon in particular, are a favorite target species amongst our guests, and rightfully so as they are nothing short of delicious and also return in abundance. Recent record runs to Bristol Bay as a whole support this. We target sockeye salmon in a variety of ways including, but not limited to, twitching small 1/8oz marabou Jigs tipped with salted prawn, backtrolling small plugs also wrapped with prawn or roe, and finally, fishing the same small Jigs tipped with roe or salted prawn under a float. All three of these methods, allow our guests a good level of success, while also allowing for very selective harvest, and successful release of fish that are not desired for harvest. The same holds true from Chum and Pink Salmon with similar methods and bait.
A total bait ban on the Togiak would completely impede our ability to target these species without providing any increased survivability for King Salmon.

In an effort to maintain the viability of the King Salmon run in the Togiak River, in light of region wide king Salmon declines, we have already implemented a number of house rules/policies to protect adult king Salmon that have made it past the commercial nets and into the river. These rules/policies are as follows;

- No retention of female King Salmon

- No retention of King Salmon over 20 lbs
- Use of cured roe is limited to an attractant used in conjunction with a wrapped lure such as a Kwikfish, Flatfish, or other large "plug" where the roe is wrapped to the belly of the lure, or to the back of a large "spinner" that impedes the fish's ability to take the hook deeper than the lips/gum line.
- When roe is used on its own as a bait, it is only used in this manner when "side drifting" or "bobber dogging", methods that move the boat and the anglers with the current, and prevent the bait from being taken deeply.
- "Backbouncing" roe on its own is prohibited per lodge policy, so as to avoid hooking fish deep in the gills or throat.

If any limitations on the use of bait should be considered, we feel that it would be most sensible to prohibit the use of cured roe on its own as a singular attractant, and allow its use in conjunction with other lures, including but not limited to, diving lures (plugs, kwikfish, flatfish, etc) spinners, spoons, Jigs, and Spin-N-Glo's (winged bobbers) large beads (16mm and above). All of these methods allow for great success in targeting King Salmon, while impeding the fish from being hooked deep, and also allow for successful healthy release of fish that have been caught using these methods.

If any changes should be made to the current daily/possession limits for King Salmon within the Togiak Drainage we feel that it would be most sensible to;

- Change the definition of a "Jack" to include any King Salmon under 24" of length which would be consistent with the definitions in Washington and Oregon.
- Prohibit the retention of female King Salmon
- Prohibit the retention of King Salmon over 30"
- Allow the retention of 3 "Jacks" (24" and under) per day
- Allow the retention of 1 adult King Salmon (between 24" & 30") per day up to an annual limit of 4 adult King Salmon

Thank you for your consideration.

Regards,

Zackery Larsen
C.O.O.

Jordan Larsen
C.E.O.
Togiak River Lodge

PC45

**Name:** Ryan Leonhardt

**Community of Residence:** Edgewood WA

**Comment:**

Prop 15: Subsistence fish wheel shall be allowed in Ugashik District. I Support this proposal.

Prop 34: Drifters not allowed within 1000' of the 18' hightide line from Smokey Point to Muddy Pt. in the Ugashik District. I Support this Ugashik is a big district with plenty of fishable and productive waters other than between setnet operation's that have been established for years.

Prop 35: Increase the distance of 100' to 300' that drifters have to stay off the end of setnet gear. I support this proposal 100' becomes zero feet and gear entanglement is an all too often occurrence from Smokey Point to Dago Creek. Multiple times a year especially with the influx of new skippers with shallow drive boats that don't know and understand the currents in the area.

PC46

**Name:** Joel Ludwig

**Community of Residence:** Arlington

**Comment:**

Support proposal 49. Due to lack of Enforcement. General district should be implemented when escapement goals have been achieved, in the Eastside Districts. This will increase opportunity to Fishing fleet, Processors, Local and State Tax Jurisdictions.

# Proposal 55

**I am the proposal author, providing more information.**

I offer for consideration some mathematical facts, sourced online through Wikipedia, as follows:

A postulate is a statement that is assumed true without proof. A theorem is a true statement that can be proven.

- *Postulate 1:* A line contains at least two points.
- *Postulate 3:* Through any two points, there is exactly one line.
- *Theorem 1:* If two lines intersect, then they intersect in exactly one point.

Proposal 55 suggests defining the Naknek Section by INTERSECTING the existing line defined by the Naknek-Kvichak southern boundary, with the existing line defined by the Naknek Sideline, which goes from the Libbyville beach waypoint to the "Naknek Section waypoint," defined by where two Loran-C lines used to cross.

**Please consider:**

1. ADF&G regulations currently utilize postulate 3, but insist on stopping at a defined waypoint. Even though the ADF&G line "stops" at the waypoint, the geometrical fact is that the line continues beyond the waypoint.
2. Since the line continues beyond the waypoint, if the defined Naknek Section sideline were extended beyond the Naknek Section waypoint, it would intersect the N/K southern boundary line in approximately 250+ feet.
3. Where those two lines intersect, a point is created.
4. The technological limitation of GPS plotters cannot sufficiently define this point, although mathematically the point is absolutely defined.
5. Proposal 55 suggests defining the Naknek Section of the N/K district as the existing ADF&G southern boundary, and the all waters east of the Naknek Section line up to where it intersects the southern boundary.
    a. The area east of the line defined by the ADF&G Naknek Section boundary (extended beyond the Naknek Section waypoint) defines the westernmost legal fishing area that a fisherman can fish when fishing in the Naknek Section of the N/K fishing district.
    b. The area north of the N/K southern boundary defines the southernmost legal fishing area, as is already established.

**Please further consider that by practical usage of these boundary lines as have been used for years in this fishery, the following is also true:**

1. When a fisherman is fishing in the Naknek Section, they utilize a GPS plotter to indicate their position, and need to stay east of the line created when they punch in the Naknek Section sideline, and north of a line created when they punch in the ADF&G defined Naknek Section southern line.
2. Fishermen (and ADF&G Enforcement) are currently utilizing this exact technology, which will be used if this proposal is enacted.
3. If ADF&G regulation-writers tried to pinpoint the existing Naknek Section waypoint:
    a. They would use the exact same procedure as outlined above.

b. They would never be able to pinpoint the waypoint accurately enough to define it in the regulation books, due to GPS accuracy limitations.

4. Because of 3a and b above, ADF&G is currently utilizing a waypoint that cannot be defined, so why not approve Proposal 55, and utilize a regulatory definition that can actually be defined?

# Proposal 54

**I am the proposal author, providing more information.**

My proposal creates two new lines to allow for specific and selective enhanced harvest opportunities. The key points that set Proposal 54 apart from others are as follows:

- **Proposal 54 does not open the General District**
- Effects only East Side fishing districts, creating two new lines:
  - Egegik north line offshore waypoint to Naknek-Kvichak southern boundary west beach line.
  - Ugashik north line offshore waypoint to egegik south line offshore waypoint.
- Will allow expanded area at times when some rivers have not reached their escapement goal, at no consequence to run conservation.
- Requires agreement between East Side district run managers, and is a management tool to be used at their discretion.

I am offering an attached boundary drawing to be included in considering the proposal.
Thank you.

# Proposals 42-44, regarding eliminating D permits:

**I am AGAINST these proposals.**

**The D permit is a great way for new fishermen to enter the fishery.**

- Being a D permit holder on another fisherman's boat is great way to own and pay for a permit, while gaining first-hand fishing and business experience, since they are actually invested in the fishery.
- Lenders are more likely to loan money on a boat purchase for a new skipper if they own their permit when looking to purchase their boat.
- Insurance companies are more ameniable to new skippers running their first boat if they have more experience, as would happen through the years of fishing their D permit.

**D permits create more room for everybody:**
For every D permit fishing, there is one less 150 fathom net competing for fish. The extra 50 fathoms tacked on to the end of D vessel's net does not have the competitive impact that a whole net operated by another fisherman would have—The D permit allows more room in congested fishing areas and is a good thing.

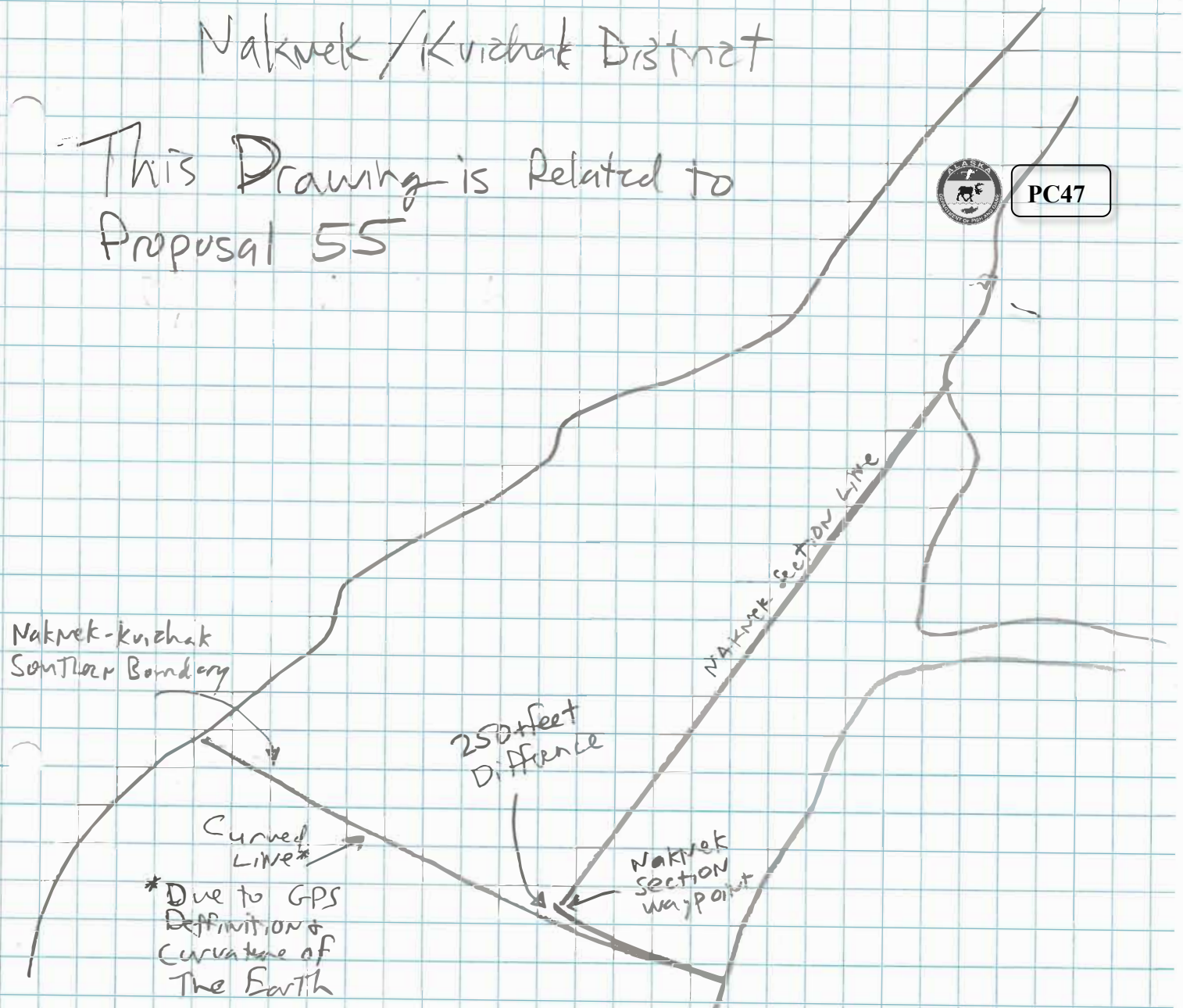
POINT OF CLARIFICATION:
**A D-permit does not guarantee more fish on the boat:**

I attest that single permit holders can catch as much fish as a D permit holder, and have more time to sleep due to less gear work, can make more sets in a day, and have less expense and overhead in gear expenses. **I fished a D permit for six years**, then switched back to single permit for the last six years, and I will never go back to a D permit for reasons as stated, and more. But I'm glad there are other D permits, because it creates more room on the fishing grounds.

# Naknek / Kvichak District

## This Drawing is Related to Proposal 55

PC47




Proposal 55 asks to extend the line through the existing ADF&G Naknek section waypoint to where it intersects the existing Nak/Kvi Southern Boundary

No New waypoint will be Created.

Then There will No Longer be a Discrepancy between The South line of the Naknek Section and the entire Nak/Kvi Southern line

Late Season

# Bristol Bay [redacted] Salmon District Boundaries

Alaska Department of Fish and Game
Division of Commercial Fisheries
*(For Illustration Purposes Only)*

Proposed By:
Matt Marinkovich
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mattsfreshfish@gmail.com

58° 43.73 N
157° 42.71 W

158° W. Long.

Nushagak District

Etolin Point

Naknek-Kvichak District

EGE-N-K
Late-Season Line

Cape Constantine

58° 19.10 N
157° 36.65 W

Cape Chichagof
(58° 20' N. Lat.)

58° 11.00 N
157 58.10 W

Egegik District

State 3-Mile Jurisdictional Limit

58° N. Lat.

UGA-EGE
Late-Season line

57.43.54 N
157.43.80 W

Ugashik District

Cape Menshikof

0 30
Kilometers

Mikal Mathisen

PC48

Proposal 12 Oppose

Fish size is variable from year to year and there is no reason to restrict out catch abilities.

Proposal 13 Oppose

F&G Management already has the ability to adjust open and close times.

Proposal 34/35 Oppose

The existing 100’ buffer outside set nets is an adequate distance and allows the drift fishermen to catch fish close to the beach.

Proposal 42/43/44/45 Oppose

Every D boat takes 100 fathoms of gear out of the water and removes one boat from the fishery. This is a win for all participants.

Proposal 46/47 Support

The dual permit rule should be amended so that either two persons with one permit each on the same vessel or one person with two permits are allowed the extra 50 fathoms of net. This will make it easier to rotate crew throughout the season and also allow someone fishing by his or her self the opportunity to fish 200 fathoms of net. The entire fleet benefits from the dual permit rule as more boats and gear are removed from the fishery. Having the captain as the dual permit holder by himself allows crew to rotate throughout the season as a second permit holder is not required to be onboard throughout the season. I often start and end the season with only one deckhand and some years that is not the same person. I also occasionally fish by myself and would like the ability to use 200 fathoms of net. I am also good with the idea of making a permanent D permit such that if one person fishes two permits they cannot be split up in the future. Two permit holders should still be allowed to combine on one boat. The Cook Inlet fishery allows ones person dual permit fishing rights and I think Bristol Bay should also.

Proposal 49/50/51/52/53/54 Support

Any version of these proposals would be a great addition to the late season fishery. There is no reason to keep the fleet in a bottleneck area once all eastside escapement has been met. The 3

mile boundary line as used in the 2004 early season fishery worked great. Specific points could be designated between Naknek/Egegik and Egegik/Ugashik for tax allocation purposes.

Proposal 55 Support

This seems like a no brainer book keeping adjustment and makes a common south line in the Naknek Kvichak district.

Proposal 56 Support

Some version of this proposal would be a great way for boats to do a shakedown cruise and make sure everything works correctly before leaving for a fishing area several hours away. An easy solution would allow fishing in the east side districts without dropping a blue card until June 15. To put something in place closer to this proposal I would suggest a Naknek only test fishing area drawing a southern boundary line running straight west from the Naknek river existing southern boundary point to the existing Naknek/Kvichak dividing line. Test fishing could then be allowed in the upper triangle area of the Naknek district as F&G elects to open it. The goal of this proposal is to make sure the boats and crews are ready for the season.

PC49

**Name:** Nathan Mathisen

**Community of Residence:** Seattle, Washington

**Comment:** Proposal 12 - Oppose

Proposal 13 -Oppose

Proposal 34 - Oppose

Proposal 35 - Oppose

Proposal 42 - Oppose

Proposal 43 - Oppose

Proposal 44 - Oppose

Proposal 45 - Oppose

Proposal 46 - Support

Proposal 47 - Support

Proposal 49 - Support

Proposal 50 - Support

Proposal 51 - Support

Proposal 52 - Support

Proposal 53 - Support

Proposal 54 - Support

Proposal 55 - Support

Proposal 56 - Support

PC50

**Name:** Maria Melito

**Community of Residence:** Port Townsend, WA

**Comment:**

Proposal 43, Oppose

The fleet has modernized a great deal since dual permits began, greatly contributing to quality and safety. This proposal if passed would punish those who invested the most in the fishery and stop future improvement.

PC51

**Name:** Gaylynn Mertz

**Community of Residence:** Homer

**Comment:**

PROPOSAL #28: PUBLIC COMMENT | OPPOSITION

To whom it will concern,

My name is Gaylynn Mertz and I am a life long Alaskan resident who not only has been a fishing guide on Mulchatna but has been an employee of ADFG for 6 years as a Tech II where I've managed multiple weir sites for Sport Fish, but also have worked for the commercial side in both Hatchery and Ground fish divisions in both the Soldotna and Homer departments. I have been front an center on the side of science, when it comes to fish management. Based on said work experiences with both departments which also included years of limited Chinook returns on the Kenai and Anchor River. I have personally counted a lot of them for years.

The proposal of shutting down the Mulchatna, Nuyakuk and upper Nushagak rivers without providing any factual justification supported by scientific data or research on the amounts of pressure on the spawning areas for Chinook salmon is not only incredibly alarming but also ridiculously ignorant.

Beings how there are over the course of hundreds of river miles, only 3 fishing camps in which only one is historically active catching multi specific fish, how is it they can in such a small window of season, impact an entire run of Chinook? They don't even have clients come out until second week of July and go for only 4-5 weeks at the most. The fact that the Mulchatna closes on the 25th makes it even more restricted! With that said, I ask… what exact pressure can one outfit really have that late in the season? I will remind you that none of these areas are on a road system… the "pressure" excuse that is being used to push this agenda is so far fetched it's truly ridiculous.

This brings me to my next thought. Why would a system that has worked so flawlessly all these years suddenly need to change? EO's are put into place and followed religiously. What would shutting down those specific areas prove when there is little to no pressure to begin with? It seems like this is not only a waste of time, money and effort(s) by reinventing a system that is already working, but more so a slap in the face to those who have successfully managed these areas up until this point.

As I'm sure you already know, this isn't about people impacting said spawning areas over the course of such a large area…this is a bigger issue at hand and the spotlight should be focused on more probable and likely issues… like the fact these fish spend 4, 5 and sometimes on a rare occurrence 6 years out in the ocean. Granted we can only speculate because we can only gather so much info on the incoming fish and of course extrapolate that to make the best guess we can

but fact remains. There is a lot more impacting Chinook returns that we don't have any control over like the rising of ocean temps which absolutely throws off plankton/krill blooms…

I don't even have to point a finger at all too used commercial fishing impact…the facts are facts. Fish numbers fluctuate year by year. Mother Nature is incredibly finicky that way. Thank goodness we have a proven, capable management system in place for those areas that are more than appropriate and proactive when it comes to conservation and sustainability.

Shutting down these areas down out of the blue, based on absolutely zero fact or scientific data to support the proposal, sends a message that you don't trust even trust your own means of management and you are willing to take assumption over research.

Thank you for giving me the opportunity to share my thoughts. I truly do hope you continue your great work by keeping what is already successfully working in place by rejecting proposal #28.

Best,

Gaylynn Mertz

PC52

**Name:** Christie Most

**Community of Residence:** Seattle, WA

**Comment:**

I am writing in support of proposal 59 -Repeal provisions directing the department to avoid continuous fishing with set gillnet gear in the Egegik District. Repealing this provision will provide additional flexibility for the biologist to manage the fishery.

PC53

**Name:** Nushagak King Salmon Committee

**Community of Residence:** Alaska

**Comment:**

Proposal 11 - Support

During the December 2018 Bristol Bay Finfish meeting, the Alaska Board of Fisheries struck a committee to review Nushagak River and District fisheries and regulations, and to provide recommendations on a comprehensive solution to Chinook salmon management. The first two report documents are two of a total of four document's that are being prepared for the BOF. The first report captures the process and outcomes from the committee, which met between February 2019 and April 2022. The second is an updated historical report on the Nushagak King salmon stock and the associated fisheries.

Proposal 11 includes the seven proposed actions agreed to be the committee:

1. Manage large sockeye runs so that escapements fall in the upper portion of the escapement goal range.

2. Use a Nushagak District Test Fishery to assess relative abundance of sockeye and king salmon.

3. Modify/Clarify the Wood River trigger and establish a Nushagak River trigger,

4. Provide a directed commercial fishery for King Salmon when surplus clearly exists

5. Modify/reduce the annual limit for king salmon.

6. Avoid complete closures of the sport fishery when possible.

7. Provide ADF&G with flexibility to restrict but not close the subsistence fishery in low inriver run scenarios and standardize subsistence fishing schedule and area under a restricted scenario

See attached for additional information

PC53

# Summary of Outcomes from the Committee to Examine the Nushagak-Mulchatna King Salmon Management Plan, 2019-2022


Prepared by:

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Bristol Bay Science and Research Institute
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Prepared for:

Nushagak-Mulchatna King Salmon Management Plan Committee
and
Alaska Board of Fisheries

Final DRAFT, Submitted to Alaska Board of Fisheries, Public Comment

November 14, 2022

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# Executive Summary

This report is one of four reports prepared by the Study Team that worked with the Alaska Board of Fisheries committee to examine options to revise the Nushagak-Mulchatna King Salmon Management Plan (NMKSMP). This report documents the process and outcomes from that committee, which met between February 2019 and April 2022.[1]

During the December 2018 Bristol Bay Finfish meeting, the Board of Fisheries (Board) struck a committee to review Nushagak River and District fisheries and regulations, and to provide recommendations on a comprehensive solution to Chinook salmon management. Three Board members were assigned to the committee (Payton, Morisky, and Ruffner) and the selection of stakeholders to serve on the committee was to be done in early 2019. In February 2019 at the Special Committee Meeting immediately following the Alaska Peninsula/Aleutian Island/Chignik Finfish meeting the Board selected 8 Committee members representing the commercial, sport, and subsistence fisheries. The inaugural committee meeting took place on October 2019 and a total of 15 committee meetings occurred between December 2019 and March 2022. A final committee meeting was to be held in November 2022 to review this report and prepare for the upcoming Board of Fisheries meeting.

As a starting point for discussions during the first year of committee meetings, members identified the current challenges to, or problems with, management of Nushagak River king salmon fisheries. The focus was on challenges or problems related directly to the NMKSMP, but the discussion was not limited to challenges pertaining narrowly or only to the Plan. After discussing the fishery challenges faced by the Nushagak River king salmon fisheries at the initial meetings, committee members were asked to discuss what constitutes success in their various fisheries? Members were then asked to identify possible management objectives that, if implemented, would ideally fulfill the measures of success as identified. Finally, the groups were asked to identify possible changes or additions to the NMKSMP "action" provisions that direct ADF&G to act and that would, in turn, lead to achieving the objectives previously developed in this process.

In January 2021, the full committee reviewed and revised the lists and descriptions of the Measures of Success, Management Objectives, and Possible Management Plan Actions that had been developed. Shortly thereafter, work focused directly on clarifying possible regulatory management actions needed to achieve the management objectives, and further discuss non-regulatory actions needed. BBSRI provided technical information on certain topics, particularly management triggers and the effects of mesh size on sockeye exploitation rates, to inform and address questions raised by the committee. By April 7, 2022, the committee had reached consensus on seven proposed actions. The committee examined five other actions in detail but failed to reach consensus on them. On behalf of the Committee, the Study Team submitted a

[1] The four reports prepared by the study team include: 1) Historical review of Nushagak River King Salmon Management, 2) this report, 3) Technical analysis of options considered by the Nushagak King Salmon committee, and 4) Recommendations for non-regulatory actions for Nushagak King salmon management.

proposal to the Board of Fisheries in April 2022 to modify the Plan by directly inserting the management objectives and regulatory actions with consensus above.

The seven proposed actions submitted to the Board of Fisheries in April 2022 included the following.

1. Manage large sockeye runs so that escapements fall in the upper portion of the escapement goal range.
2. Use a Nushagak District Test Fishery to assess relative abundance of sockeye and king salmon.
3. Modify/Clarify the Wood River trigger and establish a Nushagak River trigger,
4. Provide a directed commercial fishery for King Salmon when surplus clearly exists
5. Modify/reduce the annual limit for king salmon.
6. Avoid complete closures of the sport fishery when possible.
7. Provide ADF&G with flexibility to restrict but not close the subsistence fishery in low inriver run scenarios and standardize subsistence fishing schedule and area under a restricted scenario.

Five actions that were considered but failed to garner committee consensus included the following.

1. Restrict mesh size in regulation to better conserve king salmon and exploit sockeye salmon.
2. Better adhere to existing regulations and/or Modify the Nushagak District Allocation Plan to make clearer a priority for escapement of sockeye and king salmon.
3. Mitigate Bay-wide Fleet Dynamics that Exacerbate early season harvest rates in the Nushagak District by modifying the Transfer Period.
4. Reduce and Mitigate Continuous Commercial Fishing in the Nushagak District where possible.
5. Keep all Non-Subsistence Fisheries closed until the king salmon escapement goals have been met.

The committee concluded there are substantial limits to what changes in the management Plan can do to improve king salmon management and the fisheries that depend on them. During deliberations of fishery challenges and subsequent topics, the committee identified numerous needed improvements that are outside the regulatory scope of the Plan. Fulfilling these information needs offers greater potential to improve the fisheries than modifications to the Plan. Some on the committee felt that these things need to *precede* any Plan changes and that if these issues remain, the Plan will remain largely ineffective at achieving success in the fishery. These needs identified by the committee are discussed briefly in this report and will be described in more detail in a separate report.

# Introduction

During the December 2018 Bristol Bay Finfish meeting, the Alaska Board of Fisheries struck a committee to review Nushagak River and District fisheries and regulations, and to provide recommendations on a comprehensive solution to Chinook salmon management. This report documents the process and outcomes from that committee, which met between February 2019 and April 2022.

In 1992, the Alaska Board of Fisheries (Board) adopted the Nushagak-Mulchatna King Salmon Management Plan (Plan) to guide management of the subsistence, commercial and sport fisheries that harvest this important stock. Production of Nushagak River Chinook (king) salmon had peaked in the early 1980's and resulted in a surge of interest and record harvests in the commercial fishery and development of the then-growing sport fishery (Nelson, 1987). Fishery managers responded by enacting fishery restrictions and implementing assessment programs to ensure enough king salmon survived the fisheries to sustain the stock. However, poor runs in the late 1980's resulting from poor production from the recent large runs further heightened the need for improved escapement monitoring, a formal escapement goal, and additional fishery restrictions, all of which provided the impetus for developing the Plan.

The Nushagak River fisheries that harvest king salmon have been managed under the direction of the Plan since then. The Board modified the Plan several times but its purpose and structure, with management actions tied directly to projected inriver run abundance estimate at the Portage Creek sonar project, have remained like the original version. Salmon fishery dynamics changed notably over the life of the Plan. Sockeye runs to the Wood and Nushagak Rivers increased in magnitude in the 2010s while king salmon runs have declined to some of the lowest levels recorded. Commercial fishing directed at king salmon has remained closed since 2014, and sport fishing regulations have become increasingly conservative. At the same time, substantial uncertainties over the ability of the sonar to estimate inriver run abundance remain. These events led to two key proposals submitted to the Board at its December 2018 meeting.

Restrictions to the sport fishery due to low early season inriver passage of king salmon combined with sometimes intense fishing for sockeye in the Nushagak District in the mid-2010's led to calls to pair restrictions in the commercial and sport fishery (Proposals 41 and 42, 2018 Bristol Bay Board meeting; Appendix A). At the meeting, the Board in response to the proposals and working with affected stakeholders, removed several triggers in the Plan that affected the sport fishery (RC51; Appendix B) and tabled Proposals 41 and 42. These changes provided fishery managers greater flexibility in dealing with a complex fishery and sometimes inaccurate escapement information.

The Board also established a committee to develop a comprehensive solution to the Plan through RC 84 and the charge statement (RC86; Appendix B). The Board charged the committee with reporting back at its Statewide meeting in March 2020. The Bristol Bay Science

and Research Institute (BBSRI) committed to supporting the committee's work through a stakeholder-led technical analysis of options the committee was expected to consider (RC 80).

## Committee Process

### *Committee Formation*

The board released a request for committee nominations on January 31, 2019 (https://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2018-2019/nm_committee_nominations_request.pdf). The intent of the solicitation was to have interested parties apply by sending in a letter of interest which included their background in the fishery. The applicants' letters of interest were due to the executive director of boards by February 18, 2019.

The Board received 14 letters of interest from which they chose 8 public committee members to represent the stakeholder groups involved with the Nushagak-Mulchatna King Salmon fishery.

### *Committee Members*

**Robert Heyano** – Lifelong resident of the Nushagak Bay area. He started fishing in the Nushagak Bay on the family-owned set net site in the 1960s. In 1972 he started drift gillnetting as an owner operator which he still currently doing. He has been active in the Board process since 1978 and served on the Board from 2004 to 2007. He has also served on the Nushagak AC and as its chair. He was on the AC when the original NKMP was drafted in 1991.

**Bud Hodson** – He has been fishing King Salmon on the Nushagak River for 40+ years with 2 different camps for guided angling for Kings. He served on the Board of Fisheries from 1986 through 1990 and served as Chairman of the Board for over 2 years. He was deeply involved with the original drafting of the NKMP and the allocation considerations in the creation of the original Plan.

**Brian Kraft** - He was the author of Prop 41 and 42 that were before the BOF in Dillingham at the 2018 meeting. Those proposals were the catalyst for the Board to create this committee. He has owned and operated a fishing lodge in BB for more than 25 years. He has operated a fishing camp on the Nushagak for similar time.

**Bob Klontz** – He has been involved in the Nushagak King salmon sport fishery since 1984 and a property owner on the river since 1999. His families on-river experience of more than 30 years and networking with other camps and fisherman has given him a well-rounded perspective of the status of the inriver fishery and of the King Salmon stock.

**Tom O'Connor** – He is a year-round resident within the Nushagak Bay area. He has many decades of experience as a set net fisherman in the Nushagak district on Ekuk beach. He is a

long-time member of the Nushagak AC and has participated in the Board process for more than 20 years.

**Nanci Lyons** - She has been guiding in the Bristol Bay region since 1985 and has been a user of the Nushagak river since 1986. She was involved in the Board of Fish meetings that constructed and approved the original Nushagak King Salmon management Plan and has been actively involved in the fishery and the management Plan ever since. She is the owner/operator of a sportfishing lodge in the BB area.

**Peter Christopher** – He is resident of New Stuyahok which is a community on the Nushagak River. He has served on the Nushagak AC for many decades. He has subsistence fished for his entire life and commercially fished in the Nushagak district from 1965 to the present. He is an active subsistence fisher for King, Chum, and Sockeye salmon. He and his family are heavily dependent on the salmon they catch for their winter food.

**George Wilson** - He resides in Naknek across the Bay from the Nushagak. He has commercially fished since 1980 when he was 9 years old with his dad. He currently owns and operates his vessel and permit and has done so since 1999. His children are his crew and will be taking over the family business in due time. He also participates subsistence fishing.

### *Study Team Members*

A three-person Study Team sponsored by BBSRI led and facilitated the committee process, prepared project analyses, and project reports.

**Tom Brookover** – Tom worked in various capacities with ADF&G since 1985, including as the Commercial Fisheries Assistant and Area Management Biologist for the Nushagak District from 1990-1998. He also worked as the Sport Fish Area Biologist in Sitka, Southeast Alaska Management Supervisor, Statewide Habitat Research Supervisor, and Deputy Director. Tom served as Director of Sport Fisheries Division from 2015 – 2018. Tom joined BBSRI's Nushagak Study Team shortly after retiring from ADF&G in 2018.

**Michael Link** – Michael has been the Executive Director of the Bristol Bay Science and Research Institute (BBSRI) since 2002. He first worked in Bristol Bay as the Research Project Leader for ADF&G's Commercial Fisheries Division in the late 1990s. Michael has led numerous research projects and policy analyses including an extensive multidisciplinary analysis of escapement goal policies for Bristol Bay sockeye salmon (2012-2015, https://www.bbsri.org/escapement-goal-analysis). Farther back, he led an analysis to examine options to restructure the Bristol Bay commercial salmon fishery (2001-2003, https://www.bbsri.org/other-project-reports).

**Jeff Regnart** – Jeff has held several positions within Bristol Bay. Starting in 1990 he was the commercial fishery manager for the Naknek-Kvichak district. He then moved into a variety of Bristol Bay regional positions each with a greater scope of responsibility. From 2011 to 2015, Jeff served as Director of the Commercial Fishery Division of ADF&G where he represented the

department in the Board of Fisheries process. Since retiring from ADF&G in 2015, Jeff has done fisheries certification work with the Alaska Seafood Marketing Institute (ASMI) and has worked as a technical advisor to BBSRI.

### *Consensus Decision Making*

All committee decisions were to be made on a consensus basis, and any proposed solution(s) to emerge from the committee would need to be comprehensive in scope. The committee operated on a consensus basis over a ~3-year period and strived to find robust solutions that would eventually include regulatory changes to the Plan and non-regulatory recommendations.

### *Schedule*

It was initially expected that work products would emerge in time for consideration at the Board's Statewide Meeting in March 2020. Concerns from the public relayed to committee members about insufficient time for public vetting of any proposals coming from the committee work ultimately led to the work schedule sliding by about one year, with work products expected to be released prior to the April 2021 proposal deadline for consideration at the in-cycle Bristol Bay meeting (December 2021). A COVID-pandemic delay to the Board meeting schedule shifted all these deadlines by one year, with a committee-supported proposal submitted in April 2022 for consideration at the Bristol Bay meeting in late November 2022.

### *Kick-off Meeting*

The committee first met in Anchorage on October 21, 2019, to get underway and present preliminary analyses of the fishery's history and technical challenges associated with monitoring and managing the fishery (Figure 1). Committee members were provided a questionnaire about challenges and problems each saw with respect to king salmon management, what constituted success in their fishery, and what problems might be addressed by changes in the Plan and/or stock assessment programs. Meeting documents, including an agenda and meeting summary, for the kick-off meeting are available on the Board's website here.

### *Initial Breakout Groups of Stakeholders*

Break-out groups of subsets of the full committee met with the BBSRI Study Team in December 2019 (Anchorage; sport/commercial) and February 2020 (Dillingham; commercial, subsistence, sport). These break-out meetings produced initial lists of 1) the challenges faced by the Nushagak king salmon fisheries, and 2) what defined success from each stakeholders' perspectives. The meetings also provided initial ideas for (3) possible management objectives to address challenges and meet measures of success in each fishery, and (4) possible regulatory actions and non-regulatory information or actions needed to achieve management objectives. The discussions identified much of the technical analysis for the Study Team to examine. COVID-19 precluded an in-person meeting for the entire committee scheduled for April 2020 in King Salmon.

### *Formal Board Committee Disbanded and Follow-on Structure*

At the Upper Cook Inlet meeting in February 2020, the Board disbanded the formal committee and strongly encouraged stakeholders remaining on the committee to continue to work together in preparation for the next in-cycle Bristol Bay meeting in 2021. BBSRI reasserted its commitment to serve the committee and move toward its original mission outlined in the charge statement: a comprehensive solution to the Plan. The committee makeup remained the same as selected by the Board initially on February 19, 2020, minus the Board members Payton and Morisky (Ruffner was not to be re-appointed June 2020).

### *Committee Meetings*

The committee and subsets of the committee met 15 times between December 2019 and April 2022 (Figure 1). Between meetings the Study Team pulled together committee work products and prepared goals, objectives, and agendas for follow-on meetings. The pandemic-related constraints on travel and in-person meetings precluded many of the committee meetings from being in person.

The committee met via video conference on December 17 and 18, 2020 to refine challenges, management objectives, measures of success, possible action item, and non-regulatory information needs. The committee met again January 14, 2021, to review an early draft of this report describing the committee's work and begin a focused review and discussion of possible regulatory changes to the Plan that would continue through March 2021. Subsequent meetings resulted in a refined list of those possible management actions with consensus by the time the committee concluded for the winter. The Study Team met with ADF&G in April 2021 to discuss those management actions with consensus from the committee at the time.

The committee reconvened in January 2022 to discuss and work toward a regulatory proposal incorporating those actions with committee consensus and identify additional information or programs needed in addition to regulation changes (i.e., non-regulatory recommendations).

From January through April 2022, the committee reviewed the 2021 fishing season, 2022 sockeye salmon forecast, updated tables from the Historical Report that included 2020-2021 data (Brookover, 2022), and ADF&G input on the possible management actions under consideration by the committee. The Study Team presented and discussed with the committee 1) impacts of different management triggers for the Wood and Nushagak river to delay the onset of the commercial fishery in the Nushagak District, and 2) the effects of mesh size on exploitation rates (Appendix D). Other discussion topics included the plans for BBSRI's 2022 test fishery in the Nushagak District and input the Study Team had received from ADF&G concerning a Nushagak sockeye salmon management trigger. With input from ADF&G and the committee, the Study Team further refined the list of management actions to put forward in the form of a proposal in April 2022.

Meeting outcomes included ideas for regulatory changes to the NMKSMP but were not limited only to regulatory changes. The committee raised issues to improve king salmon management that require action outside of the Plan, including improving inseason management and monitoring programs. Since some of the greatest fishery challenges/problems cannot be addressed by changes to the management Plan alone, the committee felt strongly that these should not be ignored in a search for comprehensive solutions. Hence, the inclusion of these non-regulatory recommendations in the committee's work products.

| Year | Date | Location | Composition | # Days | Outcome |
|---|---|---|---|---|---|
| 2019 | October 21 | Anchorage | Full | 1 | Initial committee kickoff meeting |
| | December 12 | Anchorage | Partial | 1 | Identify Challenges, Management Objectives, Measures of Success, Possible (Regulatory) Management Actions, and Information/Non-Regulatory Needs |
| 2020 | January 14 | Zoom | Full | 1 | Committee review of draft document describing all items above. Discuss possilbe management actions, including nine from the committee and four from BBSRI |
| | January 20 | Phone | Partial | 1 | Discuss possible management actions |
| | January 21 | Zoom | Partial | 1 | Discuss possible management actions |
| | January 27 | Zoom | Partial | 1 | Discuss possible management actions |
| | February 2 | | Full | 1 | Discuss possible management actions with consensus, those needing more information, and actions with no consensus |
| | February 20 | Dillingham | Partial | 1 | Identify Challenges, Management Objectives, Measures of Success, Possible (Regulatory) Management Actions, and Information/Non-Regulatory Needs |
| | December 17 | Zoom | Full | 2 | Review 2020 fishing season, discuss and refine list of all items |
| 2021 | March 3 | Zoom | Full | 1 | Review revised tables for Historical Report, discuss possible management actions in regulatory text form |
| | March 18 | Zoom | Partial | 1 | Refine specific possible actions |
| | January 27 | Zoom | Full | 1 | Review 2021 fishing season, review possible management actions including modifications made by the partial group at the 3-18-2021 meeting and input received from ADF&G, refine list of possible management actions with consensus |
| | February 21 | Zoom | Full | 1 | Review revised tables for Historical Report, discuss and refine Wood River Trigger and Upper/Lower Escapement Goal actions, identify additional information needed |
| 2022 | March 3 | Zoom | Full | 1 | Present mesh size analysis, discuss 2022 test fish plan; Nushagak River sockeye salmon trigger, outline of draft summary report, and plan for list of research projects needed |
| | April 7 | Zoom | Full | 1 | Review analysis on usefulness of triggers, update mesh size analysis, cand onfirm action items with consensus |

*Figure 1.- Committee meeting dates, locations, and outcomes, 2019-2022.*

# Fishery Challenges

As a starting point for discussions at the early committee meetings, members were asked to identify the current challenges to, or problems with, fishery management pertaining to the Nushagak River king salmon fisheries. The focus was on challenges or problems related directly to the NMKSMP, but the discussion was not limited to challenges pertaining narrowly or only to the Plan. Ultimately, the committee identified six key challenges faced by the Nushagak River king salmon fisheries. These challenges and problems are described below and form the foundation for subsequent committee discussions of Plan changes and other possible actions.

## *Overlap in timing and spatial distribution of king and sockeye salmon in Nushagak Bay creates a mixed-species (Chinook, sockeye, and chum salmon) and mixed-stock fishery (Wood, Nushagak, and Igushik sockeye), which makes fishery management difficult.*

The committee identified this challenge – how to best manage a mixed-stock and mixed-species fishery with stocks and species of differing productivity, in addition to overlapping timing and spatial distribution of stocks and species – as a fundamental challenge in the Nushagak District commercial fishery. It was also one of few challenges identified by both groups of committee members that met in December 2019 and February 2020. King salmon are caught incidentally during the commercial fishery for sockeye salmon. This makes it difficult to harvest available abundant sockeye salmon stocks and protect weak king salmon runs.

Factors that may affect this challenge include the when the first commercial openings for sockeye salmon are scheduled, when the fishery opens relative to the tide stage, how and when continuous[2] fishing occurs, and selectivity of gillnet mesh size. The NMKSMP, other management plans, and management practices bear on these factors. The NMKSMP directs the department to keep the commercial fishery for sockeye salmon closed until the projected escapement into the Wood River exceeds 100,000 fish. This provision received considerable discussion. The Nushagak drift and set net allocation plan (5AAC 06.368) was also brought up as it guides commercial fishing time for each gear type during the sockeye salmon fishery. This raised the question: *are separate species-specific management plans appropriate or optimal managing Nushagak King Salmon?* The committee believes there may be ways to make the sockeye fishery more selective for sockeye salmon by implementing various management measures. These might include altering the language associated with the current Wood River trigger and/or altering when the fishery operates relative to the tide stage. Continuous versus non-continuous fishing with drift and set net was discussed as a possible means to improve king salmon conservation.

[2] During committee discussion, questions arose as to what continuous fishing means. For the purposes of this document, continuous fishing means a continuous period, from a certain point in time to the end of the season, when the commercial fishery is opened to drift nets, set nets, or both gear types until further notice or for the remainder of the season. It is distinct from intensive fishing. Intensive fishing, as discussed by the committee, means fishing on an every-tide basis beginning at a certain point in time to the end of the season. Intensive fishing, unlike continuous fishing, is managed by emergency order daily and is characterized by repetitive fishery openings of a certain number of hours in duration, e.g., 10-hour periods.

*There is a large level of uncertainty associated with the king salmon fishery assessment information. Particularly information from the inriver sonar program, lack of a rigorous king escapement goal, and lack of being able to develop any preseason indication of king run strength.*

This challenge, like the first, was also raised as an issue at every committee meeting held. Committee members felt that uncertainty associated with the current king salmon assessment program estimates has limited the understanding of the king salmon stock, available yield, and fishery performance. The accuracy of commercial catch estimates, including age-size-sex, is limited. "Dropouts" in the commercial fishery are unaccounted for in the annual run accounting. Similarly, catch-and-release mortality in the sport fishery is not factored in to estimates of mortality associated with sport fishery. Catch and escapement age-sex-size characteristics in are not well measured or understood, and confidence in the accuracy of the inseason and post-season sonar-based estimates of inriver abundance has declined as research has examined assumptions made in the program. Without substantive improvement in these areas, and particularly with inriver abundance and escapement estimates, the development of brood tables is compromised and with it, the ability to produce robust escapement and inriver goals, pre-season forecasts and inseason inriver abundance projections.

Given the accuracy of assessment data, committee members felt the Plan remains too narrowly prescriptive. While the Board of Fisheries reduced the number of inriver abundance-based triggers in the Plan at the December 2018 meeting, some felt the ability to manage for even two triggers (55,000 and 95,000 fish) was questionable. Similarly, fishery management decisions are based on highly inaccurate inriver run estimates. Can other sources of information, such as catch rates in set, drift, sport, and/or subsistence fisheries, be used for inseason assessment of kings? In the long run, what can be done to improve estimates of the inriver run, both inseason and post-season, so that the Plan precision and management practices match our understanding of the actual inriver abundance and escapement?

*Impacts from inseason restrictions are costly to the different fisheries but vary in important ways.*

In the sport fishery, complete inseason closures have had very large economic impacts for what was seen by most as likely modest biological benefits. Inseason closures have entirely precluded the ability to fish, typically for the remainder of the season. Closures carry obvious impacts to anglers, but also carries high costs, i.e., cancellations, to sport fishing businesses for the season, and negatively effects bookings for following years. In turn, the number of king salmon protected from harvest or incidental mortality by closures during years of low inriver abundance is low, i.e., in the hundreds or low thousands of fish. Unlike the commercial fishery, it is not possible to close and then re-open the guided sport fishery without substantial impacts to the fishery.

In the commercial fishery, the directed fishery for king salmon has remained closed in 8 of the last 10 seasons. Closures in the sockeye fishery to conserve king salmon late in the season have disproportionately higher costs in terms of foregone sockeye harvest, with a lower gain in king salmon conservation than restrictions applied earlier in the season.

The burden of conservation for king salmon has varied among fisheries (stakeholders), years, and run sizes. The fisheries, as well as the stocks, are somewhat separated in time and along the migratory path which can lead not only to king salmon conservation issues but to unequal burdens for conservation as well.

In small king salmon runs, the sport fishery has typically borne the greater burden of conservation through inseason fishery restrictions in July while current management plans focus on prosecuting the commercial fishery. Inseason closures in particular, as implemented in the sport fishery during 1999 and 2010, represent a very large impact on the guided sport fishery operators. When management allows for pushes of sockeye to move into the escapement in June with the intention of protecting kings and there are no subsequent restrictions to the sport fishery, it could be argued the commercial fishery has borne a greater burden of conservation. In any event, the separation in space and time for when each fishery is restricted can lead to unequal sharing of the conservation burden.

The subsistence fishery has a statutory priority over other fisheries. Reducing the inriver subsistence fishery to less than 7 days per week when the projected escapement falls below 55,000 fish potentially jeopardizes the ability of the fishery to achieve amounts necessary for subsistence (ANS) of salmon.

### *Declines in abundance, size and returns per spawner of king salmon over the past 10 years have raised biological concerns and caused increase fishery restrictions.*

King salmon runs have gotten smaller in recent years, causing an increase in the number and severity of inseason restrictions in the commercial, sport and subsistence fisheries, and resulting the escapement goal not being achieved in several years. Based on existing data, king salmon productivity (returns per spawner) appears to have decreased. King salmon have also been getting smaller in size. Committee members asked how this affects the reproductive potential of a given number of king salmon spawners in terms of egg deposition, and whether the escapement goal needs to take these runs of smaller fish into account.

### *Recent large sockeye salmon runs support a large Bay-wide fleet response and very high harvest rates at a time when king salmon runs are relatively low and cannot afford high harvest rates.*

The recent dynamic produced by the combination of Challenges #4 and #5 together has resulted in both foregone harvest of early season sockeye salmon and has hindered achieving the king salmon escapement goal. It has also exacerbated Challenge #1 above.

In an unfortunate positive feedback effect, recent large sockeye returns to the Nushagak District, have influenced Bay-wide drift boat fleet dynamics that have created unprecedented fleet sizes (>600 drift vessels), which has further increased early season harvest rates over historical rates, and negatively affected any attempts to limit catch of king salmon in the commercial sockeye fishery. To further amplify this phenomenon, late sockeye runs in recent years to Bristol Bay's Eastside districts (e.g., Egegik and Naknek) can attract almost half the entire Bay's drift fleet to the Nushagak District.

### *Clarity in Plan provisions and how they are implemented.*

Several points pertaining to specific provisions of the Plan arose in meeting discussions. First, some felt the basis for the inseason Nushagak River king salmon escapement and inriver abundance projections was not clear. For example, it wasn't clear whether the Plan intended to use *projected* inriver returns in some provisions and *projected* spawning escapement in others, or whether the use of the different terms was intentional. It was also not clear how inseason projections are made, i.e., what data is used in projecting inriver returns and escapement. Committee members also stated that the method for estimating the projected sockeye escapement into the Wood River under NMKSMP provision (e)(1) was not clear, as previously mentioned under Challenge #1.

## What Constitutes Success, Possible Plan Objectives, and Possible Actions to Take

After discussing the fishery challenges faced by the Nushagak River king salmon fisheries at the initial meetings, committee members were asked to discuss **what constitutes success** in their various fisheries; what conditions would need to be met for them to consider the fishery successful? After considering how a successful fishery would be characterized, members were then asked to identify **possible management objectives** that, if implemented, would ideally fulfill the measures of success as identified. Such management objectives could be incorporated into the NMKSMP to help guide more specific actions/provisions that follow. Finally, the groups were asked to identify **possible changes or additions to the NMKSMP** "action" provisions that direct ADF&G to act and that would, in turn, lead to achieving the management objectives previously developed in this process.

In January 2021, the full committee reviewed and revised the lists and descriptions of the Measures of Success, Management Objectives, and Possible Management Plan Actions that had been developed. The measures of success and management objectives described below remain much as they were discussed to the committee's satisfaction at that time.

## *What Constitutes Success in Each Fishery*

### Sport Fishery

*Inriver abundance and catch opportunity.*

Consistent fishing opportunity for king salmon was emphasized as an important attribute of a successful fishery. Consistent inriver abundance, as a given year's run timing allows, is needed to provide the opportunity to catch (and harvest) fish. There was recognition that the pulse nature of the inriver run precludes consistent levels of abundance through all parts of each season, and that natural fluctuations in run size hamper consistent levels of abundance among years. However, abundance as the natural pulses allow are important for a successful fishery. Ideally, success would equate to a catch rate of 2 large king salmon or more per day/angler. The opportunity to catch fish, or fishing success, is just as important and goes together with the next measure toward a achieving a successful fishery.

1. *Predictably open season.*

To provide for consistent opportunity, it is important that the king salmon fishery remain open throughout the 3-4 weeks from mid-June to mid-July. The ability to "have a line in the water" during this time was more critical to success than, for example, achieving high catch rates in all weeks and all seasons. It is important that such an open fishery is predictable and consistent, or could be counted on, both within a season and from season to season. However, an open fishery doesn't, by itself, necessarily result in a successful fishery.

2. *Harvest opportunity.*

Ideally, opportunity for anglers to harvest one or more king salmon (any size) would help to fully define success in this fishery. However, this is not as important as the ability/opportunity to fish for king salmon provided by the first two measures above and is the least important of the three.

### Commercial Fishery

3. *Access to a directed king salmon fishery when a harvestable surplus of king salmon exists.*

The productive capacity of the Nushagak king salmon has in the past and has the potential to support a viable commercial fishery.

4. *Access to available surplus sockeye subject to addressing other concerns, including but not limited to: sustaining the king salmon population, avoiding a line fishery, obtaining escapement throughout the season, attaining allocation goals among gear groups, and ensuring annual harvest rates do not reach excessively high rates (e.g., >85-90%).*
    a. Maximize the value of the salmon catch to harvesters and processors. This was described as taking fish quality, harvesting costs, etc. into account in managing the fishery. Providing fish throughout the district to spread use among fishermen (avoiding a line fishery) and across the season are examples of success in this regard.

5. *The fishery is kept to the traditional fishing area (Nushagak District).*

6. *Achieve sustainable escapement goals among the salmon stocks in the district.*

This will maximize long-term yield and avoid a potential "Stock of Concern" designation by ADF&G and the Board of Fisheries.

Subsistence Fishery

7. *Reasonable opportunity.*

8. *Amounts necessary for subsistence.*

9. *A subsistence priority over other users.*

## *Possible Management Plan Objectives*

Sport Fishery

1. *Provide consistent sport fishing opportunity within and among seasons. This includes a level of inriver abundance as a given year's run timing allows, and a predictably open season.*

Commercial Fishery

2. *Provide a directed commercial king salmon fishery when surplus is available.*

This will require changes to king salmon stock assessment programs to include the production of a robust preseason forecast and inseason and post-season escapement estimates. These, in turn, will require robust estimates of age-specific returns, i.e., brood tables, and improved accounting of the inriver run.

3. *Provide for an uninterrupted commercial sockeye salmon fishery (i.e., minimize disruptions to the sockeye salmon fishery).*

Conducting the early season fishery conservatively will minimize the need for costly late-season king conservation measures. The concept of conservative early season fishing was initially suggested as a separate management objective but later combined here due to its similarity with this objective.

Subsistence Fishery

4. *The department shall manage the commercial and sport fisheries in the Nushagak District as follows: … reasonable opportunity for subsistence harvest of king salmon. Note: This is language currently included in the NMKSMP.*

*5. The subsistence fishery is the last fishery to be closed.*

Biological

*6. Achieve escapement goals for all species in the district.*

While this is a biological objective, it was raised as an important objective for both the sport and commercial fisheries. All felt it imperative to achieve goals and thereby ensure sustained salmon stocks and fisheries. In addition to providing high levels of yield, or production, achieving the inriver goals for Nushagak River king salmon was felt by sport fishery representatives to achieve the measures of success identified above. In other words, achieving the inriver goals generally provides for the consistent inriver abundance needed for a successful fishery.

*7. Maintain a representation of age classes in the escapement similar to the run.*

This is currently implied as an objective in the NMKSMP under subsection (b)(2). It was generally discussed to be relative to a given year's run (i.e., strive to achieve an age and size composition in the escapement that is similar to the return to the district). Committee members believed that it was not intended to be used to strive to achieve historical age class representations in a given year (i.e., differentially harvest specific ages in a given year's return to match the historical or average age compositions in the escapement).

## *Possible Management Plan Actions, with Consensus*

By early 2021, after the lists and descriptions of fishery challenges, measures of success, and management objectives had generally been accepted by the committee, work focused directly on clarifying possible regulatory management actions needed to achieve the management objectives. At the February 2020 meeting the committee discussed 14 possible management actions that had been developed and made an initial attempt at identifying actions with (a) strong agreement with little need for additional information, (b) agreement on intent but need more information, and (c) disagreement.

Subsequent meetings continued to focus on possible management actions with an intent to achieve consensus on as many of actions as possible. BBSRI provided technical information on certain topics, particularly management triggers and mesh size effects, to inform and address questions raised by the committee (Appendix D). All action items were discussed further. Some were combined, others were revised, and levels of consent by individual members changed over time for some actions. By April, a total of 12 actions had been identified and discussed.

Below are seven regulatory action items for which there was consensus among the committee as of April 7, 2022. These actions numbered 1-7 would fall under the Nushagak River King Salmon Management Plan, except where otherwise labeled. The committee examined five other actions in detail but failed to reach consensus on them being advanced as committee recommendations. These without consensus actions are described in a later section of this report.

Commercial Fishery

*1. Manage large sockeye runs so that escapements fall in the upper portion of the escapement goal range (Table 1), which would reduce incidental catch of king salmon*

(X) Consistent with 5 AAC 06.367 Nushagak District Commercial Set and Drift Gillnet Sockeye Salmon Fisheries Management and Allocation Plan, the department in an attempt to conserve king salmon shall manage for sockeye escapements in the Nushagak District to fall within the

(1) lower half of the escapement goal range when the Wood River sockeye salmon run is 8 million or less and/or the Nushagak sockeye salmon run is 4 million or less, or the

(2) upper half of the escapement goal range when the Wood River sockeye salmon run is greater than 8 million and/or the Nushagak sockeye salmon run is greater than 4 million based on the preseason forecast and in-season assessment of run size.

(X) On or after June 25, the department shall consider when evaluating total run of sockeye salmon to the Nushagak District all possible data sources including but not limited to: pre-season forecast, Port Moller test fishery indices and stock and age composition, total C+E to date, age composition of C&E and district test fishing.

Table 1. Sustainable Escapement Goals (SEGs) for the Nushagak District sockeye salmon stocks, and intent of ammendments to the sockeye plan by the Board of Fisheries regulation in March 2015, in thousands of fish. The last two coloumns show the differences in the management target across small (below average) and large (above average) returns in thousands of fish. Adhering to the Board intent and regulatory change in large sockeye runs results in an 470,000 larger escapement target than using the entire SEG range (275,000 of these due to a large Wood River run alone).

| | ADF&G Adopted Sustainable Escapement Goal (SEG), March 2015 | Board of Fisheries, March 2015 - Plan Modification Intent; Goal Range for Small and Large runs | | Difference in Midpoint Target between Small and Large Runs | Difference in EG Target from ***Single EG range*** vs Abundance-based EG | |
|---|---|---|---|---|---|---|
| Stock | **Entire SEG Range** | Lower half of EG range | Upper half of EG range | | ***Small Runs*** | ***Large Runs*** |
| **Wood River** | | | | | | |
| Lower | 700 | 700 | 1,250 | | | |
| Upper | 1,800 | 1,250 | 1,800 | | | |
| Mid-point | 1,250 | **975** | **1,525** | **550** | ***-275*** | ***275*** |
| **Nushagak River** | | | | | | |
| Lower | 370 | 370 | 635 | | | |
| Upper | 900 | 635 | 900 | | | |
| Mid-point | 635 | **503** | **768** | **265** | ***-133*** | ***133*** |
| **Igushik River** | | | | | | |
| Lower | 150 | 150 | 275 | | | |
| Upper | 400 | 275 | 400 | | | |
| Mid-point | 275 | **213** | **338** | **125** | ***-63*** | ***63*** |
| Sum of midpoints | 2,160 | 1,690 | 2,630 | **940** | **-470** | **470** |

*2. Use a Nushagak District Test Fishery to assess relative abundance of sockeye and king salmon*

(X) From June 1 through June 30 the department in an attempt to conserve king salmon shall conduct a drift gillnet test fishery to assess the abundance of sockeye and king salmon prior to opening by emergency order a fishing period directed at sockeye salmon.

*3. Modify/Clarify the Wood River trigger and establish a Nushagak River trigger*

(X) close, by emergency order, the sockeye salmon commercial fishery in the Nushagak District until the projected sockeye salmon escapement past the Wood River tower exceeds 100,000 within the next 12 hours if the forecasted Wood River sockeye run is 8 million or less. If the Wood River sockeye run is forecasted to be more than 8 million the fishery shall close by emergency order until the projected sockeye salmon escapement past the Wood River tower exceeds 300,000 within the next 12 hours.

(X) close, by emergency order, the sockeye salmon commercial fishery in the Nushagak District until the projected sockeye salmon escapement past the Nushagak River sonar counter exceeds XXXXXX if the forecasted Nushagak River sockeye run is XXXXXXX. If the Nushagak River sockeye run is forecasted to be more than XXXXXX the fishery shall close by emergency order until the projected sockeye salmon escapement past the Nushagak River sonar counter exceeds XXXXXX.

*4. Provide a directed commercial fishery for King Salmon when surplus clearly exists*

(c) If the total inriver king salmon return in the Nushagak River is projected to exceed 95,000 fish, the department will consider a directed commercial king salmon fishery, and the guideline harvest level described in (b) (1) (C) of this section does not apply.

Sport Fishery

*5. Modify/reduce the annual limit for king salmon.*

*5 AAC 67.022. Special provisions for season, bag, possession, and size limits, and methods and means in the Bristol Bay Area.*

(g) In the Nushagak River drainage, excluding the Wood River drainage, and unless otherwise specified in 5 AAC 06.361 or 5 AAC 06.368, the following special provisions apply:

(1) the bag and possession limit for king salmon 20 inches or greater in length is two fish, of which only one fish may be 28 inches or greater in length; the annual limit for king salmon 20 inches or greater in length is four fish, ***of which only one fish may be 28 inches or greater in length***; the bag and possession limit for king salmon less than 20 inches in length (jack salmon) is five fish; …

after taking and retaining a bag limit of king salmon 20 inches or greater in length, a person may not sport fish with bait for the remainder of that day in the Nushagak River drainage, excluding the Wood River drainage;

*5 AAC06.361 Nushagak-Mulchatna King Salmon Management Plan*

(c) if the inriver return of king salmon in the Nushagak River is projected to exceed 95,000 fish,

(1) the guideline harvest level described in (b)(1)(C) of this section does not apply, and

**(X)** ***the commissioner may increase the annual limit for king salmon to 4 king salmon 20 inches or longer (no restriction to one fish over 28 inches)***

*6. Avoid complete closures of the sport fishery when possible.*

(e) (2) shall: restrict to catch and release, by emergency order, the sport fishery for king salmon in the Nushagak River and prohibit the use of bait for fishing for all species of fish until the end of the king salmon season specified in 5 AAC 67.020 and 5 AAC 67.022(g)

Subsistence Fishery

*7. Provide the department with flexibility to restrict but not close the subsistence fishery in low inriver run scenarios and standardize subsistence fishing schedule and area under a restricted scenario.*

(e)(3) may establish, by emergency order, fishing periods during which the subsistence fishery is restricted to 3 days per week in the Nushagak District; and the waters above the district including Dillingham beaches, Wood River up to Red Bluff, and the Nushagak River drainage.

## *Management Plan Actions Considered, with No Consensus*

This list includes five items discussed by the committee for which consensus was not achieved.

Commercial Fishery

*1. Restrict mesh size in regulation to better conserve king salmon and exploit sockeye salmon*

From June 1 through July 10 in the Nushagak District gillnets may not exceed four and three-quarters inches for the protection of king salmon unless superseded by the commissioner. However, if the total inriver king salmon return in the Nushagak River is projected to exceed 75,000 fish, the mesh size restriction in (b) (5) (NEW) of this section does not apply. Such a restriction may more effectively target sockeye salmon, thereby decreasing fishing time overall with conservation benefits to king salmon. However, it may also skew the size composition of specific sockeye salmon age classes.

*2. Better adhere to existing regulations and/or Modify the Nushagak District Allocation Plan to make clearer a priority for escapement of sockeye and king salmon.*

Further emphasize that king salmon escapement takes priority over the Nushagak District drift and set net allocation plan, especially in June. This could be done by modifying the Nushagak-Mulchatna King Salmon Management Plan to reiterate the existing priority of managing for escapement over allocation (Sustainable Salmon Fishery Policy, SSFP, 5 AAC 39.222). This might allow the commercial fishery to target sockeye and reduce incidental catch of king salmon more effectively. However, how, specifically, such a measure would be implemented by managers

was not known and, as a result, effects to the fishery and the salmon stocks were also uncertain.

*3. Mitigate Bay-wide Fleet Dynamics that Exacerbate early season harvest rates in the Nushagak District by modifying the Transfer Period.*

Under #5 of the fishery challenges, it was pointed out that the recent large sockeye salmon runs attract a large drift fleet early in the season and support very high harvest rates at a time when king salmon are present, and runs are relatively low (and cannot afford a high harvest). It may be possible to mitigate the total number of registered drift boats early in the season by amending the Registration/Reregistration regulation (5AAC 06.370) to extend the waiting period to transfer into and/or out of the Nushagak District during the E.O. period beyond the current 48 hours. Lengthening the time that a vessel must wait to either enter or exit the Nushagak District might deter some in the fleet from participating in the district in June, allowing the fishery to take smaller bites out of the sockeye run and prevent unwarranted very high harvest rates. However, effects on fleet dynamics were uncertain and there was some risk the action may negatively affect king salmon by inadvertently increasing fishing effort by discouraging some vessels to leave when they might otherwise have left under the 48-hour.

*4. Reduce and Mitigate Continuous Commercial Fishing in the Nushagak District where possible*

Continuous commercial fishing was described as fishing from a certain point in time when the commercial fishery is opened to drift nets, set nets, or both gear types until further notice for the remainder of the season. This is often prompted in the Nushagak District on or after July 10 in recent years when the sockeye goals were either attained or about to be. Restricting the frequency and length of fishing periods through regulatory language could move kings and to some extent, sockeye into the river which could improve the quality of escapement and possibly the in-river abundance. However, how, specifically, such a measure would be implemented was not clear and, as a result, effects to the fishery and the salmon stocks were also uncertain.

<u>General</u>

*5. Keep all Non-Subsistence Fisheries closed until the king salmon escapement goals have been met.*

It was understood by the committee that meeting the needs (ANS) of the subsistence fishery is the priority in managing the harvest of salmon in Bristol Bay. During discussions it was proposed that to ensure a reasonable opportunity be provided to the participants in the subsistence fishery all non-subsistence fisheries should be closed until the king salmon escapement goal has been met. Such a regulation would substantially impact other user groups (commercial and sport fishing) by reducing opportunity to either participate in a fishery and/or be able derive an income. Others on the committee believed such an extreme measure was not necessary. They asserted that conservation measures and escapement can be addressed without a complete closure of the sport and commercial fisheries until, say early July in at least some years.

## Proposed Regulatory Changes

On behalf of the Committee, the Study Team submitted a proposal to the Board of Fisheries in April 2022 (Appendix E) to modify the Plan by directly inserting the management objectives and regulatory actions with consensus above. The relationships among the actions, management objectives, and measures of success are presented in Figure 2.

| Management Objective | Possible Action(s) that Help Achieve the Objective | Measure(s) of Success Desired for Each Management Objective |
|---|---|---|
| 1-Provide consistent (sport) fishing opportunity within and among seasons. | 6-Avoid complete closures of the sport fishery when possible.<br><br>*NOTE: Actions listed under Objective 6 (Achieve escapement goals) help achieve this Management Objective).* | 1-Inriver abundance and catch opportunity.<br><br>2-Predictably open season.<br>3-Harvest opportunity. |
| 2-Provide a directed (commercial) king salmon fishery when surplus is available. | 4-Provide a directed commercial fishery for king salmon when surplus clearly exists. | 4-Access to a directed (commercial) king salmon fishery when a harvestable surplus of king salmon exists. |
| 3-Provide for an uninterrupted (commercial) sockeye salmon fishery (i.e. minimize disruptions to the sockeye salmon fishery). | 1-Manage large sockeye runs so that escapements fall within the upper half of the escapement goal range.<br><br>2-Use a Nushagak District Test Fishery to assess relative abundance of sockeye<br><br>3-Modify/clarify the Wood River trigger and establish a Nushagak River trigger. | 5-(Commercial) access to all available surplus sockeye subject to addressing other concerns, including but not limited to: sustaining the king salmon population, avoiding a line fishery, obtaining escapement throughout the season, attaining allocation goals among gear groups, and ensuring annual harvest rates do not reach excessively high rates (e.g. >85-90%).<br>6-The (commercial) fishery is kept to the regular district, i.e. use of the WRSHA is avoided to the extent practical. |
| 4-…manage the commercial and sport fisheries in the Nushagak District … (for) reasonable opportunity for subsistence harvest of king | 7. Provide the department with flexibility to restrict but not close the subsistence fishery in low inriver run scenarios, and standardize subsistence fishing schedule and area under a restricted scenario.<br>*NOTE: Actions listed under Objective 6 (Achieve escapement goals) help achieve this Management Objective).* | 8-Reasonable (subsistence) opportunity.<br><br>9-Amounts necessary for subsistence. |
| 5- The subsistence fishery is the last fishery to be closed. | 7. Provide the department with flexibility to restrict but not close the subsistence fishery in low inriver run scenarios, and standardize subsistence fishing schedule and area under a restricted scenario.<br>*NOTE: Actions listed under Objective 6 (Achieve escapement goals) help achieve this Management Objective).* | 10-A subsistence priority over other users. |
| 6-Achieve escapement goals for all species in the district. | 1-Manage large sockeye runs so that escapements fall within the upper half of the escapement goal range.<br>2-Use a Nushagak District Test Fishery to assess relative abundance of sockeye<br>3-Modify/clarify the Wood River trigger and establish a Nushagak River trigger.<br>5-Modify/reduce the annual limit for king salmon | 1-Inriver abundance and catch opportunity.<br>2-Predictably open season.<br>3-Harvest opportunity.<br>5-(Commercial) access to all available surplus sockeye subject to addressing other concerns, including but not limited to: sustaining the king salmon population, avoiding a line fishery, obtaining escapement throughout the season, attaining allocation goals among gear groups, and ensuring annual harvest rates do not reach excessively high rates (e.g., >85-90%).<br>7-Achieve sustainable escapement goals among the salmon stocks in the district.<br>8-Reasonable (subsistence) opportunity.<br>9-Amounts necessary for subsistence.<br>10-A subsistence priority over other users. |
| 7-Maintain a representation of age classes in the escapement similar to the run. | 1-Manage large sockeye runs so that escapements fall within the upper half of the escapement goal range.<br>2-Use a Nushagak District Test Fishery to assess relative abundance of sockeye | |

*Figure 2.- Relationships of Management Objectives, Actions that help achieve each Management Objective, and Measures of Success desired for each Management Objective.*

## Non-Regulatory Recommendations

There are some substantial limits to what changes in the management Plan can do to improve king salmon management and the fisheries that depend on them. During deliberations of fishery challenges and subsequent topics, the committee identified information needed to improve management of king salmon in the Nushagak District but that are outside the regulatory scope of the Plan.

In ways, fulfilling these information needs offer greater potential to improve the fisheries than modifications to the Plan. Some on the committee felt that these things need to *precede* any Plan changes and that as long as these issues remain, the Plan will remain largely ineffective at achieving success in the fishery. Early in the process the committee identified the following as tasks and information needs for improved management. These needs will be fleshed out in further detail in a separate report.

1) Robust enumeration of king salmon catch and escapement.
   a) Accurate inseason estimate of the inriver run of king salmon. Current gillnet apportioned sonar counts are thought to be an index of abundance but ground truthing efforts show that the sonar program does not consistently index the inriver run.
      i) Address shortcomings of the current sonar program design.
   b) Accurate post-season estimates of age-specific king salmon escapement.
   c) Improved catch accounting that better estimates/explicitly takes into account:
      i) the commercial home pack,
      ii) processor reporting inconsistencies,
      iii) catch and release mortality in the sport fishery,
      iv) sport fishery catch and harvest estimation considering the recently eliminated guide logbooks.
   d) Age composition estimates for harvests in each fishery.

2) Use non-sonar indices of abundance for the inriver run, such as guided sport fishing catch rates, which are not currently used or included in the Plan.

3) Robust/defensible escapement goal for Nushagak king salmon. This requires a robust assessment program to build useful brood tables (accurate age-specific catch and escapement).
   a) Preseason king salmon forecasts would help to better guide early season fishing in all fisheries.

4) Funding for the assessment program is inadequate relative to the intensity and value of management of king and sockeye salmon in the district.

5) Monitor and maintain spawning and rearing habitat.

6) A better understanding of what drives king salmon abundance, and whether escapement goals in the current regime can be improved and preseason forecasts can be made
   a) Age-specific escapement levels versus subsequent returns; the effects of changes body size of escapement and freshwater and marine survival.
      i) Smolt enumeration program
      ii) Early ocean survival monitoring (e.g., Yukon River kings).

# Appendices

# Appendix A. 2018 Bristol Bay Board of Fisheries Meeting Proposals

## *Proposal #41 - 5 AAC 06.361. Nushagak-Mulchatna King Salmon Management Plan.*

Reduce fishing time in the Nushagak District commercial salmon fishery when the Nushagak River sport fishery is restricted for king salmon conservation, as follows:

Nush Chinook Option 1

When the Nushagak Chinook run is not meeting minimums and the Sport Fishing user group has in season Emergency Orders for stepping down (example: no bait, catch and release, or closures), then the Commercial fishery must also participate in the conservation effort for protecting the Chinook run. The ComFish Department shall not open the Nushagak district to more than 12 hours time total of commercial drift and set fishing in a 24 hour period when the Department has issued EO's restricting the sport fishing user group. The department can break the 12 hours up into two 6 hour openers or any other combination as long as the open commercial fishing time does not total more than 12 hours in a 24 hour period. Additionally, the Department shall not run two 12 hour openers back to back--meaning there can not be a 12 hour opener starting at 12:00 Noon and ending at Mid-night and then another opener starting at 12:00 Midnight and running to 12:00 Noon. The Drift and Set user group openings do not have to be at the same time periods. However, the total for each group cannot exceed 12 hours each when the Sport Fish EO's are in place. Thus, Drift could be open for 12 straight hours from 1:00 AM to 1:00 PM and Set could be open from 3:00 AM to 9:00 AM and again from 4:00 PM to 10:00 PM. The definition of a 24 hour period would start at 12:00 Midnight and end at 11:59 PM on that same day. Once the Sport Fish biologist removes all EO's restricting effort of the Sport Fishing user group in the district the Commercial openings can go back to as directed by the ComFish Biologist with no time restrictions.

**What is the issue you would like the board to address and why?** The burden of conservation of the Nushagak Chinook Salmon run is 100% on the shoulders of the Sport Fishing industry. There are efforts made by Com Fish with mesh sizing that try to eliminate the by-catch of Chinook when targeting sockeye but there is still a large enough by-catch that it has an impact on the fishery. Sport Fish is not trying to prevent the Com Fish industry from catching sockeye and making a living. The impact on the number of Chinook making it in river is immediately diminished when commercial openers happen. This is not intended by the Com Fisher, but it happens. We need help in preserving the Nushagak Chinook run. When the Chinook run falls below acceptable escapement numbers, the sport fishery is restricted or potentially closed, yet com fish openings remain aggressive. The commercial fishery in the Nushagak district, although targeting sockeye, certainly has a by-catch or interception of Chinook bound for the Nushagak. At low estimates of 3 Chinook intercepted per vessel in a 12 hour opener and 400 vessels in the district we are talking about 1,200 Chinook. Many times the district is open for 23.5 or 24 hour periods thus hitting both tides and intercepting double that amount per day--2,400 Chinook in our example. That equates to 16,800 Chinook harvested via by-catch in one 7 day period. The Board is encouraged to take preventive measures to ensure that the Nushagak Chinook run survives.

**PROPOSED BY:** Brian Kraft **(** EF-F18-067)

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## *Proposal #42 - 5 AAC 06.361. Nushagak-Mulchatna King Salmon Management Plan.*

Reduce fishing time in the Nushagak District commercial salmon fishery when the Nushagak River sport fishery is restricted for king salmon conservation, as follows:

Nush Chinook Option #2

When the Sport Fishing user group has had effort reduced by in-season EO's that restrict the group (ex: no bait, catch and release, closures, etc) Com Fish Biologist shall not permit Commercial Fishing, Drift or Set, on two consecutive high tides. Once the EO's are in force and restrictions applied to the Sport Fishing user group and the Com Fishers have fished a high tide, the district shall close to all commercial fishing 4 hours prior to the next published high tide at Clark's Point. The district can reopen 4 hours after that published high tide at Clark's Point.

**What is the issue you would like the board to address and why?** The burden of conservation of the Nushagak Chinook Salmon run is 100% on the shoulders of the Sport Fishing industry. There are efforts made by Com Fish with mesh sizing that try to eliminate the by-catch of Chinook when targeting sockeye but there is still a large enough by-catch that it has an impact on the fishery. Sport Fish is not trying to prevent the Com Fish industry from catching sockeye and making a living. The impact on the number of Chinook making it in river is immediately diminished when commercial openers happen. This is not intended by the Com Fisher, but it happens. We need help in preserving the Nushagak Chinook run. When the Chinook run falls below acceptable escapement numbers, the sport fishery is restricted or potentially closed, yet com fish openings remain aggressive. The commercial fishery in the Nushagak district, although targeting sockeye, certainly has a by-catch or interception of Chinook bound for the Nushagak. At low estimates of 3 Chinook intercepted per vessel in a 12 hour opener and 400 vessels in the district we are talking about 1,200 Chinook. Many times the district is open for 23.5 or 24 hour periods thus hitting both tides and intercepting double that amount per day--2,400 Chinook in our example. That equates to 16,800 Chinook harvested via by-catch in one 7 day period. The Board is encouraged to take preventive measures to ensure that the Nushagak Chinook run survives.

**PROPOSED BY:** Brian Kraft **(** EF-F18-068)

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# Appendix B. 2018 Bristol Bay Board of Fisheries Meeting Record Copies (RCs)

*RC51 – Proposed language for Proposal 41 submitted by the Board at the request of Board member Payton*

*RC69 – Report on the "Effectiveness of Gillnet Mesh Sizes…" prepared by Raborn and Link (BBSRI)*

*RC80 – Recommendations regarding Proposals 41, 42 and 43 submitted by Link (BBSRI)*

*RC84 – Document describing concerns and outlining steps submitted by ADF&G at the request of Board member Ruffner*

*RC86 – Board of Fisheries charge statement for the Nushagak-Mulchatna king salmon management plan committee (2018-291-FB)*

PC53

RC 51

Submitted by the Alaska Board of Fisheries at the request of Board Member Israel Payton
November 30, 2018

Proposed language for proposal 41:

**5 AAC 06.361. Nushagak-Mulchatna King Salmon Management Plan.**

(a) The purpose of this management plan is to ensure biological spawning escapement requirements of king salmon into the Nushagak-Mulchatna river systems. It is the intent of the Alaska Board of Fisheries (board) that Nushagak-Mulchatna king salmon be harvested in the fisheries that have historically harvested them. This management plan provides guidelines to the department in an effort to preclude allocation conflicts between the various users of this resource. The department shall manage Nushagak-Mulchatna king salmon stocks in a conservative manner consistent with sustained yield principles and the subsistence priority.

(b) The department shall manage the commercial and sport fisheries in the Nushagak District as follows:

(1) to achieve an inriver goal of 95,000 king salmon present in the Nushagak River upstream from the department sonar counter; the inriver goal provides for

(A) a biological escapement goal of 55,000 - 120,000 fish;

(B) reasonable opportunity for subsistence harvest of king salmon; and

(C) a king salmon sport fishery guideline harvest level of 5,000 fish, 20 inches or greater in length;

(2) in order to maintain a natural representation of age classes in the escapement, the department shall attempt to schedule commercial openings to provide pulses of fish into the river that have not been subject to harvest by commercial gear;

(3) the department may close the commercial drift or set gillnet fishery if the harvest in the directed commercial king salmon fishery for either gear group is more than two sockeye salmon for every one king salmon.

(c) If the total inriver king salmon return in the Nushagak River is projected to exceed 95,000 fish, the guideline harvest level described in (b)(1)(C) of this section does not apply.

(d) If the spawning escapement of king salmon in the Nushagak River is projected to be more than 55,000 fish and the projected inriver return is less than 95,000 fish, the commissioner

(1) shall close, by emergency order, the directed king salmon commercial fishery

in the Nushagak District; during a closure under this paragraph, the use of a commercial gillnet with webbing larger than five and one-half inches in another commercial salmon fishery is prohibited;

(2) [IF THE PROJECTED INRIVER RETURN OF KING SALMON IN THE NUSHAGAK RIVER IS AT LEAST 70,000, BUT LESS THAN 95,000 FISH, AND TO ENSURE THAT THE SPORT FISHERY GUIDELINE HARVEST ESTABLISHED IN (B)(2)(C) OF THIS SECTION IS NOT EXCEEDED, SHALL ESTABLISH, BY EMERGENCY ORDER, A DAILY BAG LIMIT OF ONE FISH PER DAY, ONE IN POSSESSION, FOR KING SALMON 20 INCHES OR GREATER IN LENGTH;] **Repealed.**

(3) [IF THE PROJECTED INRIVER RETURN OF KING SALMON IN THE NUSHAGAK RIVER IS LESS THAN 70,000 FISH, AND TO ENSURE THAT THE PROJECTED SPAWNING ESCAPEMENT DOES NOT FALL BELOW 55,000 FISH, SHALL ESTABLISH, BY EMERGENCY ORDER, FISHING PERIODS TO RESTRICT THE KING SALMON SPORT FISHERY IN THE NUSHAGAK RIVER DURING WHICH ANY, OR A COMBINATION OF THE FOLLOWING RESTRICTIONS MAY BE APPLIED AT THE DISCRETION OF THE COMMISSIONER:

(A) REDUCTION OF BAG AND POSSESSION LIMITS

(i) FROM TWO TO ONE FISH 20 INCHES OR GREATER IN LENGTH; AND

(ii) IF NECESSARY, FROM ONE FISH TO NONRETENTION OF KING SALMON; IF A NONRETENTION FISHERY FOR KING SALMON IS ESTABLISHED UNDER THIS PARAGRAPH, THE USE OF BAIT FOR FISHING FOR ALL SPECIES OF FISH WILL BE PROHIBITED UNTIL THE END OF THE KING SALMON SEASON SPECIFIED IN 5 AAC 67.020 AND 5 AAC 67.022(G);

(B) A SEASONAL LIMIT OF UP TO FOUR FISH 20 INCHES OR GREATER IN LENGTH;

(C) PROHIBITION OF THE USE OF BAIT;

(D) REDUCTIONS IN THE TIME OR AREA FOR FISHING;

(E) A CLOSURE OF THE KING SALMON SPORT FISHERY DURING WHICH THE USE OF BAIT FOR FISHING FOR ALL SPECIES OF FISH WILL BE PROHIBITED UNTIL THE END OF THE KING SALMON SEASON SPECIFIED IN 5 AAC 67.020 AND 5 AAC 67.022(g).] **Repealed.**

(e) If the spawning escapement of king salmon in the Nushagak River is projected to be

less than 55,000 fish, the commissioner

(1) shall close, by emergency order, the sockeye salmon commercial fishery in the Nushagak District until the projected sockeye salmon escapement into the Wood River exceeds 100,000 fish;

(2) shall close, by emergency order, the sport fishery in the Nushagak River to the taking of salmon and prohibit the use of bait for fishing for all species of fish until the end of the king salmon season specified in 5 AAC 67.020 and 5 AAC 67.022(g); and

(3) shall establish, by emergency order, fishing periods during which the time or area is reduced for the inriver king salmon subsistence fishery in the Nushagak River.

(f) Notwithstanding 5 AAC 06.200, in a directed king salmon commercial fishery, the southern boundary of the Nushagak District is a line from an ADF&G regulatory marker located at Etolin Point at 58° 39.37' N. lat., 158° 19.31' W. long., to 58° 33.92' N. lat., 158° 24.94' W. long. to Protection Point at 58° 29.27' N. lat., 158° 41.78' W. long.

(g) During a directed king salmon commercial fishery in the Nushagak District, drift gillnet and set gillnet fishing periods will be of equal length, but do not have to be open concurrently.

# Effectiveness of Gillnet Mesh Sizes in the Nushagak District Commercial Sockeye Fishery Based on Selectivity Curves Developed from the Port Moller Test Fishery

Prepared by

Dr. Scott Raborn and Michael Link
Bristol Bay Science and Research Institute
November 29, 2018

## Conclusion

Restricting mesh size in the Nushagak District to a maximum of 4¾" when targeting Sockeye Salmon can be expected to:

- increase the average annual Sockeye catch from the Nushagak District,
- lessen the frequency and magnitudes of over-escapement events to the Wood River,
- decrease the vulnerability of King Salmon to Sockeye gear, and
- decrease the use of the WRSHA.

These benefits would be most significant in years when there is a large contrast in the age of returns to the Wood and Nushagak rivers. By increasing the harvest rate on the Wood River fish in the district, we should expect that in at least some years less fishing time would be needed for a given harvest level. Less fishing effort in the district can only decrease bycatch of non-target species. In addition, vulnerability of King Salmon in the Sockeye fishery will only fall with decreasing mesh size.

## Introduction

The retention rate of salmon in gillnets is affected by the body size of the fish relative to the mesh size to which it is exposed. Mesh-specific selectivity curves quantify the retention rates (sometimes called "relative selectivity") of fish varying in body size. Beginning in 2009, the Bristol Bay Science and Research Institute (BBSRI) began conducting research on gillnet selectivity at the Port Moller Test Fishery (PMTF). Based on this research, the traditional gillnet used at Port Moller was changed in 2011 from four 50 fathom shackles of 5⅛" mesh to four shackles alternating between 4½" and 5⅛" mesh. This change was made because 5⅛" mesh selects for 3-ocean fish over 2-ocean fish at a ratio of about 1.4:1. Conversely, the smaller 4½" mesh selects 2-ocean fish over 3-ocean fish at a ratio of about 1.2:1. Aside from offsetting the age composition bias in the PMTF catches, the addition of the smaller mesh allowed for the estimation of contact selectivity curves for various mesh sizes. That is, for any given mesh size the relative selectivity across fish lengths can be estimated, and the fish length for which it is most selective can be determined (relative selectivity is then set to one for this size). Moreover, selectivity can be estimated for any age or stock for which the length frequency distribution is available. For this exercise, the average shaped selectivity curve based on PMTF data 2009-2018 was used to approximate performances of varying mesh sizes on stocks in the Nushagak District commercial fishery.

During years dominated by 2-ocean fish to the Wood River (e.g., 2018), tailoring mesh size to maximize efficiency in catching smaller fish may help to increase Sockeye Salmon catch, lessen over-escapement, reduce the amount of fishing time in the district, and reduce the frequency of being restricted to the Wood River Special Harvest Area (WRSHA). In addition, using a similar mesh size for 2-ocean fish during runs dominated by 3-ocean fish may have little risk of reducing the fleet's efficiency due to the shape of the selectivity curve (we expound on this idea below).

Objective

Assess how catches, exploitation rates, and escapements vary across mesh sizes for each stock in the Nushagak District for years contrasting in run size and age composition.

Methods

The average PMTF selectivity curve was applied to the 2011 and 2018 Nushagak runs. These two recent runs provide a strong contrast in the age- and size-composition. For each year, the most likely mesh that was used by the fleet was determined by adjusting the mesh size and exploitation rate until simulated and observed escapements matched. Subsequently, 4½", 4¾", and 5" mesh sizes were applied to estimate how fishery metrics (age-specific catch and escapement) would have changed across Nushagak District stocks for both years.

Results and Discussion

The 2011 run totaled 6.8 million and was comprised of 71% 3-ocean fish; in 2018 the run was 33.8 million with 32% being ocean age 3. In both years, Igushik and Nushagak stocks were dominated by 3-ocean fish, whereas this component was largely absent for the Wood River stock in 2018 (see Figure 1 for length distributions by stock and year overlaid with various selectivity curves). Interestingly, differences in catches across meshes were greatest for the Wood River stock in 2018.

Overall catch was estimated to have been greater for 5" versus 4½" mesh in 2011 and while this pattern reversed in 2018, the differences were not the same (Figure 2). In 2011, switching from 4½" to 5" mesh would increase catch by about 394 thousand or 9%; switching from 5" to 4½" mesh would increase catch by about 6.5 million or 32%. Mesh sizes to maximize catch were estimated to be 4¾-5" and 4½" in 2011 and 2018, respectively. Not surprisingly, the average mesh size used by the fleet was estimated to be close to 4¾" in both years. As this estimate is an average, one should not interpret this result to mean that every fisher was using this mesh size. In reality, mesh sizes likely ranged from 4½" to 5¼" (anecdotal reports indicate this to be the approximate range, but no official records were available).

Exploitation rates were more consistent across meshes within stock-year combinations more evenly split between ocean ages (Figure 3). The greatest differences occurred for the 2011 Nushagak stock (96% 3-ocean) and 2018 Wood River stock (4% 3-ocean) but were more pronounced for the latter. Exploitation changed more between 4¾" and 5" mesh than between 4¾" and 4½" mesh. This result occurred because of the shape of the selectivity curve and the differences in where small versus large fish are caught. The three modes on the selectivity curve going from right to left correspond to fish being (1) tangled around their head, (2) gilled just behind the gill plates, or (3) wedged between the gill plates and the dorsal fin (Figure 4). The curve descends faster on the left side causing small fish to be missed by larger meshes at a greater proportion than large fish are missed by smaller meshes. Consequently, a smaller mesh (say, 4½") will miss proportionately fewer fish in a 3-ocean dominated year than will a larger mesh (5" or 5⅛") in a 2-ocean dominated year.

Finally, using 4½" mesh in 2018 would have reduced over-escapement to the Wood River by about 3.5 million compared to what was observed (Figure 5).

As mentioned above, the fleet utilizes a range of mesh sizes and requiring a single mesh size would not be feasible without imposing undue economic hardship. Some fishers will inherently switch to smaller

mesh sizes given that they have the gear available and a proportionately larger 2-ocean component is anticipated. Others may stay with larger gear because smaller gear is unavailable or because they believe targeting 3-ocean fish will high-grade their catch and increase overall profit. At any rate, the average mesh size tends to be around 4¾". The results from this exercise indicate that capping mesh size at 4¾" will stop large 2-ocean Wood River runs more efficiently and pose little risk of missing 3-ocean runs. Some fishers will want to fish even smaller gear, but the idea is simply to truncate the upper end of the mesh size distribution to better prosecute the fishery.

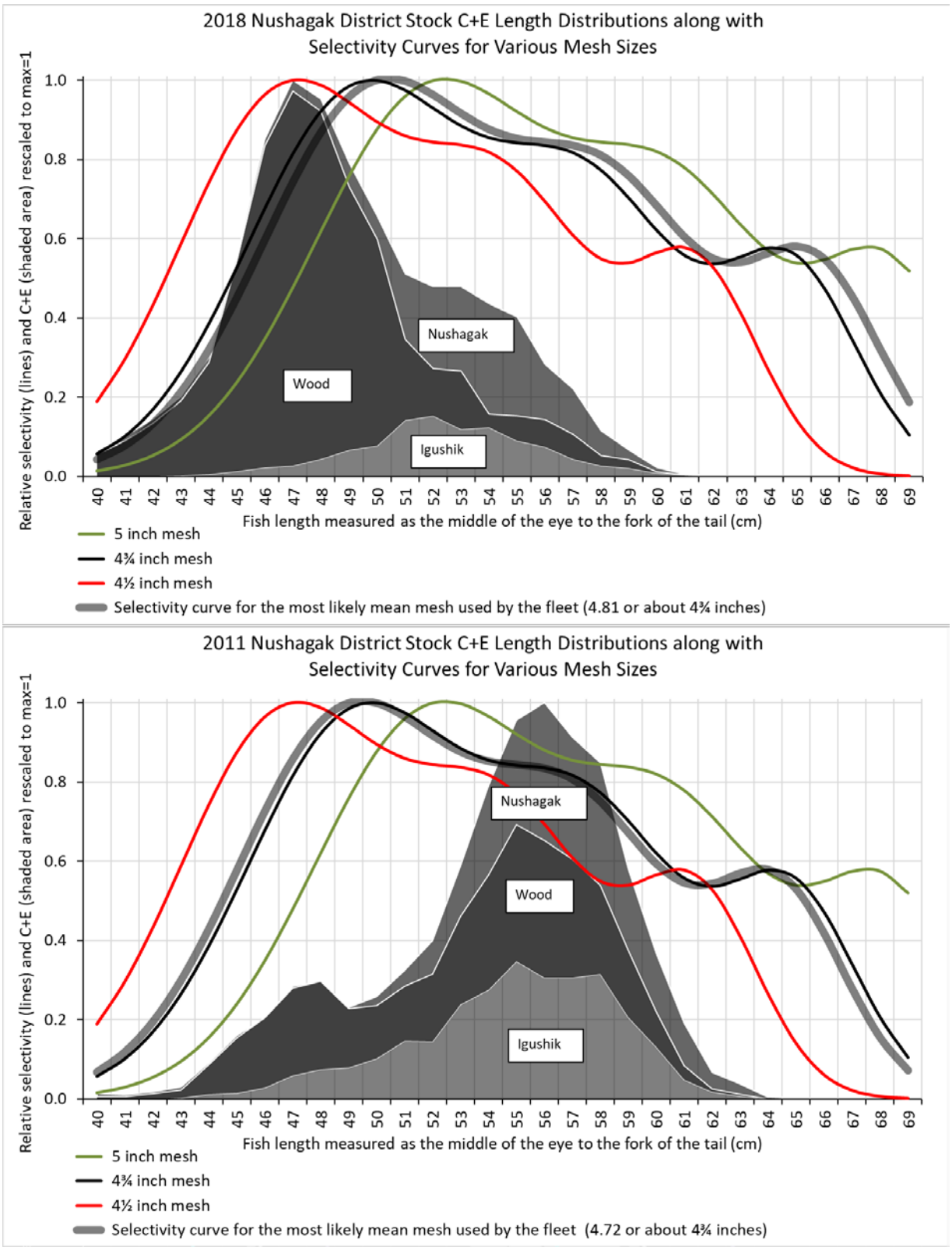
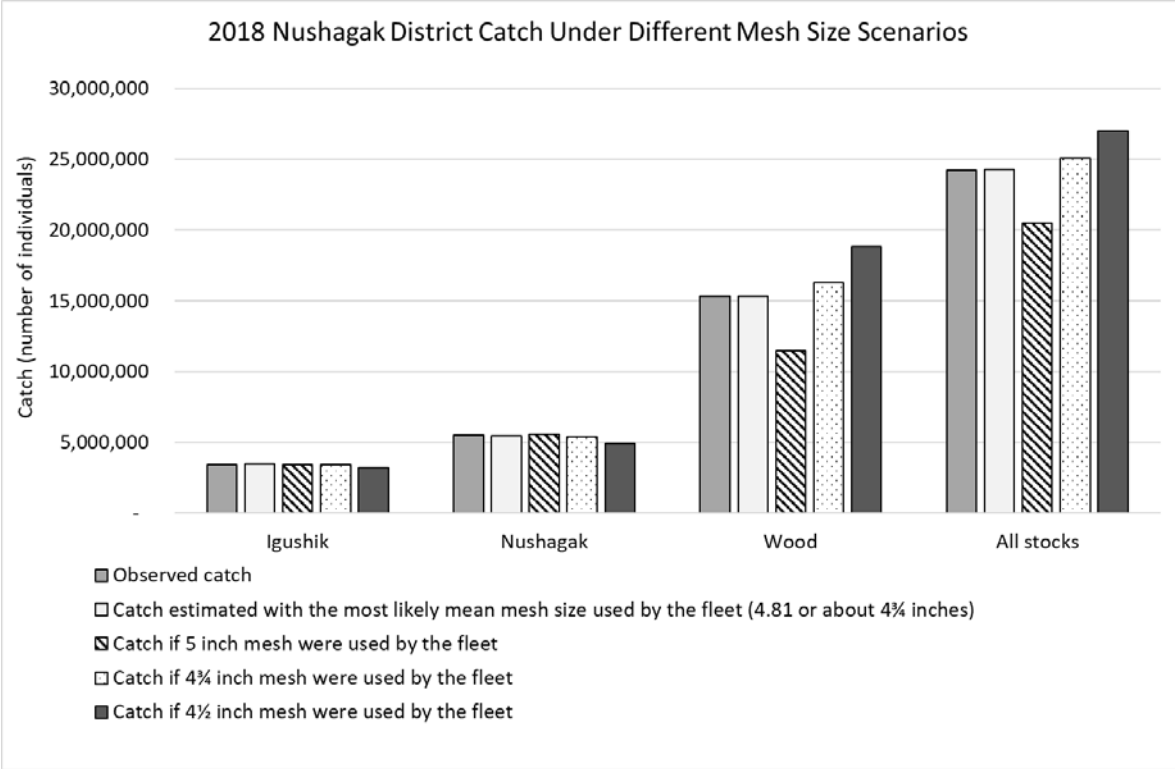



Figure 1. Length frequency distributions for stocks within the Nushagak District years 2011 and 2018 superimposed with selectivity curves for varying mesh sizes.



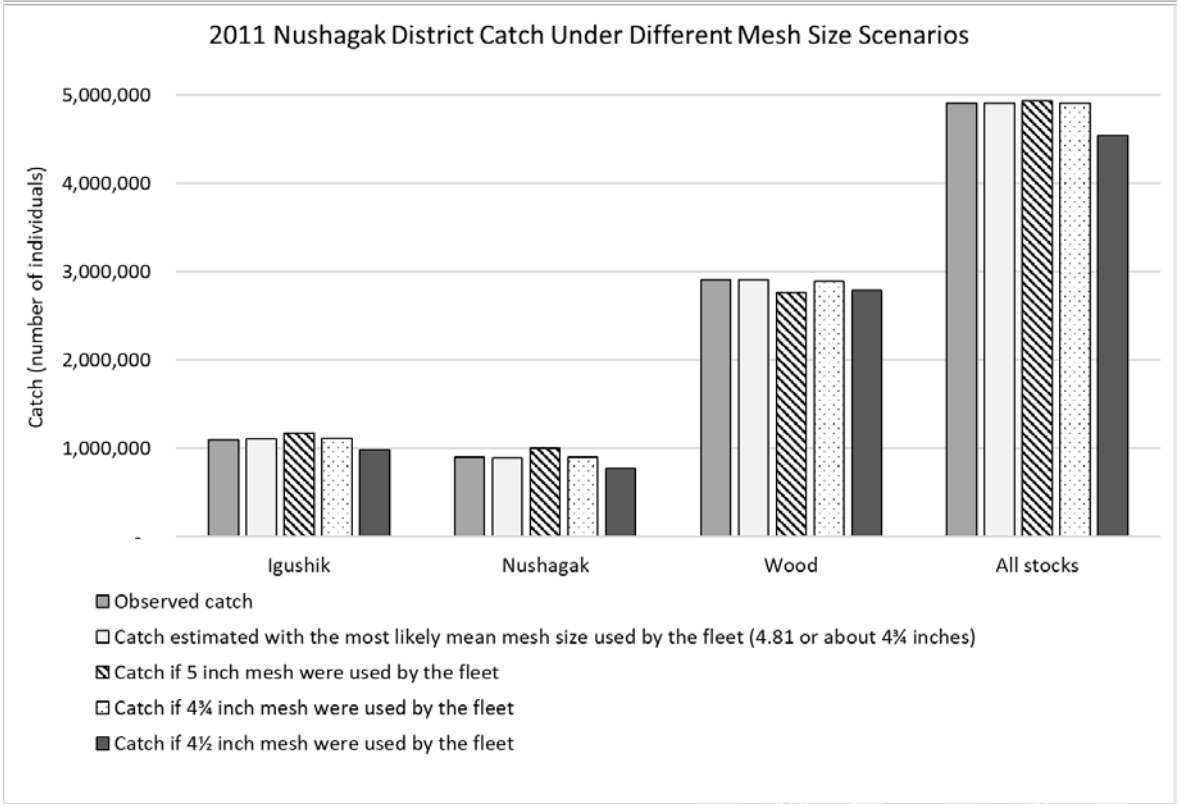




Figure 2. Catch observed and simulated with various mesh sizes for stocks within the Nushagak District years 2011 and 2018. Note: vertical axis scales are not consistent between years.

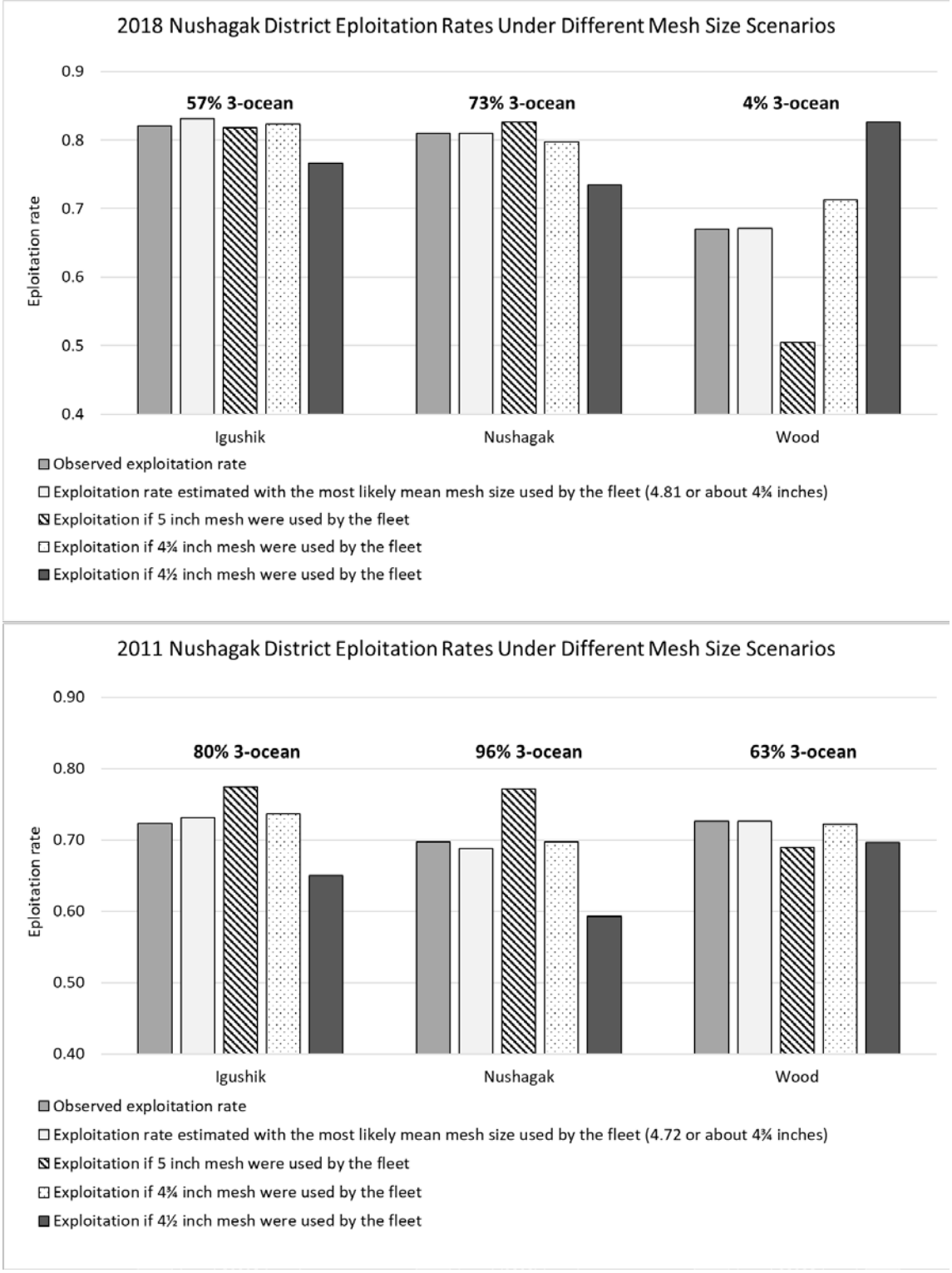



Figure 3. Exploitation rates observed and simulated with various mesh sizes for stocks within the Nushagak District years 2011 and 2018. The ocean age component is given above each stock.

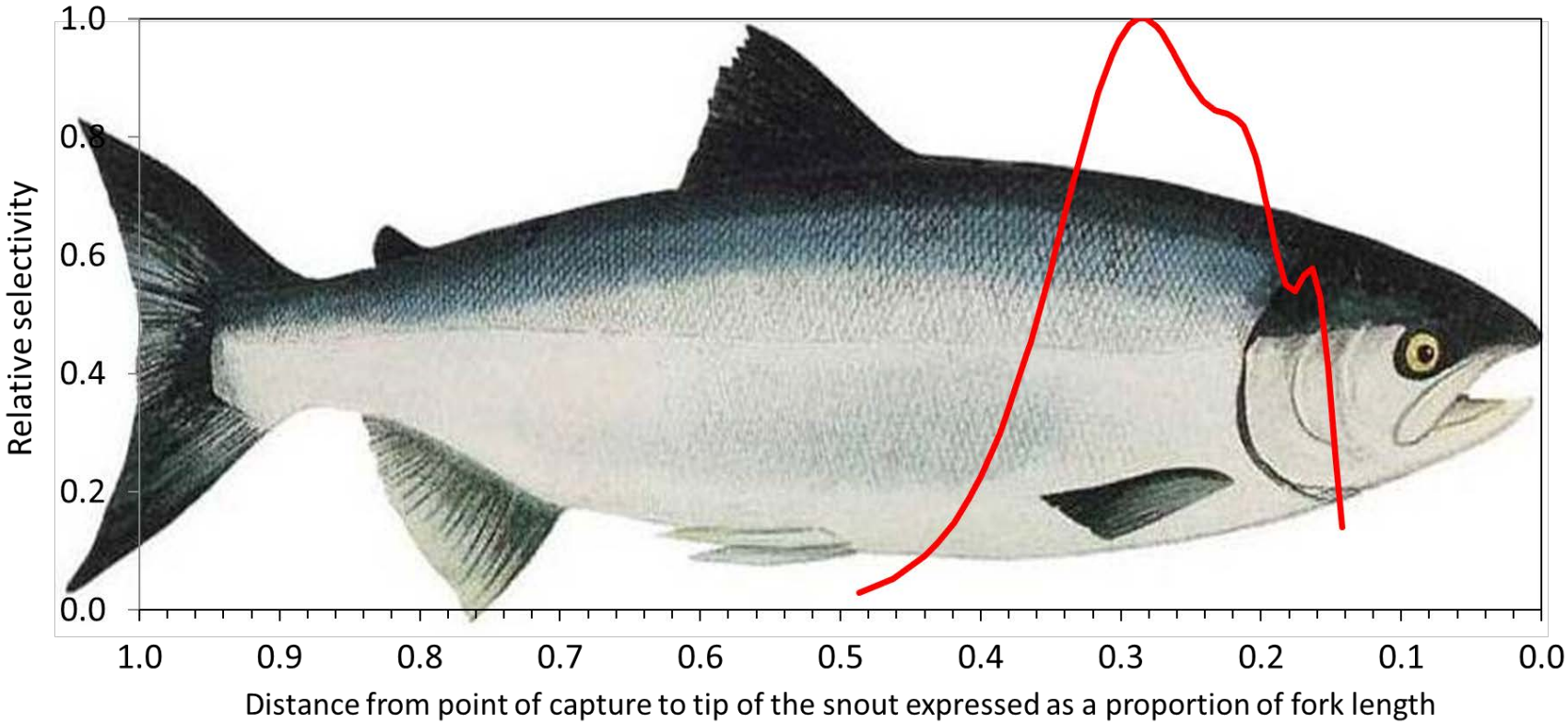
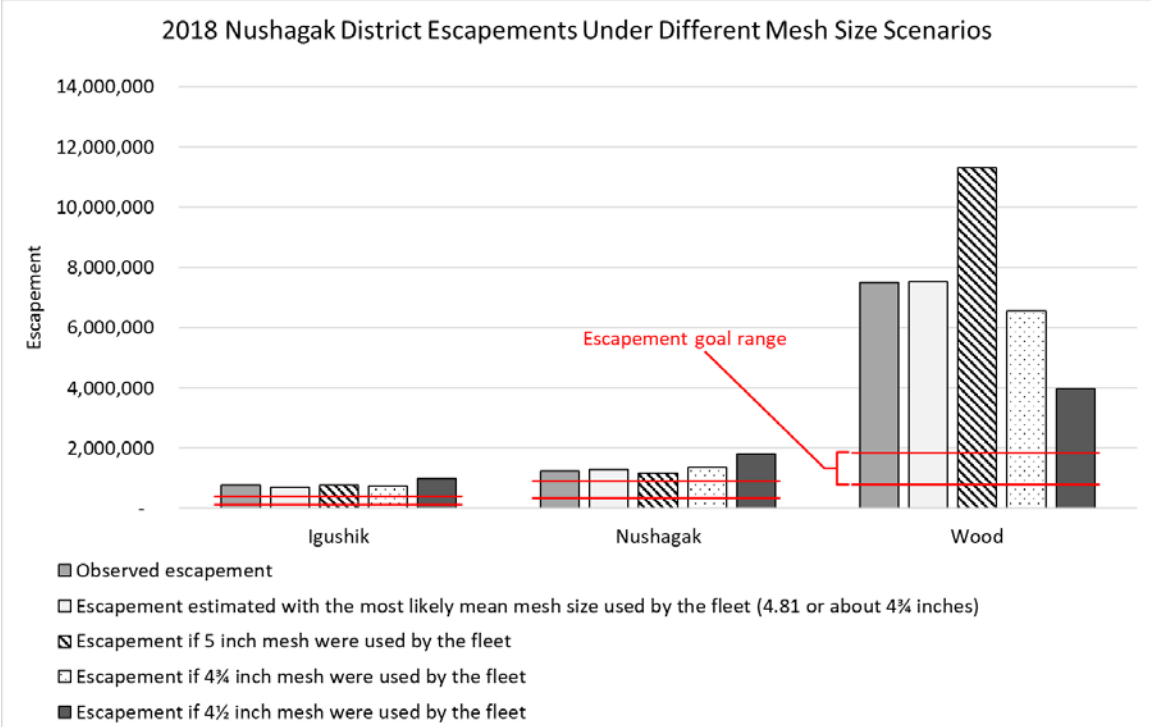



Figure 4. Estimated mean selectivity curve for years 2009-2018 superimposed onto the image of an average shaped ocean phase Sockeye. Starting from right to left three modes aligned with the following body structures: (1) the tangled mode occurred around the preoperculum; (2) the gilled mode occurred just after the gill cover; (3) the wedged mode occurred midway between the gill cover and the dorsal insertion.



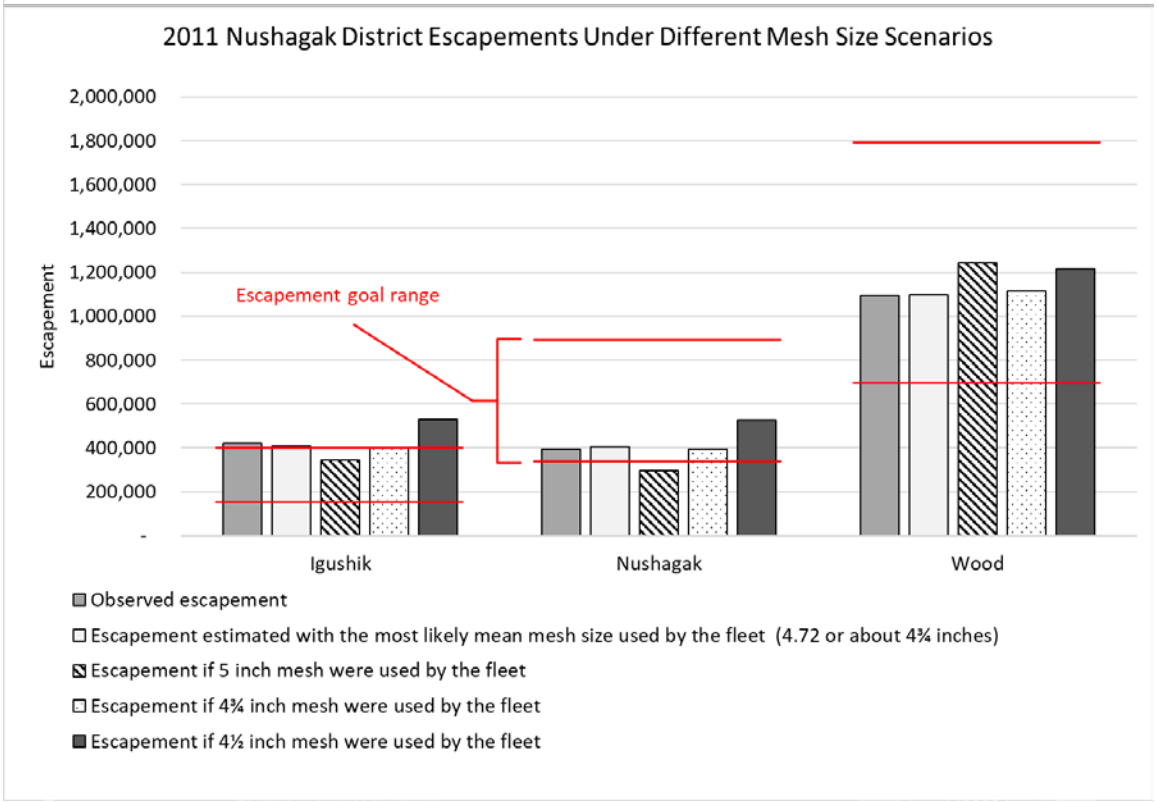




Figure 5. Escapement observed and simulated with various mesh sizes for stocks within the Nushagak District years 2011 and 2018.

# Proposals 41, 42, 43 and the Nushagak-Mulchatna King Salmon Management Plan

**Michael Link, Bristol Bay Science and Research Institute**

***Recommendation**: 1) Adopt RC 51 (strike two provisions from the NMKSMP) to address proposal 41 and 42; 2) take "No Action" on proposal 43; 3) in conjunction with the Department, Board of Fisheries, and stakeholders, conduct an examination of the the Nushagak-Mulchatna King Plan and the information and assessment programs that it is based on; and 4) use results from this analysis to consider changes to the Plan in 15 months that will better provide for the conservation and sustainable use of Nushagak King Salmon by subsistence, sport, and commercial fisheries users.*

## Rationale

The Nushagak-Mulchatna King Salmon Management Plan is a highly prescriptive plan with multiple precise management triggers for action based on the King Salmon passage estimates derived from the Nushagak River Sonar Project. Unfortunately, there is a mismatch between the precision of the Plan and the precision and accuracy of escapement information managers must use. The mismatch regularly makes it difficult for the fishery manager to simultaneously adhere to the letter of the Plan, conserve the stock, and, when warranted, provide sustainable use by subsistence, sport, and commercial users. The problem is double-edged. Most importantly, issues with the sonar can mask the need for conservation actions but they also can lead to foregone harvest by all users.

ADF&G acknowledged in its October 3, 2018 Bristol Bay Escapement Goal Memo "*… a substantial number of kings are not enumerated by the existing sonar assessment.*" and they recommend updating the Nushagak King Salmon escapement goal for the next Bristol Bay regulatory meeting in 3 years. This is progress. However, updating the escapement goal using similarly imprecise estimates of historical escapement and inserting revised numbers as new triggers in the existing Plan will not improve the plan and management of the stock. Nor will small tweaks and/or further refinements to the Plan (e.g., proposals 41, 42, 43), at least without first considering the Plan's limitations and various opportunities to augment and improve the information it is built on. With this, users can then work together to build a better Plan.

## Background

The Nushagak River Sonar Project was initiated in 1980 to enumerate sockeye salmon amidst all species of salmon. Apportionment of sonar targets to each fish species, necessary to estimate the sockeye passage, eventually led to the indexing of the daily King Salmon passage. Large and small runs of this valuable King Salmon stock in the 1980s led to allocation conflicts and intensified the need for a management plan. In 1991, the Board, working closely with subsistence, sport, and commercial fisheries stakeholders over two years, created the Nushagak-Mulchatna King Salmon

Management Plan[1] (5 AAC 06.361). The Plan's triggers were added over the years and were based on the King Salmon passage estimates from the sonar project. Since it was developed, much has been learned over 27 seasons about the precision and accuracy of sonar-based Nushagak King Salmon estimates. Shifts in the run sizes of Chinook and sockeye, and changes in the sport and commercial fishery over time have also affected the utility of the Plan developed in 1991.

Comparisons between the annual sonar-based estimates and upriver post-season aerial survey counts identified issues with the sonar years ago (e.g., 1997 and 1999). More recently, acoustic tagging (2011-2014) and mark-recapture (2014-2016) studies also showed that the sonar underestimates annual King Salmon passage, and most importantly, by a variable degree. In 2017, low early-season sonar-based King Salmon passage estimates triggered restrictions on harvest opportunities; subsequent examination of all information suggested that estimates were probably about 50% lower than actual. Although the restrictions helped increase King Salmon escapement, skepticism grew among users about misplaced certainty in the assessment information. Finally, due to a lack of quality age-specific escapement information for Nushagak King Salmon, ADF&G abandoned attempts to prepare preseason forecasts and that has further hindered managers' ability to provide sustainable harvests for all users.

**Suggested Actions include (but are not limited to):**

*Escapement monitoring*

1. Fully quantify and make explicit the uncertainty in daily and annual King Salmon passage and escapement estimates for setting and/or revising triggers in the Plan, setting an escapement goal range, and making preseason forecasts.
2. Identify/develop methods to detect inseason problems with the current sonar-based estimates.
3. Examine other existing sources of information available to the fishery manager to determine whether any could be integrated into the Plan to increase managers' ability to take corrective actions inseason that would otherwise be precipitated by erroneous sonar-based estimates.
4. Explore ways to improve inseason assessments from the sonar to develop post-season, age-specific escapement estimates in the short- and long-term.

*King Plan Elements*

5. Explore several options to better provide for the conservation and sustainable use of Nushagak King Salmon by subsistence, sport, and commercial fisheries users.
6. Consider use of additional metrics to assess in-season abundance.
7. Consider utility of preseason forecasts to guide early season management.

[1] 91-131-FB. Nushagak Chinook Salmon Management Plan, findings of the Board of Fisheries, Jan. 1992; attached and available www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/findings/ff91131x.pdf

Based on the above analyses, develop a suite of recommendations for updating the Nushagak-Mulchatna King Salmon Management Plan, and for improving information the plan is based on.

This effort could be accomplished by a work group with technical support and completed prior to the 2020 season. Users and the Board of Fisheries should be integral to this process because they are either responsible for changes to the Plan or must be able to operate under it; stakeholders bring useful perspectives and ideas on ways to manage this valuable and fully exploited fish stock. Ideally, the work group should involve one or two Board of Fisheries members, ADF&G Commercial and Sport Fisheries Divisions staff, and stakeholders from the subsistence, sport, and commercial fisheries. The work group would be supported by technical experts. Recommendations for the Plan could be brought before the Board in time to be "noticed" and considered at the March 2020 Statewide meeting (i.e., in ~15 months).

There are precedents for similar approaches elsewhere in the State. Something similar, but not the same, was successfully applied in Bristol Bay with the sockeye escapement goal analysis initiated at the 2012 Board of Fisheries[2]. The Bristol Bay Science and Research Institute (BBSRI), which designed and led the Board-directed Bristol Bay sockeye escapement goal analysis, is willing to lead the effort proposed here.

[2] See Executive Summary, Analysis of Escapement Goals for Bristol Bay Sockeye Salmon taking into Account Biological and Economic Factors, available at: https://www.bbsri.org/escapement-goal-analysis

# RC 84

Submitted by ADF&G at the request of Board Member Ruffner, December 2, 2018

**Nushagak-Mulchatna King Salmon Management Plan (NMKSMP)**

At the 2018 Bristol Bay meeting held in Dillingham, proposals were submitted that called for changes to the NMKSMP (5 AAC 06.361). A small group of stakeholders including the author of two relevant proposals met with three members of the Alaska Board of Fisheries (Board) and multiple Alaska Department of Fish and Game (ADF&G) staff. There was a consensus in the group to modify the NMKSMP by striking provisions (d) 2 and 3 as described in (RC51). This removes sonar triggers that auto-restrict the sport fishery. Removing these trigger provisions from NMKSMP (RC51) will allow ADF&G to consider sonar data along with other in-season information in managing fisheries to ensure the escapement goal is met.

The parties present recognized two concerns that need additional consideration:

1) Uncertainty in sonar data used to establish the king salmon escapement goal and recent in-season issues with the accuracy and precision of sonar counts may have caused unwarranted restrictive actions.

2) Restrictions in the sport fishery for king salmon without actions in the commercial sockeye fishery may or may not be achieving necessary conservation needs and should be considered in the context of sharing a conservation burden.

To address these concerns, ADF&G in collaboration with a stakeholder-led study team will review all data related to the enumeration of Nushagak River king salmon, and identify options to improve this information and management of Nushagak River king salmon. To support this effort, ADF&G would accelerate updating the Nushagak River king salmon escapement goal prior to March 2020. The study team will provide a progress report to the board at the October 2019 work session.

Concurrent with the technical enumeration study effort, the Board Chair will appoint a working committee (WC) consisting of no more than 9 members of the public and 3 members of the board for a total of 12. The WC will be supported by the technical study team and provide input to the help guide the team's work products. The WC committee will meet prior to the Oct. 2019 Board Work Session, receive a preliminary update from ADF&G on the enumeration efforts and set a schedule that includes a target of generating a proposal for any changes to NMKSMP to the Board for consideration at the Statewide Meeting in March 2020. This schedule signals the intent of this board to address the topic of the NMKSMP before the next regular Bristol Bay cycle if new information can refine the plan; however, it does not guarantee any particular outcome.

In addressing the allocative issue, the WC will acknowledge and adhere to the goals of the Sustainable Salmon Policy (5 AAC 39.222), as well as the concept of sharing the conservation burden as outlined in the Sustainable Salmon Policy. The WC will also recognize and consider that any hard trigger closures need to acknowledge tradeoffs between sockeye and king salmon. (i.e. is it in the best interest of the state to forego 100,000 sockeye salmon for 1,000 king salmon; 1,000,000 for 10?)

**ALASKA BOARD OF FISHERIES**

**CHARGE STATEMENT FOR THE NUSHAGAK-MULCHATNA KING SALMON MANAGEMENT PLAN COMMITTEE**

**2018-291-FB**

At its 2018 Bristol Bay Finfish meeting, the Alaska Board of Fisheries' (board) heard testimony from Nushagak sport and commercial fishing stakeholders regarding Proposals 41 and 42 seeking to create a mechanism that would pair restrictions on both the sport and commercial fishery for the purposes of king salmon conservation.

As a result of this discussion, the board is creating a temporary committee to review the fisheries and provide recommendations to the board on a comprehensive solution. The charge statement of this committee as described in detail in RC84.

The committee, with Members Payton, Morisky, and Ruffner, will provide an update and potentially a recommended proposal at the board's 2020 Statewide meeting.

Vote: 7-0
December 2, 2018
Anchorage, Alaska

Reed Morisky, Chair
Alaska Board of Fisheries

# RC 84

Submitted by ADF&G at the request of Board Member Ruffner, December 2, 2018

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The parties present recognized two concerns that need additional consideration:

1) Uncertainty in sonar data used to establish the king salmon escapement goal and recent in-season issues with the accuracy and precision of sonar counts may have caused unwarranted restrictive actions.

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Concurrent with the technical enumeration study effort, the Board Chair will appoint a working committee (WC) consisting of no more than 9 members of the public and 3 members of the board for a total of 12. The WC will be supported by the technical study team and provide input to the help guide the team's work products. The WC committee will meet prior to the Oct. 2019 Board Work Session, receive a preliminary update from ADF&G on the enumeration efforts and set a schedule that includes a target of generating a proposal for any changes to NMKSMP to the Board for consideration at the Statewide Meeting in March 2020. This schedule signals the intent of this board to address the topic of the NMKSMP before the next regular Bristol Bay cycle if new information can refine the plan; however, it does not guarantee any particular outcome.

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# Appendix C. 2019 Board of Fisheries Work Session Record Copies (RCs)

*RC9 – Memo from BBSRI to Board members re Update on Special Committee*

# Bristol Bay Science And Research Institute

RC9

**MEMORANDUM**

Date: October 12, 2020

To: Alaska Board of Fisheries members
Glenn Haight, Executive Director, Alaska Board of Fisheries

From: Michael Link, Executive Director, BBSRI, and Project Manager, Stakeholder-led study team
Jeff Regnart, Policy Analyst and Senior Technical Advisor, BBSRI
Tom Brookover, Senior Technical Advisor, BBSRI

Re: Update on the Special Committee to Examine the Nushagak-Mulchatna King Salmon Fishery Management Plan

This letter is to update the Board on progress and schedule for the committee work to address the Nushagak-Mulchatna King Salmon Management Plan. We represent the leadership of a stakeholder-led study team committed to work with the fishery's stakeholders to identify options for a comprehensive solution to modifying the Plan.

Origins of the Committee

At the December 2018 Bristol Bay Finfish meeting the Board, in response to two proposals to modify the Nushagak-Mulchatna Chinook Salmon Management plan (5AAC 06.361), took the following actions:

- removed several triggers in the Plan that affect the sport fishery, which would provide managers greater flexibility in dealing with sometimes inaccurate escapement information,
- tabled #41 and #42 (paired closures of sport and commercial fisheries),
- created a special Board committee to develop a comprehensive solution to the Plan through RC 84 (Ruffner) and the charge statement (2018-291-FB), and
- charged the committee with reporting back to the full board at its statewide meeting in March 2020 (15 months).

Stakeholder-led Study Team

Also, at the 2018 Bristol Bay meeting the Bristol Bay Science and Research Institute (BBSRI)[1] committed to supporting the committee's work through a stakeholder-led technical analysis of options the committee was expected to consider (RC80; Link).

[1] *The Bristol Bay Science and Research Institute (BBSRI) is a regional non-profit research organization founded in 1998. Our mission is to conduct applied research and monitoring to improve the well-being of residents of Bristol Bay, Alaska with an emphasis on the Bay's fish stocks and fisheries.*

Vision for the Process and Schedule

At first, it was envisioned that a consensus-based comprehensive solution would emerge from the committee and study team in time for consideration at the Board's state-wide meeting in March 2020.

Concerns from the public relayed to committee members about insufficient time for public vetting of any proposals coming from the committee work (expected in Jan-Feb 2020) ultimately led to the work schedule and product deliverables sliding by ~1 year. The original author of proposals 41 and 42 (Dec. 2019), who is on the committee concurred with this change in schedule. With this change, the committee's work products would now be released prior to an April 2021 proposal deadline and be considered at the next in-cycle Bristol Bay meeting (Dec. 2021).

Committee Meetings

The full committee (minus departed Ruffner) met in Anchorage on October 21, 2019 (October 15-16, 2020 Work Session Board packet item #4 and 5) to get underway and present preliminary analyses of the fishery's history and technical challenges associate with monitoring and managing the fishery. Break-out groups of subsets of the full committee met with the study team in December 2019 (Anchorage; sport/commercial) and February 2020 (Dillingham; commercial, subsistence, sport). COVID-19 precluded an in-person meeting for the entire group scheduled for April 2020 (King Salmon). These committee meetings provided much for the study team to examine.

Disbanding of the Formal Committee, February 2020

At the Board's Upper Cook Inlet meeting in February 2020, the Board disbanded the formal committee and made it clear that they encouraged stakeholders on the committee to continue to work together in preparation for the next in-cycle Bristol Bay Board meeting in 2021.

In addition, BBSRI reasserted its commitment to serving the committee and moving toward its original mission outlined in the charge statement – a comprehensive solution to the Nushagak-Mulchatna King Salmon Management Plan.

Toward that end, the we refer to the committee hereafter as all those who were selected by the Board in February 2019, minus the two Board members. We have not added nor subtracted any of the public from this committee.

Committee Work Products Prior to April 2021

The study team is drafting components of a comprehensive report for the remains of the committee in draft form January 2021. Subsequently, the committee will meet one or more times in preparation of possible producing one or more proposals for the next in-cycle Bristol Bay Board meeting. Work products from this process will be available to the public prior to the April 2021 call for proposals. We are aware that the timing of the next Bristol Bay meeting could be impacted by COVID-19 and if so, we may adjust schedules accordingly.

# Appendix D. Presentations provided by BBSRI to the NMKSMP Committee

*October 21, 2019. Initial Meeting of a Board of Fisheries Committee: Nushagak-Mulchatna King Salmon Fishery Management Plan*

*March 3, 2021. Selected Technical Results to Assist with Development of Potential Nushagak Management Plan Actions*

*March 22, 2022. Potential for Mesh Size Regulation in the Sockeye Fishery to Increase Sockeye Harvest and Reduce Chinook Salmon Harvest*

# *Initial Meeting of a Board of Fisheries Committee:* Nushagak-Mulchatna King Salmon Fishery Management Plan

Room 104, Atwood Building
550 West 7th Avenue
Anchorage, Alaska
Monday, October 21, 2019

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## Agenda

Morning

1. Call to Order
2. Introductions of Board Committee Members and other participants.
3. Defining scope of work PART A, Committee Charge
4. Review ADF&G escapement goal and implications for plan
5. Review technical analysis scope and preliminary results

Afternoon

Return to 3. Scope of work, PART B, Goals/objectives of Plan revisions

6. Project timeline and future meeting dates
7. Adjourn

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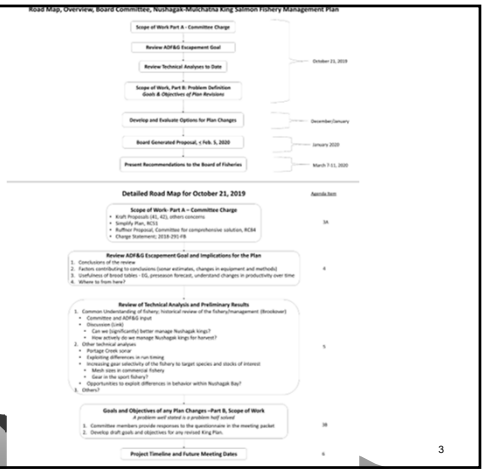
## Road Map

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## Background

- Proposals 41, 42 (Kraft) – sought paired restrictions when sport fishery restricted
- Kraft not alone on the inadequacy of Plan
- Board Action - simplified the Plan, removed intermediate triggers (Payton; RC51)
- Commitment to look for comprehensive solution: 2018-291-FB, RC84 (Ruffner)

4

4

## RC 84; Paraphrased

- Two areas need additional consideration
  - Uncertainty in escapement estimates have affected usefulness of the escapement goals and may have caused unwarranted restrictive actions.
  - Restricting the sport fishery without (simultaneously) restricting the commercial sockeye fishery may not achieve conservation goals and should be considered in the context of sharing a conservation burden.

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## RC 84, con't

1. ADF&G to update escapement goal by October
2. Stakeholder study team to provide technical support to Committee.
3. Target any proposed changes to Plan prior to the next cycle (i.e., March 2020).
4. Adhere to Sustainable Salmon Policy
   - Share conservation burden
5. Recognize any hard-trigger closures acknowledge tradeoffs between sockeye and king salmon

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## Committee Charge - Summary

- Have any management targets take into account the current uncertainty in the escapement goal and inseason assessment of inriver runs
- Better manage the fishery for conservation so sustainable escapement goals are met, and fisheries don't get restricted unnecessarily at great cost to traditional users

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## A "Comprehensive Solution"

- Identify ways management and the Plan can be improved to:
  - Ensure sustainable harvests of all species by all users and equitable sharing of conservation between sport and commercial users
  - Improve upon a sustainable escapement goal (now and in the future)
    - Identify stock assessment needed to provide a robust escapement goal and inseason targets upon which to base management decisions and fishery restrictions.

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## Clarify Roles of ADF&G and Stakeholder Study Team

- ADF&G staff
  - Revise the Chinook escapement goal
  - Repository of key datasets for analyses
  - Work with study team to vet research and management ideas, provide feedback on technical analyses and to the committee
- Stakeholder Study Team (BBSRI)
  - Technical analyses and meeting support for the Board Committee

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## Agenda

Morning

1. ~~Call to Order~~
2. ~~Introductions of Board Committee Members and other participants.~~
3. ~~Defining scope of work PART A, Committee Charge~~
4. Review ADF&G escapement goal and implications for plan
5. Review technical analysis scope and preliminary results

Afternoon

Return to 3. Scope of work, PART B, Goals/objectives of Plan revisions

6. Project timeline and future meeting dates
7. Adjourn

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## Review Escapement Goal

- Escapement goal memo, July 11, 2019
- Jack Erickson, ADF&G Research Supervisor
- *-> break away for Jack Erickson (ADF&G) to present (a separate Powerpoint presentation)*

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## Agenda

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7. Adjourn

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## Technical Analyses

Work toward a common understanding of the fishery

- Historical review – Brookover 2019
- Discussion, feedback from committee and ADF&G

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## Brookover 2019

- Historical review of the fishery

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## Discussion

- Can we better manage Nushagak kings?
- How valuable might improvements to inseason and postseason estimates of escapement be? Estimates of catch?

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## Are Nushagak Chinook Actively Managed for Harvest?

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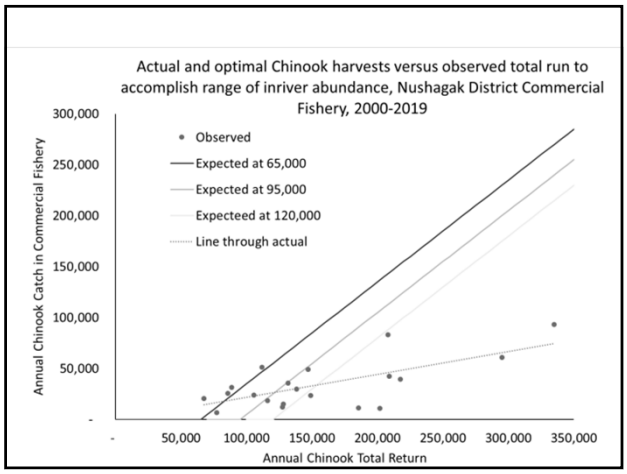


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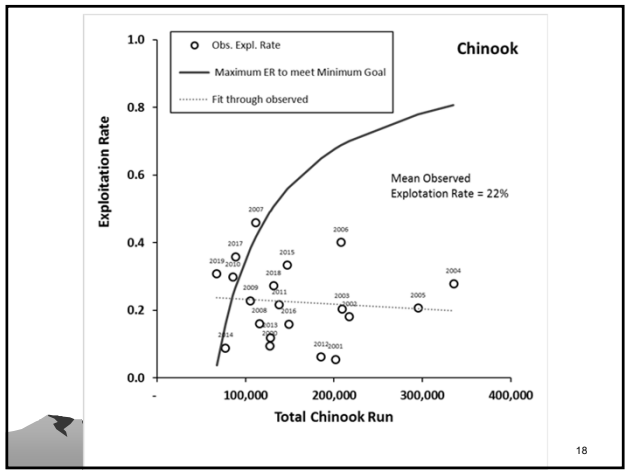


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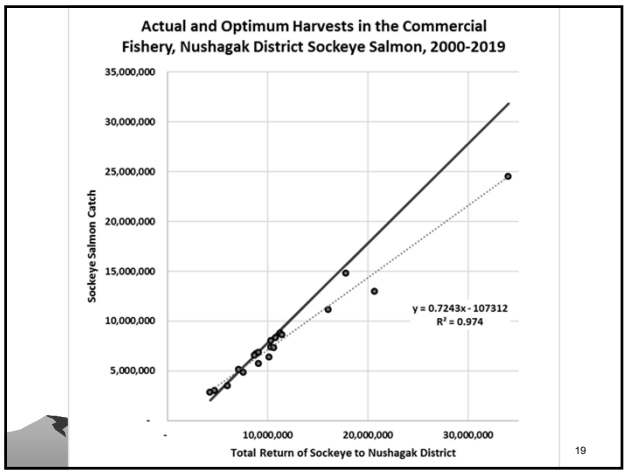


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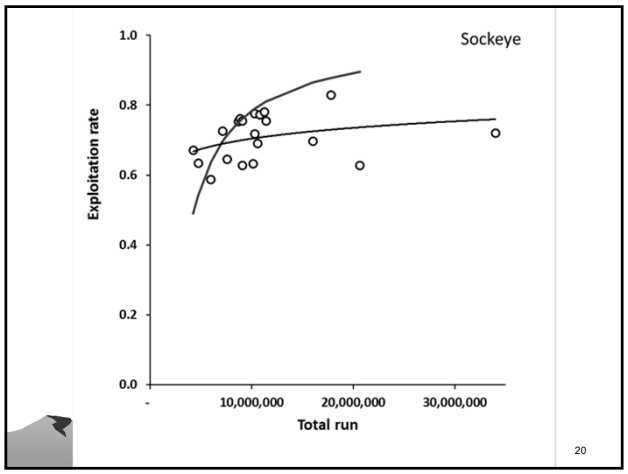


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## Technical Analyses

Selected tasks to support committee deliberations

- Portage Creek sonar
- Opportunities to exploit run timing differences
- Gillnet selectivity in comm. fishery
- Effects of tide stage on Chinook catch rate

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## Technical Analyses

- Portage Creek Sonar
  - Uncertain escapement goal
    - Conservative management in all fisheries
    - More frequent closures, foregone opportunities
    - No brood tables, no preseason forecasts, difficult to deal with small and large runs
  - Examine previous work & sampling protocols
    - Fraction outside of sonar (acoustic tagging)
    - Detectability within sonar
    - Independent estimates of escapement (M-R)
    - Species apportionment – a big issue?

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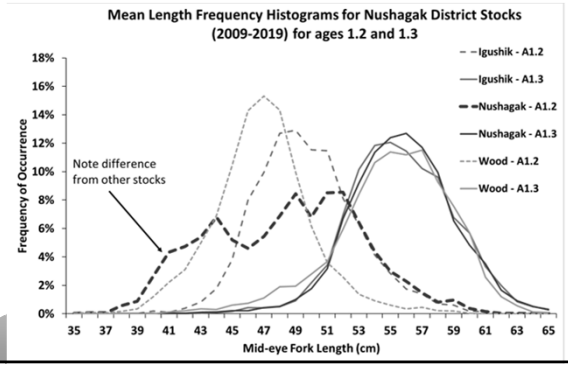
## Gillnet-based Apportionment of Sonar Counts to Species

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## Portage Sonar

- Species apportionment
  - Gillnet mesh to apportion to species, and age classes within the sockeye run
  - Sampling times within days
  - Detectability within and outside of sonar

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## Differences in Run Timing

- Exploiting differences in run timing and fishery location to target conservation actions with the greatest benefit and least costs

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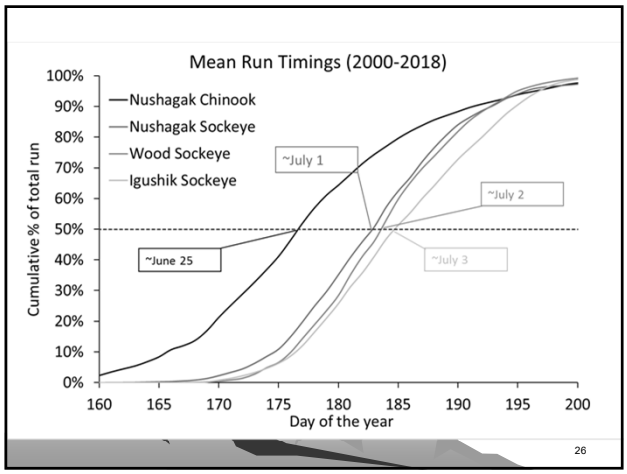


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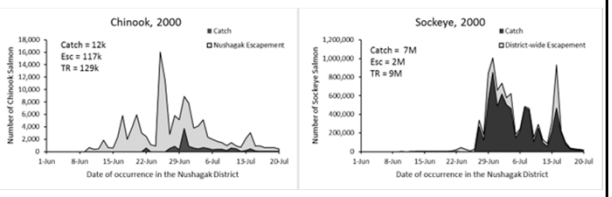
## Reconstructed Chinook and Sockeye runs in District, 2000-2018

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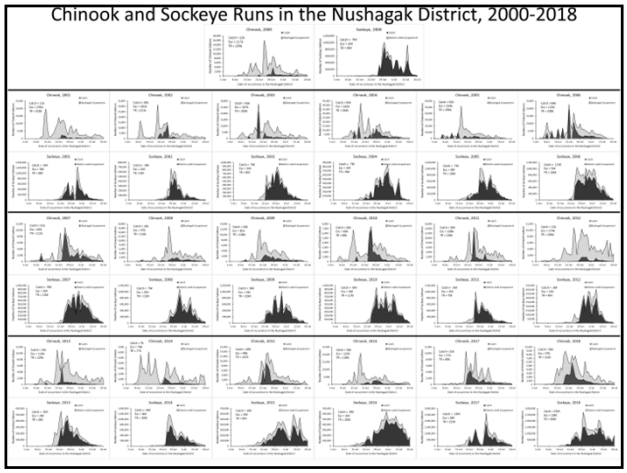


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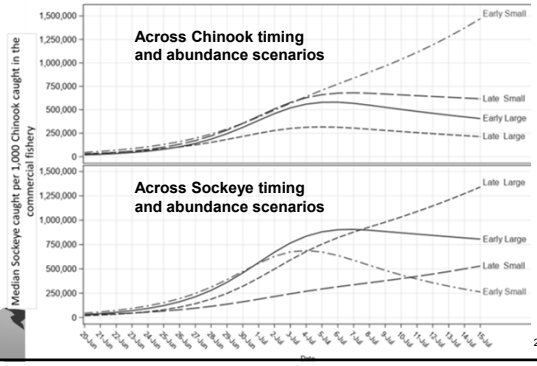
## Median # Sockeye Caught per 1,000 Chinook vs Date, 2000-2018

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## Selectivity Curves

- Initially developed from a decade of results from the Port Moller Test Fishery
  - Predicted effects/potential in the Nushagak to better target sockeye
- In 2019, test fished in the Nushagak District to develop district-and-commercial-fishery-specific selectivity curves, TBA.

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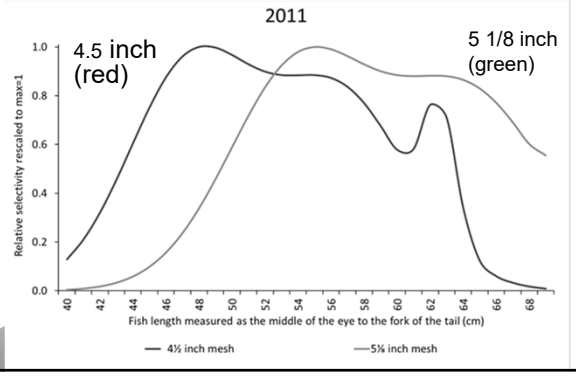
## Selectivity curves, two meshes

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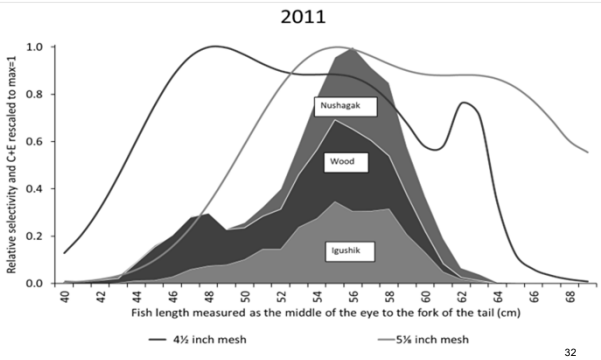
## Curves overlaid on the 2011 Run

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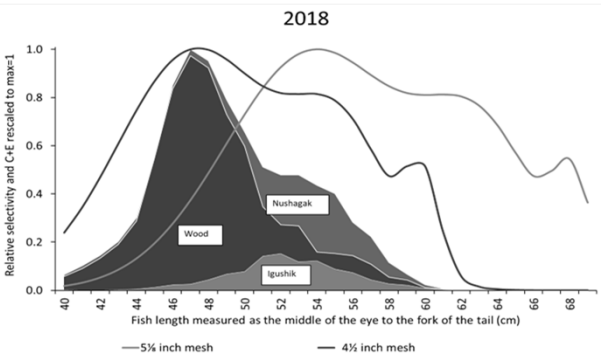
## Curves overlaid on 2018 Run

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## Exploit Tide stage?

- Does commercial fishing lower into the tide stage affect catch rates on Chinook salmon, which are typically deeper?

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## Agenda - Afternoon

~~Morning~~

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35

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## Committee Questionnaire

- What problems/challenges do you see with Nushagak king salmon management?
  - Did the changes to the Plan made in December 2018 address any of these?

…/2

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## Committee Questionaire

- What fraction of these issues could be addressed by:
  - Further modifications to the management plan? (altering time, area, and gear)
  - Improving assessment data? (sonar, test fishery, catch rates (CPUE) in the sport/subsistence fisheries, age-specific catch and escapement, preseason forecasts).

… /3

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## Committee Questionnaire

- What characterizes a successful:
  - Subsistence fishery
    - Opportunity? High CPUE?
  - In-river sport fishery
    - Opportunity? Bag limits? Steady CPUE?
  - Commercial fishery
    - Sockeye catch? King catch? Early fishing?
- 

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## Committee Questionnaire

- What are the more significant changes you have seen in the following areas, and how might they have affected the perception of what users define as a successful fishery. That is, what role have these factors played creating real (or perceived) problems with King salmon management.
  - Size and composition of the commercial sport fishery (e.g., single lodges, fly in, etc.).
  - Effects of sockeye abundance on meeting king salmon objectives.
  - King salmon abundance.
  - Confidence in the Portage sonar estimates of king (and sockeye).
  - What other significant changes have occurred?

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## Goals and Objectives of any Plan Revisions

- What (exactly) do we want to accomplish with Plan revisions?

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## Timeline and Meeting Dates?

- Is the Feb. 5 deadline for a board-generated proposal doable?

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## Wrap Up, Final Comments

42

42

# *Selected Technical Results to Assist with Development of Potential Nushagak Management Plan Actions*

Prepared by:
Michael Link and Dr. Scott Raborn

Prepared for:
Board of Fisheries-Developed Committee of Stakeholders
Zoom-based Video Conference
March 3, 2021

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## Agenda

1. Goal of this presentation
   - Outline today's topics associated with numbered actions

Technical Analysis

2. Potential to forecast in-river king run in June
3. Effects of reduced maximum gillnet mesh-size
4. Impacts of changes to the Wood River trigger on inriver king run
5. Wrap up, Q&A

2

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## Today's Goal

- Technical analyses to support selected proposed actions
  - Can inseason information be used forecast the current-year inriver king run (#6)
  - Effects of lower maximum mesh size in sockeye fishery (#3)
  - Effects of increasing the Wood River trigger (#1, and #10)

3

3

## Can we Forecast Inriver King Run ~ mid June?

- Might it be used to relax any Sport Fishery restrictions in a inseason and timely manner?
- Bud's suggestion
  - Can we use the cumulative escapement, catch, or catch + escapement predict total inriver run?

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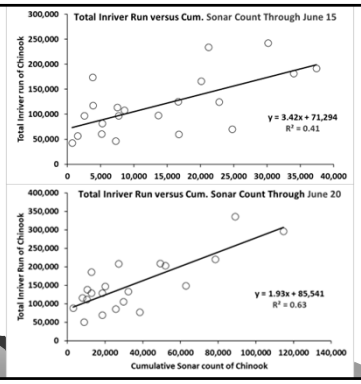


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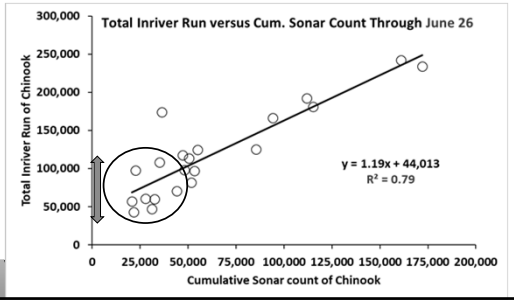
## Cumulative Sonar thru June 26 vs Total Inriver Run

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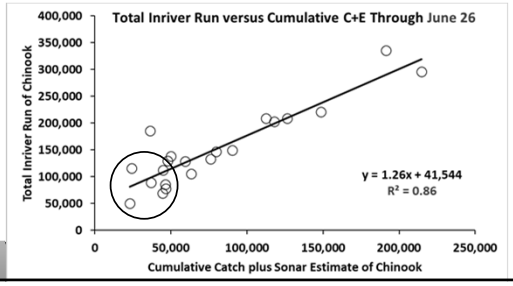
## Cumulative Sonar + Catch thru June 26 vs Total Inriver Run

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## Summary - Forecasting Inriver King Run

- Definitely can forecast inriver runs across the full range of observed runs ($r^2$ = .83)
  - Most effective for inriver runs >100,000 kings
- Considerable variation in run timing (entry patterns) among years make it more difficult to predict small king runs accurately, even with C+E through June 26

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Mesh size analysis…

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## Decrease Maximum Mesh Size (#3)

- A maximum mesh size restriction of 5 ½" has exacerbated the problems of mixed-stock and mixed-species fishing in the Nushagak District for decades
  - More kings killed incidentally than necessary, especially when large and early sockeye runs. Most problematic in weak king runs
  - Foregone millions Wood R. sockeye; more fishing effort, expense
  - Nushagak River sockeye unnecessarily overexploited
  - Expanded use of the WR Special Harvest Area
  - Environmental effects on fish size are making these issues worse.

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## 4 ¾" Mesh Size, already in regulation

- 2012 regulation to use 4 ¾" mesh size to better target Wood River sockeye and avoid the WR Special Harvest Area
- "In theory" it would absolutely help to catch more WR fish and reduce fishing time and incidental king catch in the District
  - Is the benefit real?
  - Is the fleet's gear inappropriately selective?
  - Are there downsides?
  - What stage of the season should it be implemented?

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## Mesh Size Analysis – The latest

- The latest analysis in the *Nushagak District Test Fishery Report, 2019 and 2020 (Raborn and Link 2021)*.
  - Draft is available; additional peer review and will be made available to public prior to the BoF proposal deadline.
- Short version: the **data support a 4 ¾" limit at the outset of the season** and this will help kings, increase sockeye harvests to the commercial fishermen, and decrease costs of harvest
  - How and where to mandate will be part of discussion later today.
- Review of mechanism and results below…

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## Maximum Mesh Size – Methods

- Gillnet selectivity curves from >10 years at the Port Moller Test Fishery AND 2 years in the Nushagak District
- Measure, predict catch effectiveness across a range of mesh sizes:
  - Exploitation rates on 2- and 3-ocean sockeye
  - Total number of fish in catch
  - Number of pounds in catch

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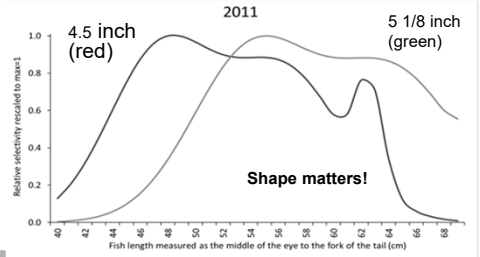
## Selectivity curves, Relative Effectiveness of Meshes Across Range of Fish Length

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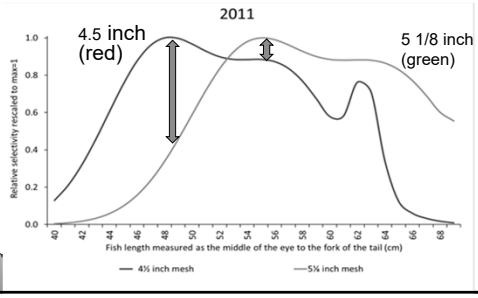
## Selectivity Curves, Why Shape Matters

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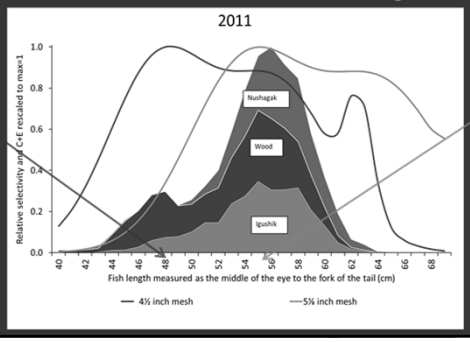
## Curves overlaid on the 2011 Nushagak Run

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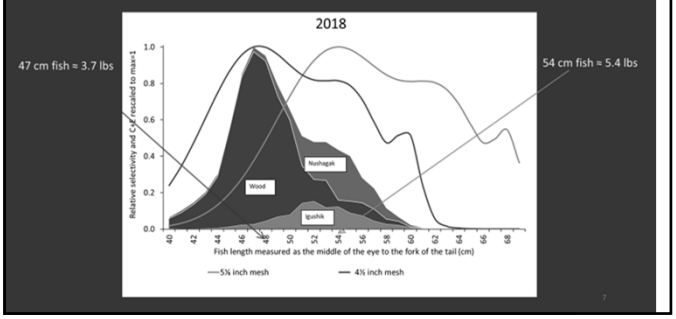
## Curves overlaid on the 2018 Nushagak Run

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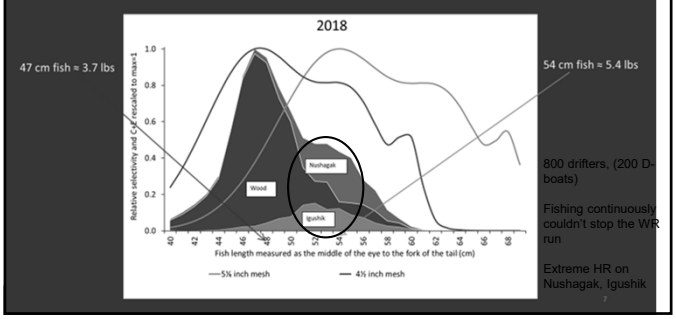
## Curves overlaid on the 2018 Nushagak Run

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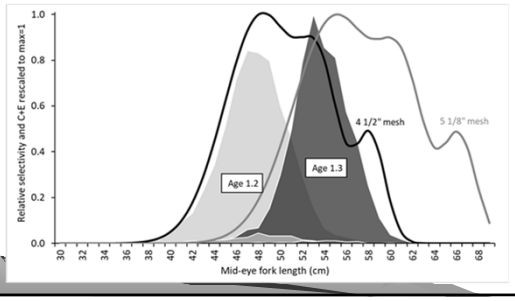
## 2019 – Nushagak Sockeye

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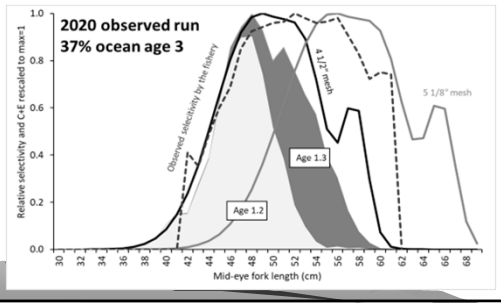
## 2020 – Nushagak Sockeye

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## Catch, lbs, & Expl. Rate, 2019: Observed age comp. and 2 hypothetical extremes

| Mesh size (inches) | Catch (individuals) | Fish wt. (lbs) | Catch (lbs) | Exploitation rate Age 1.2 | Exploitation rate Age 1.3 | Efficiency relative to mesh that max. lbs |
|---|---|---|---|---|---|---|
| **Observed run with 48% ocean age 3 fish** | | | | | | |
| 4 1/2 | 14,914,524 | 4.76 | 71,062,569 | 0.87 | 0.80 | 0.98 |
| 4 5/8 | 14,814,601 | 4.92 | 72,839,348 | 0.78 | 0.89 | 1.00 |
| 4 3/4 | 14,244,034 | 5.07 | 72,272,333 | 0.66 | 0.95 | 0.99 |
| 4 7/8 | 13,285,210 | 5.23 | 69,441,913 | 0.52 | 0.98 | 0.95 |
| 5 | 11,790,545 | 5.38 | 63,387,843 | 0.39 | 0.95 | 0.87 |
| 5 1/8 | 10,152,186 | 5.52 | 56,088,330 | 0.27 | 0.88 | 0.77 |
| **Hypothetical run with 70% ocean age 3 fish** | | | | | | |
| 4 1/2 | 14,625,818 | 5.07 | 74,082,687 | 0.87 | 0.80 | 0.90 |
| 4 5/8 | 15,240,829 | 5.20 | 79,264,378 | 0.78 | 0.89 | 0.97 |
| 4 3/4 | 15,381,642 | 5.33 | 82,032,203 | 0.66 | 0.95 | 1.00 |
| 4 7/8 | 15,048,385 | 5.45 | 82,083,866 | 0.52 | 0.98 | 1.00 |
| 5 | 13,963,935 | 5.57 | 77,779,937 | 0.39 | 0.95 | 0.95 |
| 5 1/8 | 12,502,188 | 5.69 | 71,099,999 | 0.27 | 0.88 | 0.87 |
| **Hypothetical run with 30% ocean age 3 fish** | | | | | | |
| 4 1/2 | 15,157,160 | 4.52 | 68,524,392 | 0.87 | 0.80 | 1.00 |
| 4 5/8 | 14,456,390 | 4.67 | 67,439,607 | 0.78 | 0.89 | 0.98 |
| 4 3/4 | 13,287,963 | 4.82 | 64,069,916 | 0.66 | 0.95 | 0.93 |
| 4 7/8 | 11,803,397 | 4.98 | 58,817,327 | 0.52 | 0.98 | 0.86 |
| 5 | 9,963,979 | 5.15 | 51,292,400 | 0.39 | 0.95 | 0.75 |
| 5 1/8 | 8,177,192 | 5.32 | 43,472,183 | 0.27 | 0.88 | 0.63 |

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## Optimum mesh across metrics, 2020

| Mesh size (inches) | Catch (individuals) | Fish wt. (lbs) | Catch (lbs) | Exploitation rate Age 1.2 | Exploitation rate Age 1.3 | Efficiency relative to mesh that max. lbs |
|---|---|---|---|---|---|---|
| **Observed run with 37% ocean age 3 fish** | | | | | | |
| 4 1/2 | 8,494,759 | 4.17 | 35,450,599 | 0.69 | 0.69 | 1.00 |
| 4 5/8 | 8,166,642 | 4.31 | 35,196,456 | 0.60 | 0.76 | 0.99 |
| 4 3/4 | 7,553,025 | 4.45 | 33,647,056 | 0.50 | 0.80 | 0.95 |
| 4 7/8 | 6,681,499 | 4.60 | 30,723,667 | 0.40 | 0.79 | 0.87 |
| 5 | 5,714,009 | 4.74 | 27,079,030 | 0.30 | 0.74 | 0.76 |
| 5 1/8 | 4,715,850 | 4.88 | 23,007,185 | 0.21 | 0.67 | 0.65 |

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## Summary – 4 ¾" Mesh Size

- Makes the size and age composition of the catch representative of the run
  - Improves the harvest rate on 2-ocean sockeye
- Maximizes the catch of sockeye (lbs and numbers)
- Reduces commercial fishing time in the District, and therefore the king salmon catch
- Reduces or eliminate the use of the WR Special Harvest Area to control WR escapement
- Easier to window sockeye fishery in latter part of king run

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Wood River triggers…

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## Adjusting the Wood River Trigger (#1)

- The onset of the sockeye fishery king run are weak is triggered by the projected escapement at WR tower.
- Exploit the fact that the cost in foregone sockeye is lowest in June
  - What is the best decision rule?
- Recall this figure from our October 2018 meeting…

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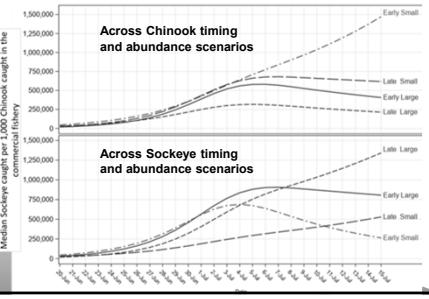
## Median # Sockeye Caught per 1,000 Chinook vs Date, 2000-2018

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## Adjusting Wood River Trigger

- How much might a higher trigger help to conserve kings?
  - At what cost in terms of foregoing early surplus sockeye?
- Does the effectiveness (and cost) of the triggers change across sockeye runs sizes?
  - Should any new triggers be contingent on sockeye run size?

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## Wood River Trigger – Methods

- Used 2001, 2007-2020 daily sockeye & king escapement and catch to "reconstruct" each species in the Nushagak District.
  - Excluded large king runs (>200,000 total run)
- Using the remaining reconstructed runs, we altered the decision rule on when the sockeye fishery was to open.
- Modeled the fishery catches under higher WR triggers

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## Chinook Savings Across Higher Triggers

Caveats!

- Some simplification, including the trigger's decision rule
- Limits to the datasets to perfectly model possible outcomes
- Characterizing benefits and costs
  - Averages used/needed as metrics, but considerable range
  - Conservative analysis
    - Possibly overestimate savings of kings *and* costs of sockeye
    - Only partially takes into account larger escapement goal in large runs
  - Does not alter the value or cost of foregone fish across run sizes

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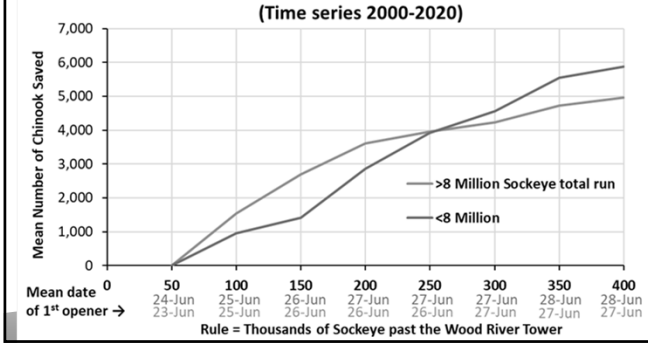
## Effectiveness of Wood River Sockeye Escapement Rule (Time series 2000-2020)

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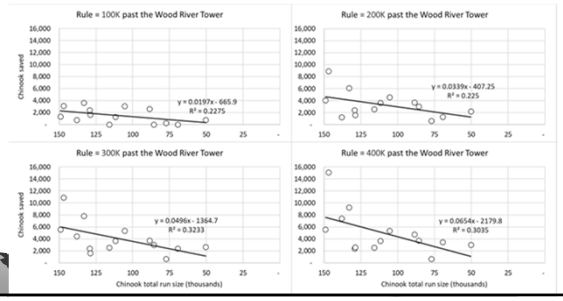
## Variation – King Savings vs King Run Size

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31

## Wood River Trigger, Savings

- Adjusting trigger moves average fishery start date 1-4 days.
- Average kings saved by increasing the trigger to 100 to 400k "at the tower" is in the range of 1,000-6,000 kings over the "50k at the tower rule" (AKA "*projected over 100k*")
  - Smaller the king runs, the less the king savings
- Biggest effects are with small sockeye runs because delay to the start date of comm. fishery is the greatest

32

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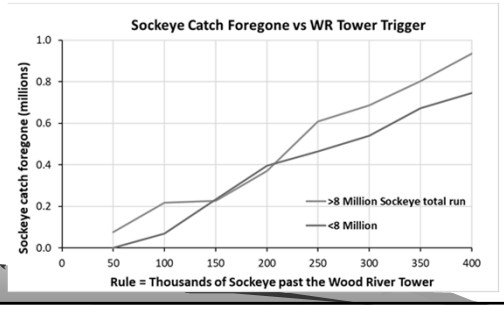
## Wood River Trigger, Average Costs in Sockeye

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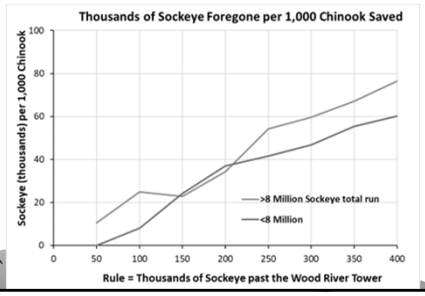
## Costs, Thousands of Sockeye per 1,000 Chinook Saved

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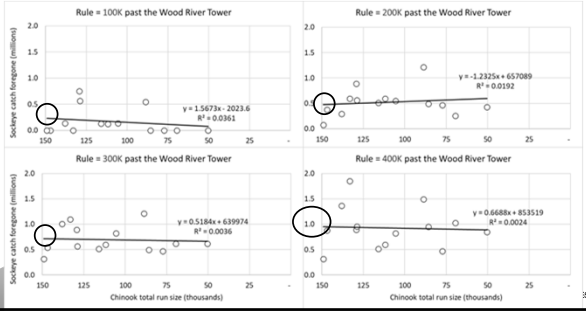
## Variation – Sockeye Cost vs King Run Size

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## Wood River Trigger, Summary

- A useful exercise
- Meaningfully add to king escapement when project inriver run falls below 55k
- Smaller effect than expected?
  - Sort of.
  - Natural variation in entry patterns of kings and rapid onset of sockeye run "hobbles" performance in at least some years.

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## Wrap Up – Technical Analyses

- What action would have a bigger impact on king conservation? Your sense?
  - WR Trigger or 4 ¾" Mesh Size?
- Questions about technical analysis?

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## The End

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## Extra reference slides

39

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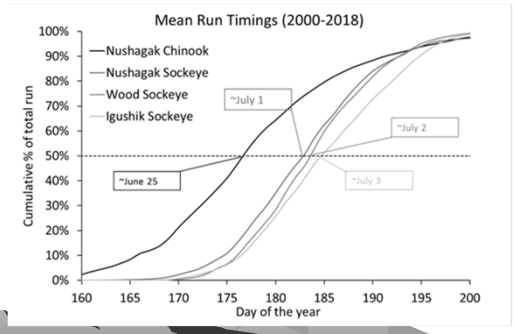


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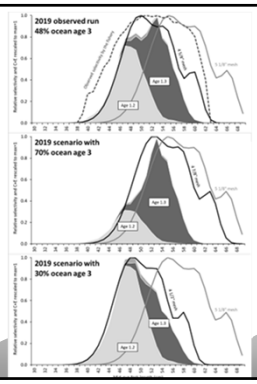


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# *Potential for Mesh Size Regulation in the Sockeye Fishery to Increase Sockeye Harvest and Reduce Chinook Salmon Harvest*

Prepared for:
Committee to Examine Changes to the
Nushagak-Mulchatna King Salmon Management Plan

Prepared by:
Dr. Scott Raborn and Michael Link
Tuesday, March 22, 2022

1

1

## Outline

1. Review GN Selectivity
   - Vulnerability to capture varies fish body size AND gillnet mesh size
2. Observations in Nushagak District
   - See differences in exploitation of stocks and 2- and 3-ocean fish
3. How mesh size regs can reduce Chinook salmon exploitation
   - Fleet effectiveness harvesting sockeye drives overall fishing time

2

2

## Selectivity Curves

Relative effectiveness of a mesh across a range of fish sizes

- A selectivity curve is SPECIFIC to mesh size
- The shape of the curve is super important
  - Catch of smaller fish drops quickly as mesh size increases
  - Catch of larger fish drops less quickly as mesh size decreases

3

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## Selectivity Curves

- Initially developed from a decade of results from the Port Moller Test Fishery
- In 2019-2020, Nushagak District Test Fishery was used to develop district-specific selectivity curves

4

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## Why Selectivity Curves in BB?

- Sockeye return across wider range of sizes and age composition across years and among stocks than other salmon fisheries
- Fish size driven by years spent at sea
  – 2 or 3 years

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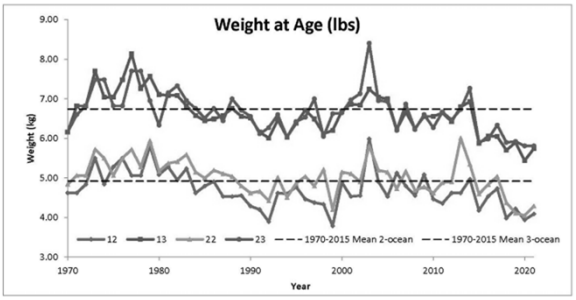
## Size, Ocean Age 2 and 3

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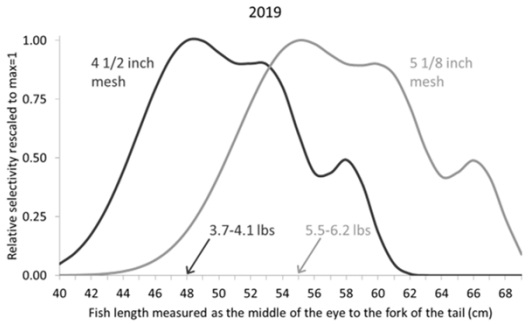
## Selectivity curves, two meshes

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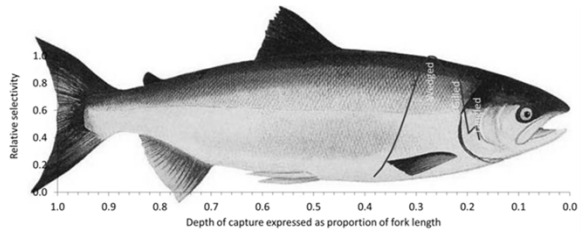
- Superimposed onto the image of an average shaped oceanic phase Sockeye allows inspection of how the estimated curve relates to capture mechanisms

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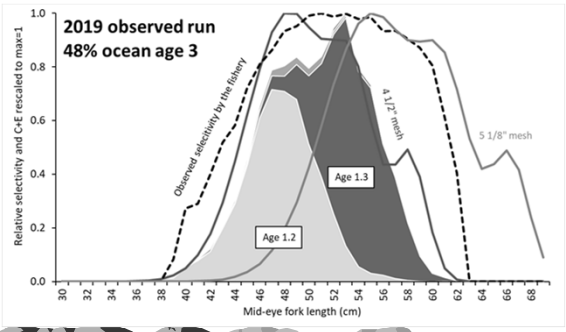
## Curves overlaid on the 2019 Run

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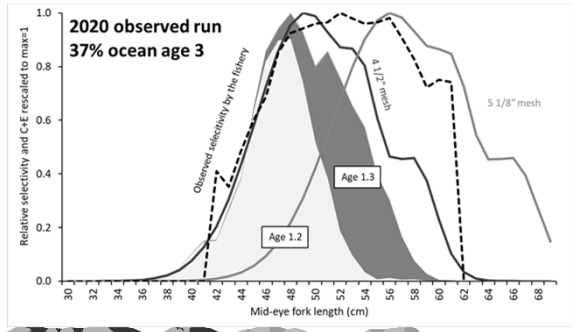
## Curves overlaid on the 2020 Run

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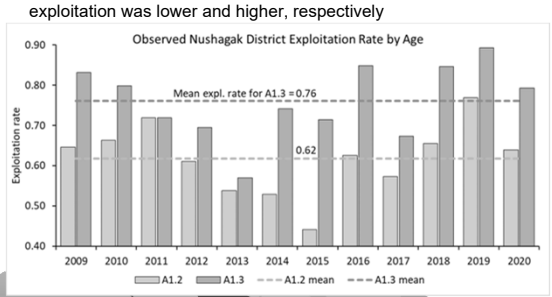
## Observations in the Nushagak District

- For the years 2009-2020 the average exploitation rate of Sockeye age-1.3 was 1.25 times greater than that for age-1.2
- This is a best-case scenario because the Nushagak enumeration site undercounts age-1.2 and overcounts age-1.3; thus, actual exploitation was lower and higher, respectively

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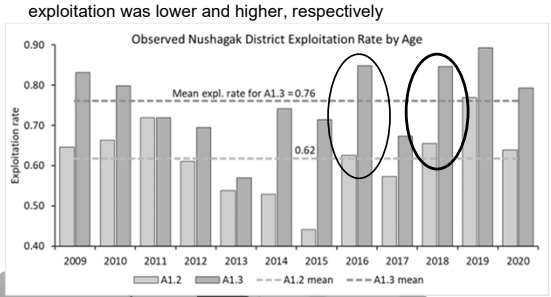


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## Observations in the Nushagak District, 2018

Largest fishing fleet/most gear days ever:

- Nushagak R. Exploitation Rate = 87%
- Nushagak R. Escapement = 1.25M
- Wood R. Exploitation Rate = **67%**
- Wood R. Escapement = **7.5M**

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## How might regulating mesh size be used to improve fleet effectiveness on Sockeye and conserve Chinook Salmon?

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## Fewer Chinook Caught with Smaller Sockeye Mesh?

- YES, but <u>not</u> the primary motivator of a potential regulatory change
  - Quantifiable – yes, but need a selectivity curve through the larger chinook body size
- Much more important mechanism….

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## Primary Mechanism

- Reduce fishing effort for sockeye
  - Provide more opportunity for unfished windows/time
  - Reduce pressure on manager to go 24/7 when sockeye escapement goals have been exceeded

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## 2019 Optimum Mesh Sizes

Most relevant to Sockeye fishery ↓ Most relevant to Chinook fishery ↓

| Mesh size (inches) | Catch (individuals) | Fish wt. (lbs) | Catch (lbs) | Exploitation rate Age 1.2 | Exploitation rate Age 1.3 | Efficiency relative to mesh that max lbs | **Inefficiency** relative to mesh that max fish |
|---|---|---|---|---|---|---|---|
| **Observed run with 48% ocean age 3 fish** | | | | | | | |
| 4 1/2 | 14,914,524 | 4.76 | 71,062,569 | 0.87 | 0.80 | 0.98 | 1.00 |
| 4 5/8 | 14,814,601 | 4.92 | 72,839,348 | 0.78 | 0.89 | 1.00 | 1.01 |
| 4 3/4 | 14,244,034 | 5.07 | 72,272,333 | 0.66 | 0.95 | 0.99 | 1.05 |
| 4 7/8 | 13,285,210 | 5.23 | 69,441,913 | 0.52 | 0.98 | 0.95 | 1.12 |
| 5 | 11,790,545 | 5.38 | 63,387,843 | 0.39 | 0.95 | 0.87 | 1.26 |
| 5 1/8 | 10,152,186 | 5.52 | 56,088,330 | 0.27 | 0.88 | 0.77 | 1.47 |

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## 2020 Optimum Mesh Sizes

Most relevant to Sockeye fishery ↓ Most relevant to Chinook fishery ↓

| Mesh size (inches) | Catch (individuals) | Fish wt. (lbs) | Catch (lbs) | Exploitation rate Age 1.2 | Exploitation rate Age 1.3 | Efficiency relative to mesh that max lbs | **Inefficiency** relative to mesh that max fish |
|---|---|---|---|---|---|---|---|
| **Observed run with 37% ocean age 3 fish** | | | | | | | |
| 4 1/2 | 8,494,759 | 4.17 | 35,450,599 | 0.69 | 0.69 | 1.00 | 1.00 |
| 4 5/8 | 8,166,642 | 4.31 | 35,196,456 | 0.60 | 0.76 | 0.99 | 1.04 |
| 4 3/4 | 7,553,025 | 4.45 | 33,647,056 | 0.50 | 0.80 | 0.95 | 1.12 |
| 4 7/8 | 6,681,499 | 4.60 | 30,723,667 | 0.40 | 0.79 | 0.87 | 1.27 |
| 5 | 5,714,009 | 4.74 | 27,079,030 | 0.30 | 0.74 | 0.76 | 1.49 |
| 5 1/8 | 4,715,850 | 4.88 | 23,007,185 | 0.21 | 0.67 | 0.65 | 1.80 |

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## Conclusion

- Size selectivity by gillnets causes exploitation to vary considerably by size and age
- The fleet in the Nushagak District has historically used mesh sizes that over-exploit larger age-1.3 Sockeye and under-harvest age-1.2 Sockeye
- This inefficiency prolongs fishing time and exposes more Chinook to commercial harvest

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## Conclusion (cont.)

- An upper limit of 4¾" mesh would:
  - Increase annual Sockeye catch
  - Reduce chances of Sockeye overescapement
  - Render age composition of escapement more like that of the overall run (genetics, etc.)
  - Reduce commercial fishing time for Sockeye because the fleet is more efficient
  - Fewer/shorter openers translates into less Chinook bycatch

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## Committee Discussion

- Michael to lead a discussion about the pros and cons of regulation versus some other way to address

"*unnecessary incidental catch of Chinook*"

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## Regulate mesh size or modify behavior in other ways?

- "It's a free country; can't tell people how to fish"
  - Why regulate depth (and length) of net gear, fishing tackle, slot limits, etc.?
- Nushagak is a unique district with a big problem?

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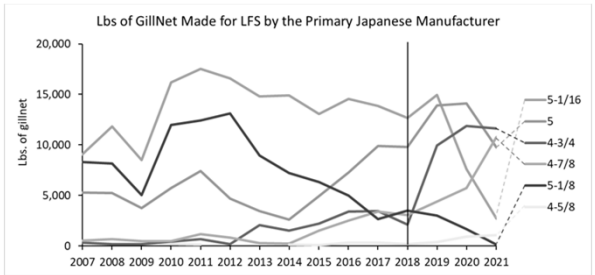
## An Index of Fleet Behavior

(complements of Bert Lewis, ADFG)

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## Acknowledgments

- Jordan Head, ADF&G, for the size-at-age over time
- Bert Lewis, ADF&G, for pounds of net by mesh size sold by a supplier to Bristol Bay
- Test Fishing crews at Port Moller TF and Nushagak District Test

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## Questions?

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25

## Miscellaneous Background

- Size at age variation and recent trend
- A reminder of why we probably underestimate the magnitude of the difference between exploitation on 2 and 3-ocean fish.

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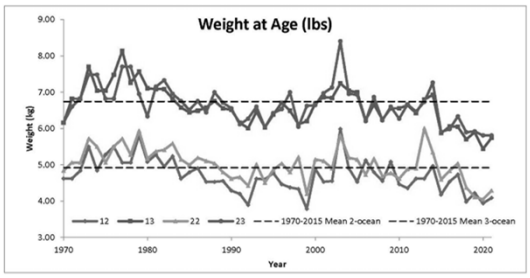
## Average size by age changes among years, recent trend down

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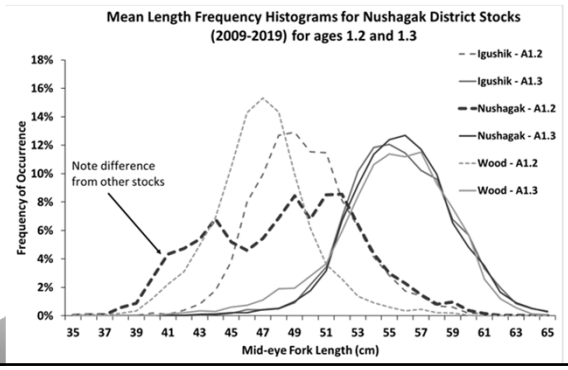
## Gillnet-based Apportionment of Sonar Counts to Species

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# Appendix E. 2022 Proposal 11, as submitted by the NMKSMP Committee

*Proposal 11 - 5 AAC 06.361. Nushagak-Mulchatna River King Salmon Management Plan and 5 AAC 67.022. Special provisions for season, bag, possession, and size limits, and methods and means in the Bristol Bay Area.*

Make numerous amendments to the Nushagak-Mulchatna King Salmon Management Plan, as follows:

As part of a larger comprehensive solution to issues facing management of the king salmon fisheries in the Nushagak drainage, the committee recommends the following regulatory changes. The list below includes eight regulatory action items with consensus among the Nushagak King Salmon Committee, of about 15 considered. Actions listed below, in draft regulatory format, would fall under the Nushagak-Mulchatna River King Salmon Management Plan (5 AAC 06.361), except where noted under #6 which would fall under sport fishing Special Provisions (5 AAC 67.022).

1. **Define specific management objectives for the Plan by adding the language below to, or following, section (a) of the Plan:**

**The department shall manage the Nushagak fisheries for the following management objectives:**

1) **Provide consistent sport fishing opportunity within and among seasons. This includes a level of inriver abundance as a given year's run timing allows, and a predictably open season.**
2) **Provide a directed commercial king salmon fishery when surplus is available.**
3) **Provide for an uninterrupted commercial sockeye salmon fishery (i.e., minimize disruptions to the sockeye salmon fishery).**
4) **Provide for reasonable opportunity for subsistence harvest of king salmon.**
5) **The subsistence fishery is the last fishery to be closed.**
6) **Achieve escapement goals for all species in the district.**
7) **Maintain a representation of age classes in the escapement similar to the run.**

*2.* **Manage large sockeye runs so that escapements fall in the upper portion of the escapement goal range, which would reduce incidental catch of king salmon, by adding new provisions to section (b) as follows:**

**(X) Consistent with 5 AAC 06.367 Nushagak District Commercial Set and Drift Gillnet Sockeye Salmon Fisheries Management and Allocation Plan, the department in an attempt to conserve king salmon shall manage for sockeye escapements in the Nushagak District to fall within the**

**(1) lower half of the escapement goal range when the Wood River sockeye salmon run is 8 million or less and/or the Nushagak sockeye salmon run is 4 million or less, or the**

**(2) upper half of the escapement goal range when the Wood River sockeye salmon run is greater than 8 million and/or the Nushagak sockeye salmon run is than 4 million based on the preseason forecast and in-season assessment of run size.**

**(X) On or after June 25, the department shall consider when evaluating total run of sockeye salmon to the Nushagak District all possible data sources including but not limited to: pre- season forecast, Port Moller test fishery indices and stock and age composition, total C+E to date, age composition of C&E and district test fishing.**

**3. Use a Nushagak District Test Fishery to assess relative abundance of sockeye and king salmon by adding the following new provision to (b):**
**(X) From June 1 through June 30 the department in an attempt to conserve king salmon shall conduct a drift gillnet test fishery to assess the abundance of sockeye and king salmon prior to opening by emergency order a fishing period directed at sockeye salmon.**

**4. Modify the Wood River trigger and establish a Nushagak River trigger by adding the following new provisions to (b) and repealing (e)(1):**

**(X) close, by emergency order, the sockeye salmon commercial fishery in the Nushagak District until the projected sockeye salmon escapement past the Wood River tower exceeds 100,000 within the next 12 hours if the forecasted Wood River sockeye run is 8 million or less. If the Wood River sockeye run is forecasted to be more than 8 million the fishery shall close by emergency order until the projected sockeye salmon escapement past the Wood River tower exceeds 300,000 within the next 12 hours.**

**(X) (1) independent of whether the Wood River tower count exceeds 100,000 or 300,000, open, by emergency order, the sockeye salmon commercial fishery in the Nushagak District when the sockeye salmon escapement past the Nushagak River sonar counter exceeds XXXXXX when the forecasted Nushagak River sockeye run is XXXXXXX. If the Nushagak River sockeye run is forecasted to be more than XXXXXXX, the fishery shall open by emergency order when the projected sockeye salmon escapement past the Nushagak River sonar exceeds XXXXXX.**

e) If the spawning escapement of king salmon in the Nushagak River is projected to be less than 55,000 fish, the commissioner

[(1) shall close, by emergency order, the sockeye salmon commercial fishery in the Nushagak District until the projected sockeye salmon escapement into the Wood River exceeds 100,000 fish;]

**5. Provide a directed commercial fishery for king salmon when surplus clearly exists by modifying section (c) as follows:**

(c) If the total inriver king salmon return in the Nushagak River is projected to exceed 95,000 fish,

**(1)** the guideline harvest level described in (b)(1)(C) of this section does not apply[.]**, and**
**(X) the department will consider a directed commercial king salmon fishery.**

**6. Modify the annual limit for king salmon by modifying 5 AAC 67.022 and section (c) of the Plan as follows:**

**5 AAC 67.022. Special provisions for season, bag, possession, and size limits, and methods and means in the Bristol Bay Area.**

(g) In the Nushagak River drainage, excluding the Wood River drainage, and unless otherwise specified in 5 AAC 06.361 or 5 AAC 06.368, the following special provisions apply:

(1) the bag and possession limit for king salmon 20 inches or greater in length is two fish, of which only one fish may be 28 inches or greater in length; the annual limit for king salmon 20 inches or greater in length is four fish**, of which only one fish may be 28 inches or greater in length**; the bag and possession limit for king salmon less than 20 inches in length (jack salmon) is five fish; …

**5 AAC06.361 Nushagak-Mulchatna King Salmon Management Plan.**

(c) If the total inriver king salmon return in the Nushagak River is projected to exceed 95,000 fish,

**(1)** the guideline harvest level described in (b)(1)(C) of this section does not apply[.]**, and**

**(X) the commissioner may increase the annual limit for king salmon to 4 king salmon 20 inches or longer (no restriction to one fish over 28 inches).**

**7. Avoid complete closures of the sport fishery when possible by modifying section (e) as follows:**

(2) shall [close]**restrict to catch and release**, by emergency order, the sport fishery **for king salmon** in the Nushagak River [to the taking of salmon] and prohibit the use of bait for fishing for all species of fish until the end of the king salmon season specified in 5 AAC 67.020 and 5 AAC 67.022(g); and

**8. Provide the department with flexibility to restrict but not close the subsistence fishery in low inriver run scenarios and standardize subsistence fishing schedule and area under a restricted scenario by modifying section (e) as follows:**

(3) [shall]**may** establish, by emergency order, fishing periods during which [the time or area is reduced for the inriver king salmon subsistence fishery in the Nushagak River]**the subsistence fishery is restricted to 3 days per week in the Nushagak District; and the waters above the district including Dillingham beaches, Wood River up to Red Bluff, and the Nushagak River drainage**.

**What is the issue you would like the board to address and why?** The Nushagak River fisheries that harvest king salmon have been managed under the direction of the Nushagak-Mulchatna King Salmon Plan (5 AAC 06.361) since 1992. Salmon fishery dynamics changed notably over the life of the Plan. King salmon runs declined to some of the lowest levels recorded and sockeye runs to the Wood and Nushagak Rivers increased in magnitude to some of the highest levels recorded. Commercial fishing directed at king salmon has remained closed since 2014, and sport fishing regulations have become increasingly conservative. At the same time, substantial uncertainties have expanded over the ability of the sonar to estimate inriver run abundance.

Restrictions to the sport fishery due to low early season inriver passage of king salmon combined with sometimes intense fishing for sockeye in the Nushagak District in the mid-2010's led to calls to enact paired restrictions in the commercial and sport fishery in 2018 (Proposals 41 and 42, 2018

Bristol Bay Board meeting). The Board, in response to the proposals, removed several triggers in the Plan that affect the sport fishery. The Board also established a committee to develop a comprehensive solution to the Plan through RC 84 and a charge statement (2018-291-FB) and charged the committee with reporting back to the Board. At the 2018 Board meeting, the Bristol Bay Science and Research Institute (BBSRI) committed to supporting the committee's work through a stakeholder-led technical analysis of options the committee was expected to consider (RC 80).

The committee first met in Anchorage on October 21, 2019 (a meeting summary can be found on the Alaska Board of Fisheries website) and break-out groups met in December 2019 and February 2020. At the Upper Cook Inlet meeting in February 2020, the Board disbanded the formal committee but encouraged stakeholders on the committee to continue to work together in preparation for the next in-cycle Bristol Bay meeting. BBSRI reasserted its commitment to serving the committee and moving toward its original mission outlined in the charge statement: a comprehensive solution to the Plan. Committee makeup remained the same as selected by the Board initially in February 19, minus the two Board members. The committee met on a consensus basis 15 times from Fall 2019 through early April 2022; 9 times as a full committee and 6 partial committee meetings.

This regulatory proposal is one part of a larger, more comprehensive solution envisioned by the committee to address issues plaguing management of the Nushagak king salmon fisheries. Other components will include additional technical analyses, recommendations for improving stock assessment, and other non-regulatory actions or recommendations. As one example of a non- regulatory action, BBSRI has secured funding to field a district test boat program to better inform managers of sockeye and king salmon abundance in the Nushagak District and thereby reduce incidental harvest of king salmon and better target sockeye salmon in the district. A report will be made available in advance of the November 2022 Board meeting to summarize the committee process and work products and present the full scope of the comprehensive solution. Work products including the report will be posted on the BBSRI website as they become available.

**PROPOSED BY:** Nushagak-Mulchatna King Salmon Committee (HQ-F22-028)

**********

PC54

**Name:** Nushagak King Salmon Committee

**Community of Residence:** Alaska

**Comment:**

Proposal 11 - Support

During the December 2018 Bristol Bay Finfish meeting, the Alaska Board of Fisheries struck a committee to review Nushagak River and District fisheries and regulations, and to provide recommendations on a comprehensive solution to Chinook salmon management. The first two report documents are two of four document's that are being prepared for the BOF. The first report captures the process and outcomes from the committee, which met between February 2019 and April 2022. The second is an updated historical report on the Nushagak King salmon stock and the associated fisheries.

Proposal 11 includes the seven proposed actions agreed to be the committee:

1. Manage large sockeye runs so that escapements fall in the upper portion of the escapement goal range.

2. Use a Nushagak District Test Fishery to assess relative abundance of sockeye and king salmon.

3. Modify/Clarify the Wood River trigger and establish a Nushagak River trigger,

4. Provide a directed commercial fishery for King Salmon when surplus clearly exists

5. Modify/reduce the annual limit for king salmon.

6. Avoid complete closures of the sport fishery when possible.

7. Provide ADF&G with flexibility to restrict but not close the subsistence fishery in low inriver run scenarios and standardize subsistence fishing schedule and area under a restricted scenario

See attached for additional information - Report #2

PC54

# Historical Review of Nushagak River King Salmon Management

Prepared by

Tom Brookover

Anchorage, AK
tbrookak@gmail.com

Prepared for

Board of Fisheries Committee to examine the Nushagak-Mulchatna King Salmon Management Plan

and

Bristol Bay Science and Research Institute

September 19, 2022

# Table of Contents

## Introduction

In 1992, the Alaska Board of Fisheries (Board) adopted the Nushagak-Mulchatna King Salmon Management Plan (Plan) to guide management of the subsistence, commercial and sport fisheries that harvest this important stock. The Nushagak River fisheries that harvest Chinook (king) salmon have been managed under the direction of the Plan since then. However, restrictions to the sport fishery due to low early season inriver passage of king salmon combined with sometimes intense fishing for sockeye in the Nushagak District in the mid-2010's led to calls to pair restrictions in the commercial and sport fishery in 2018. Proposals 41 and 42, submitted for deliberation at the November 2018 Bristol Bay Board meeting, both sought to restrict time in the commercial fishery when the sport fishery is restricted inseason by emergency order.

In response to the proposals, the Board established a committee at the 2018 meeting to develop a comprehensive solution to the Plan and charged the committee with reporting back to the Board. The Bristol Bay Science and Research Institute (BBSRI) also committed to supporting the committee's work through a stakeholder-led technical analysis of options the committee was expected to consider. Possible committee products included regulatory proposals and/or other non-regulatory recommendations.

An early (October 14, 2019) draft version of this report was developed to summarize management of Nushagak River king salmon for the committee's benefit. The history of the fishery through the mid-1980s was well documented in a comprehensive, albeit dated, report (Nelson, 1987). The 2019 draft of this report provided an updated comprehensive historical overview summarizing Nelson's report as a basis, then describing the evolution of the fisheries that followed.

The purpose of the 2019 draft was to provide committee members with key information, help create a better understanding, and provide a basis for future recommendations concerning management of the Nushagak River king salmon fisheries. The draft was intended as a "living" document and was expected to evolve with input from committee members and others and as new fishery information came available.

The committee met initially October 21, 2019, in Anchorage to get underway and discuss preliminary analysis of the fishery's history, including information presented in the draft report, and technical challenges associated with the monitoring and management of the fishery. Break-out groups met in December 2019 and February 2020. At the Upper Cook Inlet meeting in February 2020, the Board disbanded the formal committee but encouraged stakeholders on the committee to continue to work together in preparation for the next in-cycle Bristol Bay meeting. Since then, the committee met on numerous occasions toward developing comprehensive recommendations to improve the Plan and stock assessment programs in preparation for the Bristol Bay Board meeting scheduled for November 2022. BBSRI facilitated the meetings and provided technical analysis and support. The committee

process and outcomes are to be discussed in depth in a separate report and are therefore not discussed in this one.

In this report, historical king salmon management in the Nushagak District is portioned into three eras:

- 1884-1986 (recap of Nelson (1987))
- 1987-1992 (development of the Plan)
- 1992 through 2021 (the Plan years)

This report includes fishery data for the years that followed the early draft (2019, 2020 and 2021). Discussion of fishery trends have been adjusted accordingly. Comments received from committee members and staff from the Alaska Department of Fish and Game (ADF&G) have also been incorporated. The report is intended to be made available with other work products, including a separate report on the committee process and a proposal to the Board detailing changes to the Plan, to the public prior to the 2022 Board meeting. Like the 2019 draft, its purpose is to improve understanding of the Nushagak River king salmon fisheries and their management and provide a basis for committee recommendations.

## Pre-1987

The history of the Nushagak king salmon fisheries from the inception of the commercial fishery in Nushagak Bay in 1884 through the mid-1980s was well documented in a comprehensive report (Nelson, 1987). Mike Nelson worked as the Area Biologist for the ADF&G in Dillingham and oversaw management of the Nushagak commercial and subsistence fisheries from shortly after statehood until his retirement in 1987. The purpose of the report was to assist in creating a better understanding of the king salmon management program and provide a basis for future recommendations regarding fishing regulations. Nelson (1987) helped set the stage for the development of the Nushagak-Mulchatna King Salmon Management Plan in 1991.

This section summarizes Nelson's findings. By the time the report was published, the commercial fishery had "traditionally extracted a heavy toll from the total run, while freshwater sport fishing interests (were) growing rapidly." There was a growing concern that spawning escapements may be jeopardized, and that the natural productivity could not be maintained. As greater fishing pressure was exerted on the stock, the fisheries were subjected to progressively more stringent regulations. Under this background, Nelson foresaw a clear need for "a careful, quantitative appraisal of the fishery impacts and of regulatory options" to maintain or increase productivity and address hardships among the various participants.

### *Key Management Issues*

Nelson (1987) clearly recognized the value of Nushagak River king salmon to the area's commercial, subsistence and sport fisheries, as well as the challenges presented by then-

apparent very high exploitation rates and fishery practices. These included the potential for friction among the fisheries in the face of increasing demand as well as conservation-related concerns for the quantity and quality of escapement and resultant impacts to productivity of the stock. Several salient points discussed in the report included:

- exploitation rates had exceeded 95% of the early run component and were expected to remain high without further restrictions,
- gill net mesh size and depth directly influenced exploitation rates and quantity and quality of escapement,
- fish holding within and above the district created difficulties in obtaining escapement throughout the run, and
- methods to assess inriver abundance/spawning escapement were under development

Each of these points are discussed in more detail in the following sections.

**Harvests and Exploitation rates**

The commercial fishery for salmon in Bristol Bay began in 1884. Sockeye salmon were, and remain, the targeted species and main emphasis for the Bristol Bay and Nushagak fishery. However, the commercial harvest of king salmon in the Nushagak District advanced rapidly once development began. After sustained commercial utilization (1955-1971), catches declined (1972-1975) but recovered, and then reached a historical peak over the decade 1976-1986. Recovering salmon markets and advances in gear effectiveness at catching king salmon were primary factors driving the renewed commercial interest in early season fishing effort. However, peak production of king salmon in the early 1980s resulted in a surge of interest and record harvests in the commercial fishery. Nelson (1987) chronicles the trends in commercial harvest from the fishery inception through 1986; annual harvests ranged from 1,635 (1935) to 195,287 (1982) fish with the three largest harvests occurring in 1979, 1981 and 1982. By 1987, the Nushagak watershed produced the state's second largest stock-specific commercial king salmon fishery, nearly matching those of the Yukon River.

He similarly discussed trends in the subsistence and sport fisheries. While subsistence use of salmon dated back beyond the availability of written literature, little data on harvest was available prior to 1963 when a permit system was initiated. Subsistence harvests in the Nushagak District normally ranged between 50 and 80 thousand salmon and had been increasing due to increased effort from local population increases and annual influxes from non-watershed participants, and better harvest reporting. As king salmon are the first species to arrive in the spring, they received considerable interest and fishing pressure. From 1963 through 1986, subsistence harvests averaged 7,200 and ranged from 2,900 (1964) to 12,600 (1986) king salmon. Effort and harvest of king salmon had increased since 1970 and, like the commercial fishery, the subsistence fishery accounted for its largest harvests in the early 1980s.

Development of sport fisheries in Bristol Bay had occurred more recently relative to commercial and subsistence fisheries. Nelson cited Paddock (1964) describing the first significant instance of king salmon sport use on the Nushagak River taking place at Portage Creek in 1963. Since then, sport fishing had became more popular in Bristol Bay, and the peak production of king salmon in the early 1980s contributed to the growing fishery on the Nushagak River, with increasing effort and harvest. Sport harvests were estimated from 1977 to 1986. The largest sport harvest occurred in 1984 (2,382 fish).

Using available catch and escapement data from 1966 through 1986, Nelson (1987) estimated the average Nushagak king salmon total run at over 176,000. He noted an improvement in the adult production trend whereby then-recent runs (1978-1986) averaged 246,000 fish, nearly twice the size of runs averaged from 1966-1977 (125,000 fish). Over the entire period, exploitation rates averaged 54 percent and ranged from 29 (1975) to 72 percent (1969).

Exploitation on the early component of the king salmon run appeared to be of specific concern; then-recent commercial and subsistence exploitation rates had exceeded 95% for this component. Traditionally, the commercial fishery commenced in late May to early June. Approximately 85% of the annual harvest was taken in the month of June and the mid-point was June 18. Nelson (1987) describes a bimodal pattern of harvests taken 1973-1986, with the first peak occurring June 7-14 and the second, June 23-26. He ascribes the bimodal pattern to the established fishing schedule of 5 days per week prior June 16, when the fishery was closed unless opened for fishing by emergency order and notes that, as more pressure was exerted early in the run, fishery managers applied additional time and area closures. The effect of those actions became apparent in 1981, when high catch rates shifted from early in the season to later.

**Gillnet mesh size and depth**

Gillnets were (and remain) the only fishing gear allowed in the commercial fishery and were the only gear used in the subsistence fishery. Drift gill net gear accounted for most of the total catch. As a result, and because of the characteristics of the gear related to fish size regardless of species, Nelson (1987) focused considerable discussion on the impacts gillnet mesh size and depth have on king salmon.

By 1987, basic data on age, weight and length had been collected from the Nushagak king salmon harvests and spawning escapement. According to Nelson (1987), a statistically adequate number of samples had been collected each year from the commercial fishery beginning 1966, and from subsistence harvests and spawning escapements beginning 1982. Based on analysis of the samples collected, Nelson (1987) described some of the biological characteristics of Nushagak king salmon as follows:

- Age class composition of the run varies from year to year; however, most king salmon (80 percent) return as 5- and 6-year-old fish and over 96 percent return as age 4 through 7.

- Age class differences between males and females is striking; age 4 and 5 fish are predominantly males and in contrast, age 6 and 7 fish are predominately females.
- Based on data from the commercial fishery, there is considerable overlap of lengths between age classes. Females are generally longer than males of the same age class through age 6.
- Mean weight of females tends to be greater for a given age class compared to males.
- Age at sexual maturity varies between males and females.
- A weighted average (1982-1984) of catch and escapement indicated a higher proportion of males (53 percent) in the total runs.
- Based on fecundity data collected from the 1966 and 1968 Nushagak District commercial catches (n=69), number per female averaged over 10,000 eggs. Nushagak River king salmon appeared to have some of the highest fecundity rates found in the species throughout the Pacific Coast.

At that time, the Nushagak gill net fishery showed considerable selectivity by age, size, and sex. Historically, large mesh nets were used to target king salmon while smaller mesh nets were used to target sockeye salmon. Gillnet specification varied from year to year but by the mid- 1970s, 8 to 8 ½ inch mesh was commonly used to target king salmon (early in the season), while sockeye salmon were targeted using 5 1/8 to 5 ½ inch mesh gillnets (later in the season). Smaller mesh nets (5 3/8 inch) tended to selectively capture smaller king salmon which are primarily males, while larger mesh nets (8¼ to 8½ inch) tended to select for larger salmon which are primarily females. Thus, early season (large) mesh accounted for a heavy preponderance of large females in the catch, while smaller mesh sockeye gear accounted for a higher proportion of younger age males. Some important additional points regarding mesh selectivity made by Nelson (1987) follow:

- The commercial fishery showed an overall higher percent of males which Nelson attributed to a relatively greater abundance of early maturing, smaller age 4 and 5 males.
- Mesh selectivity affected the age and sex composition of the escapement.
- A weighted average (1982-1984) of catch and escapement indicated a higher proportion of males in the catch and a higher proportion of females in the escapement.
- Since large mesh gill nets tend to harvest larger female fish, mesh selectivity affected the average fecundity of the female spawning population. King salmon harvested with large mesh, i.e., 8 ½ inch, nets vs small mesh, i.e., 6 ½ inch, nets resulted in a two-fold difference in egg deposition on the spawning grounds.
- Large mesh gill nets were restricted for the first time in 1985 and 1986 to reduce catch rates and were felt to be effective in allowing additional large king salmon into the river to spawn.

While mesh size restrictions were historically implemented to manage sockeye salmon harvest, then-recent use of inseason restrictions on the use of large mesh showed promise in reducing exploitation of large fecund females.

Nelson stated that gillnet (mesh) depth was of equal importance to mesh size with respect to catch rates for king salmon. King salmon appear to follow deeper water channels in the generally shallow waters of the Nushagak District, where deeper nets are more effective.

Gillnet length and mesh size varied during the early years of the fishery until 1923 when the U.S. Bureau of Fisheries restricted both. At the time of the report, little information existed on the depth of king salmon nets in existing literature, and the depth used appeared to closely follow a 28-mesh restriction enacted in 1925 for sockeye salmon nets.

As interest in king salmon increased in the 1940's, some Nushagak fishermen began to experiment with deeper nets. Reports from fisherman indicated higher success rates with deeper nets through the mid-1950s and, as fishermen became more effective with deeper nets, interest and participation in the fishery accelerated.

By 1957, Federal fishery managers recognized that the increase in fishing effort required additional closed time for king salmon conservation purposes. In 1958, weekly fishing time (prior to June 22) was reduced by 36 hours and nets were limited to 28 meshes in depth. Nelson cited an experienced fisherman attesting to effectiveness of the depth restriction in reducing the increased exploitation on and stated that the depth restriction is an essential component of the regulatory management program for the species.

**Migratory behavior and timing**

Nelson made the point that, considering the rapid growth and "gross mismanagement" of the early Bristol Bay sockeye salmon fishery, Nushagak king salmon were fortunate in that the run arrived before the sockeye fishery began in earnest. Thus, the advanced (earlier) run timing of the species, along with the relatively low commercial interest in its smaller run, helped the stock survive the development of the sockeye fishery.

Fishery managers began to use this difference in timing to manage for conservation of king salmon in 1958. When weekly fishing time was reduced and net depth was restricted that year, the restrictions were applied prior to June 22 when king salmon were the primary species present. As fishermen became more effective at targeting king salmon and effort targeting the species increased, fishing time prior to June 16 was further reduced. For the 1987 season, ADF&G planned to prohibit fishing prior to June 1 and replace the 5-day fishing schedule then in place prior to June 16 with a 3-day schedule. At the time, fishing beginning June 16 was closed unless and until opened by emergency order. Future action, including replacing the fishing schedule prior to June 16 with emergency order management, would be considered depending on the success of the 1987 measures.

While the earlier run timing relative to sockeye salmon contributed to king salmon sustainability and provided a means to manage the species separately for conservation, other migration tendencies posed management challenges. King salmon often mill and hold within the district, are believed by many fishermen to hold deep during calm weather and therefore unavailable to the fishery and appear to move upriver and become available to the fishery under the influence of strong winds. For these reasons, the effectiveness of early

season closures on reducing harvest rates was limited at times; early season closures coincided with a noticeable shift in high catch rates from early to later in the season in the early 1980s.

Run timing data was collected from four sources: commercial, subsistence and sport harvests, and sonar-based enumeration. Over half (55 percent) of the commercial harvest was accumulated by June 16-20. Subsistence harvest in the Dillingham area peaked between June 20-30 (later upriver). Sport catches inriver peaked between June 26 and July 6. And available sonar data indicated 50% of the inriver run had passed the sonar site July 1-2. Nelson acknowledged the commercial fishery can influence the migration timing of the inriver run but pointed out that the data collectively indicated that most king salmon migrate into the lower river during late June to early July.

**Inriver abundance and escapement assessment**

Management of salmon fisheries in Alaska is based primarily on achieving escapement levels that support sustainable harvests. As Nelson stated: "the criterion of escapement has been the primary factor in determining fishing regulations in Alaska, from the passage of the White Act in 1924 to the present time." Yet, the magnitude (and quality) of spawning escapements has not always been estimated. Escapement data for king salmon is relatively difficult to collect because spawning is generally concentrated in mainstem reaches of larger, turbid river systems.

Aerial surveys to locate king salmon spawning areas and assess spawning magnitude in the Nushagak River began in 1956 and continued through publication of the report (and beyond). One of the objectives of the aerial survey assessments was to develop methods to use aerial survey counts to estimate total escapement.

In 1979, a side scanning sonar project to enumerate adult sockeye salmon was initiated on the lower Nushagak River near Portage Creek. Nelson acknowledged the potential of the sonar project to estimate king salmon escapement but continued aerial surveys during the subsequent years due to operational difficulties and sampling problems experienced by the sonar project. Some of the initial challenges of using sonar to estimate passage included exceeding the density threshold of the Bendix units, limited sonar range/coverage of the migratory pathway of the larger king salmon, and difficulties in apportioning sonar targets to specific species among the sockeye, chum, and king salmon that comigrate past Portage Creek.

Annual monitoring of daily subsistence catches at Lewis Point on the lower Nushagak River was initiated in 1980 to provide daily estimates of king salmon escapement in advance of estimates provided by the sonar project. Unlike aerial survey assessments conducted on the spawning grounds, both the sonar and Lewis Point catch monitoring projects provided the added benefit of inseason "real-time" data on inriver abundance in the Nushagak River. However, problems with the Lewis Point project also kept the emphasis on the aerial survey program as the primary means to estimate spawning escapement.

Visual counts of salmon passing by points on the shoreline were conducted from counting towers beginning in 1953 to estimate sockeye escapement. Incidental tower counts were also collected routinely for king salmon. Counting periods, designed to capture the duration of the sockeye run, did not cover the duration of king salmon run and counts were of limited use as a result. One weir project – 1968 Stuyahok River weir - had been implemented in Bristol Bay to enumerate king salmon.

Beginning in 1966, an expanded 'comprehensive' aerial survey program was used to expand counts of king salmon to total inriver spawning abundance. Expansion factors and methodology varied by year and had not been rigorously evaluated until 1982 after an extensive series of escapement data had been collected from numerous spawning streams within the Nushagak drainage. In that evaluation, selected portions of the Nushagak and Mulchatna main stems, for which counts had been collected for eight years, were correlated with total counts for years when they were available. The correlation, in turn, was then used to estimate total escapement in the Nushagak drainage. Resulting escapement estimates from 1966-1986 averaged 82,000 and ranged from 25,000 (1972) to 162,000 (1983).

### *Management Program/Tools*

Unlike the Bristol Bay sockeye salmon fishery, the Nushagak king salmon fishery received little directed effort at research and management until the 1950s. In the 1960s the management strategy was to limit harvest to a range of 60,000 to 80,000 fish with exceptions. As pressure on king salmon increased in the 1970s, the need for more robust escapement data collection also increased. And as the sport fishery grew so did the need for information on sport fishing use. In addition to funding and staffing the Dillingham area office with biologists and technicians assigned to commercial and sport fish management and research in the Nushagak District, ADF&G conducted a suite of programs aimed at king salmon at the time the report was written:

- Commercial and subsistence harvest monitoring – daily contact with processors enabled commercial catch estimates and harvest rates. Project objectives included inseason estimates of catch and fishing effort for king salmon by period, and inseason catch per unit effort.
- Commercial catch sampling – king salmon from commercial harvests were measured for weight and length, sex determined, and scale removed for age determination. Project objectives were to provide age, weigh, length, and sex data for commercially harvested king salmon.
- Sport fishery harvest monitoring
    - Creel surveys in the lower Nushagak River – anglers were interviewed inseason to collect catch and harvest data, and sample harvested fish. Project objectives included estimates of angling effort, catch and harvest rates, and collection of biological and demographic data.
    - Statewide Harvest Survey – postal surveys were mailed annually to anglers that fished in Alaska to collect effort and harvest data. Results provide harvest estimates for the Nushagak king salmon sport fishery.

- District test fishing – Fishing with gillnets took place within the Nushagak District to capture salmon. The primary objective was to monitor magnitude and entry pattern of sockeye salmon in the district. A secondary objective was to provide indications of when king salmon were present, holding, and moving upriver of the district.
- Lewis Point subsistence/test fishery – Lewis Point subsistence catches were monitored and sampled. Objectives were to estimate escapement into the river using subsistence catches, and sample catches for age, sex, and length data.
- Post-season aerial surveys – comprehensive surveys were flown to count spawning king salmon. Primary objectives were to provide estimates of drainage-wide escapement and spawning distribution.
- Portage Creek Sonar – obtain daily salmon passage rates from two Bendix side-scanning sonar units in the lower river near Portage Creek, sample salmon for age, sex, and length data, and adjust sonar counts by species. Project objective was to estimate inseason escapement of salmon by species.

At the time Nelson (1987) was published, data collected from these projects were used for king salmon inseason fishery management, post-season management assessment, and beginning in 1984, pre-season forecasts of projected run size.

## *Recommendations*

Nelson (1987) identified four categories of needs that should be addressed: habitat protection, optimum escapement objectives, methods to accurately estimate escapement, and methods to achieve escapement objectives.

### Habitat Protection

Nelson described the protection of freshwater spawning and rearing habitat a priority requirement to sustained and increased king salmon production. Three habitat objectives were identified as referenced from the 1986 Comprehensive Salmon Plan:

- Maintain present quantity and quality of salmon habitat
- Enforce state water quality and anadromous stream protection regulations, and
- Develop land use plans for public lands adjoining salmon waters

### "Optimum" Escapement Goal

Although provisional escapement objectives were in place, Nelson indicated a final goal should be developed and suggested delaying its development until after the 1990 run, when returns from the large escapements in 1981-1983 would be complete.

- Develop an optimum[1] escapement goal (after 1990 run)

[1]Nelson used the term *optimum* escapement goal like the way we currently use biological escapement goal (BEG) based on expected maximum sustainable yield (MSY). He did not use it to mean the same thing as today's Optimum Escapement Goal (OEG) in the State's escapement goal

- Continue to collect age, sex, length, and weight data needed for escapement goal development and run forecasting
- Conduct a mesh size study to determine the effects of mesh size on reproductive potential, and assess the use of regulatory mesh size restrictions as a king salmon management tool
- Conduct a tagging study to assess movement and holding patterns in the fishery, district, and lower river.

**Estimation of Escapement**

Nelson envisioned substantial benefits to providing more accurate and timely information with which to estimate inseason escapement rates. Primary benefits included allowing for additional harvest during strong runs while providing additional protection to smaller runs.

- Improved subsistence monitoring, i.e., test fish project at Kanakanak Beach, to provide daily catch estimates and possibly additional data
- Continued development of the Portage Creek sonar to provide inseason and total estimates of escapement. Species apportionment was the primary challenge to reaching this objective. Successful development would allow the termination of the aerial survey program.

**Achievement of Escapement**

This goal was aimed at providing managers with effective methods to control fishing pressure and achieve escapement goals. It was predicated on defining optimum escapement objectives and developing methods to accurately estimate inseason escapement rates.

- Conduct the commercial fishery entirely under day-to-day (emergency order) management if planned regulatory changes in 1987 were not effective in reducing the exploitation rate to achieve better distribution of escapement through time.
- Restrict large mesh gill net gear to reduce catch rates

Finally, Nelson noted positive attributes of the Nushagak king salmon stocks compared to others in Alaska: the stock is generally in good condition; is concentrated in a large river system that can be managed independently; the fisheries on the stock are conducted in a terminal area where allocation considerations are modest and, king salmon are somewhat separated from other species by timing differences in most years. Ultimately, he noted: "*the success of management will depend on the effectiveness of stock assessment capabilities and maintenance of a management strategy that is responsive to stock abundance, while retaining an element of conservatism in response to uncertainty about stock productivity*."

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policy, which is set by the Board of Fisheries and takes into account biological and socio-economic factors to set the escapement goal target.

### *Summary, Pre-1987*

The period from the early 1950s through 1986 was formative in the development of the Nushagak fisheries and their management. The period experienced a growing interest in Nushagak River king salmon, and peak production of king salmon enjoyed in the early 1980s resulted in a surge of interest and record harvests in the commercial fishery, and development of a growing sport fishery. Together, these dynamics presented concerns for adequate spawning escapement and potential for user conflicts.

Fishery managers responded to the increase in interest by enacting fishery restrictions to ensure enough king salmon for spawning escapement. In 1958, Federal fishery managers had restricted weekly commercial fishing time and gillnet depth to boost the escapement. Subsequent restrictions to fishing time, area and gear were implemented by state managers through the mid-1980s. In 1985 and 1986, large mesh gill nets were prohibited by emergency order. Plans for 1987 called for reducing area in the outer district, prohibiting fishing before June 1, and reducing the weekly fishing schedule prior to June 16 from five to three days.

Fishery managers also responded to the increased interest in the fishery by adding stock assessment programs to ensure conservation of Nushagak king salmon. Aerial surveys to document escapement began in 1956. In the 1960s, State managers expanded the aerial survey program to additional systems within the drainage and implemented a subsistence permit system in part to provide better accounting of subsistence fishing activity. In 1979, the side-scanning sonar project at Portage Creek was implemented to enumerate sockeye salmon with an interest in using that system to index or enumerate king salmon. In the 1980s, creel surveys were initiated to estimate sport fishing effort and harvest.

Improved stock assessment allowed for additional tools to use in managing the Nushagak king salmon fishery. By 1987, fishery managers had compiled a time series of estimated harvests for each fishery component and escapement, which allowed for annual estimates of total run size. Age composition estimates obtained for each component allowed for the development of brood tables, which in turn provided information needed to develop a biological escapement goal and, beginning in 1984, an annual pre-season forecast of the run.

Despite the advances in stock assessment and increasingly conservative management of the fisheries, conservation issues remained to be addressed as of 1987. A formal escapement goal had yet to be developed. Accurate and timely (daily) inseason escapement estimates, needed to take advantage of harvestable surplus of large runs and conserve small runs, required continued research and development of the sonar program at Portage Creek. Species apportionment of fish counted by sonar continued as a major obstacle to inseason assessment. Finally, managers recognized that additional management measures may be needed should the restrictions envisioned for 1987 not be effective enough to control fishing pressure and achieve escapement objectives.

## Development of the 1992 Nushagak-Mulchatna Chinook Salmon Management Plan

### *Pre-Plan, 1987-1991*

While the period spanning the 1950s to the mid-1980s was formative in the development of the fisheries and their management, the following several years cemented the need for a structured management plan. A weak king salmon run in 1986, coupled with a poor forecast for the 1987 run, indicated that the large runs experienced in the late 1970s and early 1980s were coming to an end (Minard et al., 1992). Indeed, runs observed from 1987 through 1990 (range 86 to 146 thousand) declined from the very large runs observed from 1978 to 1983 (range 218 to 356 thousand) to a level generally considered as 'depressed'.

By 1991, it had become evident that the large runs experienced in the early 1980s had produced poorly; spawning escapements from brood years 1981-1985 had produced only as many fish as had spawned in those years, or fewer. After a comprehensive review of production data, Minard et al. (1992) stated that the decrease in production at higher escapement levels was the most notable trend in the spawner-return data. Normally, this would indicate density-dependent factors in the freshwater environment. However, in this case where large escapements all occurred sequentially among brood years 1981-1985, it is difficult to determine whether the decrease in production was caused by the high levels of escapement or by other factors that may have occurred during the life cycle of salmon produced in those years (e.g.., changes in ocean carrying capacity, high seas fisheries interceptions, freshwater habitat degradation, competition with other species in the fresh and/or marine environment).

The return to more typical (or depressed) run sizes in the mid-1980s prompted managers to implement additional conservation measures. These included emergency order management of the commercial fishery that Nelson had suggested, which ultimately led to closure of the directed commercial fishery. The 1987 commercial fishery opened normally but was closed by EO after approximately 5,000 king salmon were caught with little indication of fish movement into the river. The commercial fishery was similarly closed by EO each of the three subsequent years, prompted by low pre-season forecasts and a likelihood of large incidental harvests of king salmon in the sockeye fishery. An improved forecast in 1991 and indications of escapement more than the goal prompted a commercial period June 24, 1991. However, a boycott by commercial harvesters over salmon prices kept fishing effort low.

During this period, the Board of Fisheries implemented several conservation measures affecting the commercial and sport fisheries.

- Prior to the 1988 season: the outer king salmon boundary was eliminated by regulation; the commercial district was redefined to include only the sockeye salmon boundary as the southern-most district boundary line. This effectively reduced potential fishing area for king salmon.

- the regulatory commercial fishing season was reduced from May 1 to June 1.
- sport fishing bag limits in the Nushagak drainage were reduced from 5 king salmon per day and in possession, of which only 2 may be over 28 inches, to 3 king salmon per day and in possession, of which only 2 may be over 28 inches.
- The following year (1989), the Board abolished the minimum mesh size requirement of 6 ¾ inch mesh in place in the commercial fishery prior to June 16.
- In 1990, the Board closed the Nushagak River drainage upstream from its confluence with the Iowithla River, including the Iowithla River, to the taking of king salmon from July 25 through December 31.

The poor runs experienced during this period underscored the need for a revised escapement goal as recommended by Nelson. Other dynamics further heightened the need. The provisional escapement goal was not attained in 1986, 1988, and 1990. Additionally, commercial salmon fishery managers in Bristol Bay had traditionally accounted for returns as either commercial catch or escapement, the notion being inriver harvests were so small that their impact on inriver abundance was insignificant. With growth in the subsistence and sport fisheries, and ADF&G's mandate to manage for sustained yield, inriver harvests had to be explicitly accounted for in the escapement goal. This meant that the provisional 'escapement' goal of 75,000 was an inriver goal, and by managing for 75,000 fish at the Portage Creek sonar, the goal of attaining a spawning magnitude of 75,000 king salmon would not be realized.

Nelson (1987) described concerns with the heavy toll extracted by the commercial fishery and the growing sport fishery, and identified the need for improved escapement monitoring, a formal escapement goal, and additional management measures for the Nushagak king salmon fisheries in 1987. The poor performance of the large escapements during the early 1980s, the increasingly severe restrictions in the late 1980s resulting from the depressed runs, and the state of the provisional escapement goal all heightened concerns over conservation and exacerbated user conflicts that had begun to develop prior to 1987. During this period, they were raised to a level that received the attention of fishery participants, managers, and regulators alike, and turned the heat up on the need to develop and implement a formal management plan. Because such a plan would affect allocation among users, it had to be developed via the Board of Fisheries process to be effective.

### *Development of the 1992 Plan*

Prior to the 1992 Bristol Bay Board meeting and under correspondence from the Board, the Nushagak Advisory Committee (NAC) submitted Proposal 157, and ADF&G submitted Proposal 158 to develop a management plan for Nushagak River king salmon. Both proposals expressed concern over poor recent runs and poor production trend and a need to provide ADF&G with management direction. The NAC proposal specified high seas bycatch and interception as a concern (but recognized that the issue was outside of the scope of the Board of Fisheries), and referenced habitat degradation and inriver harvest as possible factors influencing low return rates. The ADF&G proposal recognized the need to change the escapement goal to better account for biological needs and upriver harvests.

In support of the planning efforts, ADF&G conducted a review of the then-present escapement goal (Minard et al. 1992). Estimates for number and age of king salmon harvested in each fishery and for spawning escapement were available with limitations, and significant assumptions were made regarding the applicability of the data. Estimates of "biological escapement requirement" (BER), what we would call a Biological Escapement Goal (BEG) today, were derived using multiple methods, and ranged from 50,000 (early-years Ricker model) to 65,000 (all-years Ricker model) king salmon spawners. ADF&G recommended a BER at the upper end of this range to be conservative because of uncertainty in the brood tables and the uncertainty over the cause of the poor returns from the 1980-1985 runs.

Both the NAC and ADF&G proposed developing a plan that would distinguish inriver harvests from the BER, include management guidelines developed by the Board to share the burden of conservation among fisheries and provide staff with management direction, and achieve the BER. The NAC proposal prescribed specific management measures for each fishery under various projected escapement levels. Both proposals recognized that: "without a well described management plan, continued exploitation by the user groups on an apparently declining stock could have a long-term negative affect on this important stock."

Prior to the January 1992 Board meeting, ADF&G and the NAC worked together on further developing a plan. By December 1991 the committee with ADF&G's assistance had developed a draft (December 18, 1991) that contained much of the structure and content ultimately adopted by the Board in January 1992. The December 1991 draft included a BER of 65,000 spawners established by ADF&G during the then-recent escapement goal review. It included an inriver goal of 75,000 king salmon to provide for the BER and subsistence and sport harvest occurring upstream of the sonar. And it included management measures for the fisheries under three tiers based directly on projected inriver abundance estimates at the sonar.

Using the NAC draft plan as a template, the Board of Fisheries deliberated over the course of two days and approved the Nushagak-Mulchatna King Salmon Management Plan January 8, 1992 (Appendix A). The Plan directed ADF&G to manage the commercial fishery to achieve an inriver goal of 75,000 king salmon upstream from the Portage sonar site. The inriver goal provided for a BER of 65,000 and harvests above the sonar in the subsistence and recreational fishery. The Plan also set a cap on the recreational harvest not to exceed 5,000 king salmon.

The Plan was structured under three tiers and associated triggers tied to projected inriver run levels, much as it is remains today.

- At projected runs less than 40,000 king salmon, the sport and directed commercial fisheries were to be closed, the commercial fishery for sockeye was to remain closed until 10% of the Wood River escapement goal is projected, and the subsistence fishery was to be restricted by time or area.

- At inriver runs projected between 40,000 and 75,000, the directed commercial fishery for king salmon was to be closed and gillnets with greater than 5 ½ inch mesh were to be prohibited. At inriver runs projected between 40,000 and 65,000, sport fishing was to be restricted.
- At projections above 75,000 the Plan called for no restrictions on the commercial or subsistence fishery. However, at projections from 75,000 to 95,000 the sport fishery was to be managed such that harvests did not exceed 6,000 king salmon.

The third tier, in which inriver runs are projected to exceed the inriver goal, received considerable attention at the board meeting. The 'cap' on the sport fishery was one of the more controversial elements of the Plan. Some considered capping the sport harvest when harvestable surplus was available as consistent with the purpose of harvesting king salmon in the fisheries that historically harvest them. Others argued that capping sport harvest at or above optimum levels of yield was inconsistent with the sustained yield principle, particularly after other fisheries are afforded harvest under the same scenario.

## Post-1992; Plan Changes, Fishery Trends, and Plan Performance

Thirty years have now passed since the Board adopted the original Plan. Over time, changes have occurred in the Nushagak king salmon commercial, subsistence and sport fisheries and the Plan. This section is intended to highlight some of the key dynamics in the fisheries governed by the Plan since 1992 and characterize how the Plan has performed relative to its stated objectives over time.

### *Plan Modifications*

The Plan has been modified seven times by the Board of Fisheries (Table 1). Its purpose and structure, with management actions directly based on inriver run projections to the sonar, has remained very similar to the original version.

Management trigger levels (inriver projection levels of 40,000, 65,000, 75,000 and 95,000 king salmon) have changed twice. The first, in 1997, was specific and effectively reduced the range in which sport fishery restrictions were to be issued from 40,000-65,000 to 40,000-55,000. The 55,000-fish trigger was adopted partly based on analysis that showed little difference in expected productivity between the two levels. In addition, the 65,000-fish trigger had become disruptive to the sport fishery by precipitating frequent inseason restrictions prior to 1997.

The second, in 2012, changed the inriver and escapement goals and all management triggers contained in the Plan. The Board made these changes as requested in a proposal submitted by ADF&G to reflect a transition/conversion from Bendix to DIDSON sonar, because DIDSON accounted for a higher proportion of the king salmon that migrate up the Nushagak River. The biological escapement goal was changed from 65,000 to a range of 55,000-120,000 king salmon, the inriver goal was revised from 65,000 to 95,000 king salmon, and the various management triggers were changed as well.

Other changes to the Plan are discussed under the relevant fisheries below. The current Plan can be found in Appendix B.

## *Commercial Fishery*

### Regulation and Fishing Effort and Harvest

Directed commercial fishing for king salmon resumed under the Plan in 1992 (Table 2). Decisions to open the directed fishery and set the opening durations were based largely on the pre-season forecast and inseason indicators of run strength, including commercial harvest performance, subsistence harvest rates, an inriver passage rates estimated at the Portage Creek sonar (Brookover et al., 1997; Morstad et al., 2010).

The approach to scheduling directed openings varied from 1992 to present. Initially, the number and duration of openings were limited. Openings were generally scheduled to follow inriver pulses of fish evidenced by spikes in subsistence catch rates and other indicators (Brookover et al., 1997). This ensured fish migrate inriver prior to exposure to the commercial fishery. From 1994 to 1996, the directed fishery was managed more aggressively to harvest available surplus by scheduling more openings during lulls in fish passage. However, due to escapement quality problems observed in 1995 and 1996, commercial fishing periods in 1997 were scheduled directly after pulses of fish were observed moving into the river again, to reduce selectivity for large fish. The Board subsequently modified the Plan directing ADF&G to schedule openings to provide pulses of fish into the river that haven't been subject to harvest with commercial gear. From 2003 through 2009, the management strategy included openings earlier in June, with more space between openings, when a surplus appeared to be available (Fair et al., 2004; Westing et al., 2005, Morstad et al., 2010). Opening early in June during the first third of the run was intended to allow for lower levels of harvest over a larger portion of the run, still provide for fish movement past the district, and provide improved market quality and value to fishermen but carried the potential of overharvesting the early part of the run. Beginning in 2010, stakeholder meetings were used to help establish directed fishery schedules prior to the season (Salomone et al., 2011).

From 1992 through 2010, the directed commercial fishery was opened every year except two (2000 and 2001; Figure 1). Commercial fishing opportunity, based on the number of openings and total fishing time, was highest during 1994, 1995, 1998, and 2005-2007. During the 1990s, 200 or more drift boats participated based on boat counts conducted during the open fishing periods, with the largest boat counts recorded in 1994 and 1995. As an indication of the popularity of the directed fishery, the peak daily commercial drift permit registration for the 1994 and 1995 seasons occurred on dates during the directed fishery; in all other years the peak daily registration for the season occurred during the sockeye salmon fishery (Table 3). Number of drift deliveries peaked in 2005 and 2006. Based on these trends, fishing effort and harvest opportunity in the directed commercial fishery appeared to peak in 1994-1995, and again in 2005-2006.

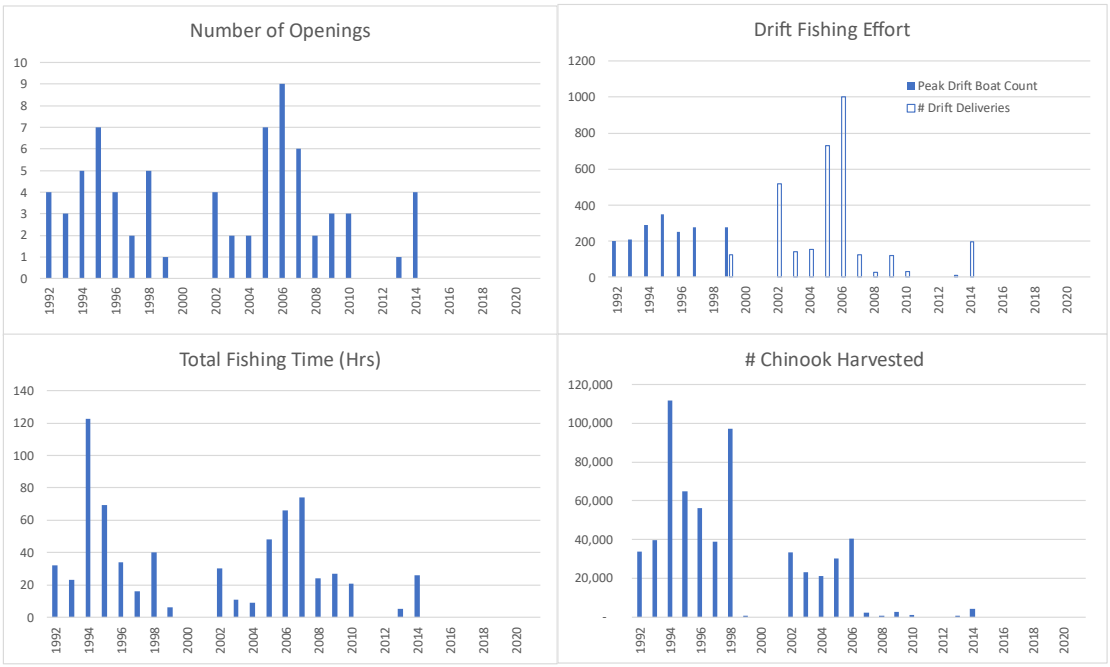


**Figure 1. Trends in fishing opportunity, drift fishing effort, and king salmon harvest in the directed commercial fishery, 1992-2021.**

From 1992-2010, annual commercial harvests ranged from just over 11,000 (1999) to nearly 119,000 (1994) king salmon and exhibited a general declining trend (Figure 2). Directed fishery harvests during this period varied greatly, comprising from 3% (2008) to 98% (1994) of the total commercial harvest during any given year (average 48%). Directed fishery harvests 1992-1998 comprised a much greater proportion (77% average) of the seasonal harvest than any other period since except for 2002 (85%). From 2003-2006 the directed fishery comprised 43% of the seasonal harvest - still much higher than the 5% average experienced 2007-2010. Across all years since 1992 during which a directed fishery occurred, harvests in the directed fishery comprised an average of 45% of the total season harvest.

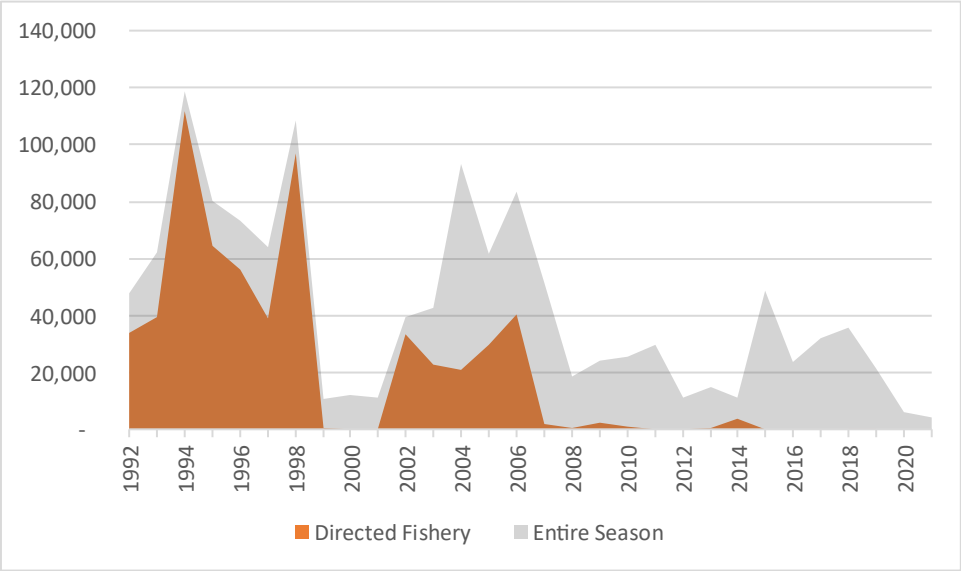


**Figure 2. Commercial harvests of king salmon in the Nushagak District, 1992-2021.**

The directed commercial fishery waned considerably after the 2010 season. The ADF&G ceased issuing a pre-season forecast for king salmon beginning 2011 (Jones et al., 2012). After experiencing a poor run in 2010 and lacking a reliable forecast, managers employed a conservative strategy for the next several years whereby fishing would be scheduled only if a harvestable surplus could be projected using inseason escapement rates. The directed fishery was re-opened in 2013 and 2014 but participation and harvests were relatively low. Indications of a strong run exhibited early in the 2014 season were followed by very poor abundance in the second half and failed to indicate the weak run that ultimately resulted.

Strong sockeye salmon run forecasts for the Nushagak and Wood rivers increasingly factored into management of the Nushagak District beginning in 2015, whereby fishing for sockeye salmon was planned to begin earlier in June to control sockeye salmon escapement (Jones et al., 2016). The directed fishery has not been initiated since 2014 due to poor runs experienced 2010-2014, lack of a pre-season forecast to guide any early season fishing, and the expected increased potential for incidental harvest of king during large sockeye runs.

Incidental harvests of king salmon taken during the commercial fishery for sockeye comprised 55% of the annual king salmon commercial fishery harvest, on average, during years when the directed fishery was opened. During these years, incidental harvests ranged from 5,900 to 72,200 and averaged 22,700 king salmon (Figure 3). During years when the directed fishery was not opened, 4,100 to 49,000 king salmon (average 21,600) were harvested incidentally. From 1992 to 2002, the annual incidental harvest averaged 13,800 and ranged from 5,900 to 25,300 king salmon. Since 2003, the annual incidental harvest in the commercial sockeye fishery averaged 27,200 and ranged from 4,100 to 49,300. The higher incidental king salmon catches in the latter period are likely due to a combination of factors, including a shift from king salmon that would have historically been caught in directed fishing effort to occurring in the sockeye fishery, generally larger sockeye returns

resulting in earlier and more intensive fishing directed at sockeye salmon, and in a few years, due to very early sockeye runs (e.g., 2003, 2013).

Large sockeye runs (~10 million+) observed since 2014 have contributed to increased king salmon harvest levels. King salmon run size is also a factor. However, care should be taken in characterizing apparent trends in the incidental harvest and total return given the uncertainty that exists in escapement estimates, which comprise a large component of the total run during low run years. Of note, commercial harvests of king salmon during the 2020 and 2021 seasons were the 3rd lowest and lowest reported since the Plan was adopted.

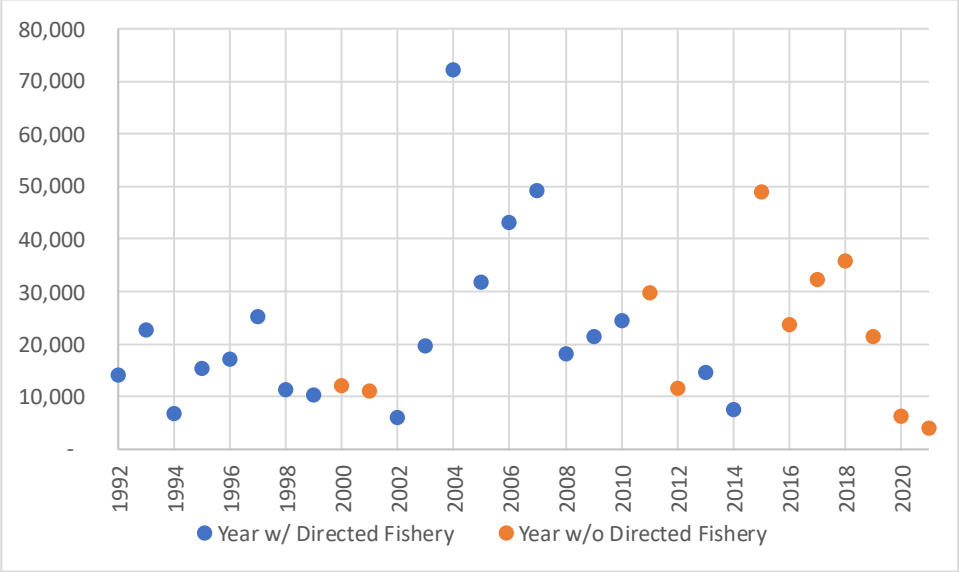


**Figure 3. Number of king salmon harvested incidentally during the commercial sockeye season, 1992-2021.**

Since the NMCSP was adopted in 1992, sockeye runs to the Wood, Nushagak and Igushik Rivers have increased over time (Figure 4; Table 4). Average run sizes increased from 6.5 million sockeye salmon in the 1990s, to 9.4 million (2000-2010) to 13.1 million (2011-2020). Runs to the Nushagak district set all-time records in 2006, and again in 2017 and 2018. The 2021 run was the third largest on record.

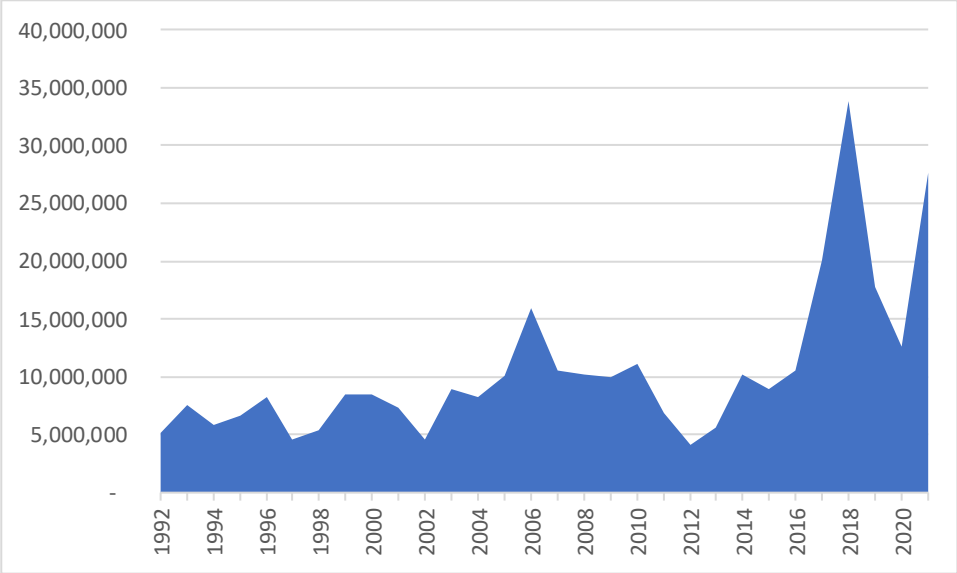


**Figure 4. Nushagak District sockeye salmon runs (district catch and escapement to Nushagak, Wood and Igushik Rivers), 1992-2021.**

With both large and early sockeye runs, managers tend to open the commercial fishery earlier in June, and in the case of large runs, schedule fishing time more intensively throughout the season to control sockeye harvest and escapement (Jones et al., 2016). Figure 5 depicts dates on which the Nushagak District opened to commercial fishing for sockeye salmon with drift gillnets, dates on which fishing began on an every-tide basis for the season, and dates on which fishing was extended until further notice. All three sets of dates, particularly season opening dates, exhibit a trend toward earlier starts to the sockeye fishery and intensive fishing regimes. This trend suggests a direct correlation to the increasing sockeye salmon run size in the Nushagak District.

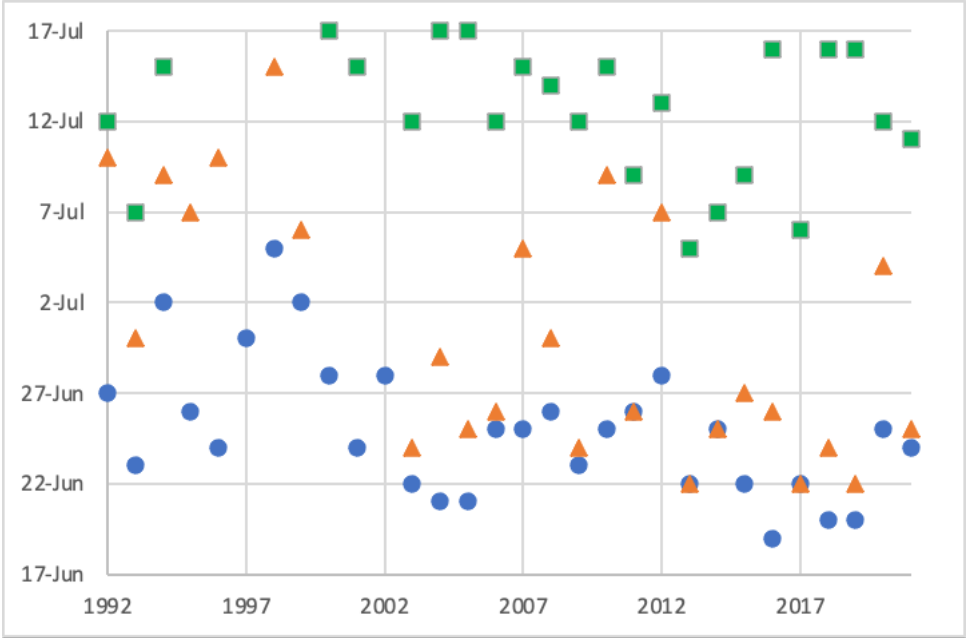


**Figure 5. Key dates associated with the annual commercial drift net fishery for sockeye, including the season opening date (blue circle), start date for fishing on an every-tide basis (orange triangle), and dates on which fishing was extended until further notice (green square).**

Since the Plan was adopted in 1992, commercial fishing effort appears to have increased based on permit registration statistics. Annual permit registration increased from the 1990s, when the average approximated 320 permits, to the 2000s and 2010s when the average approximated 415 permits (Table 3; Figure 6). Peak daily drift permit registrations showed a similar trend.

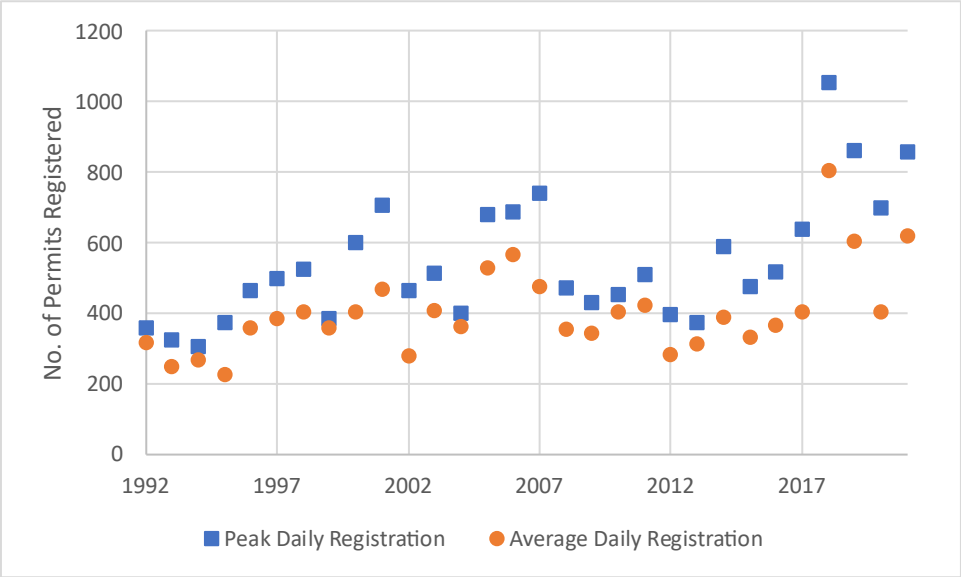


**Figure 6. Average and peak number of commercial drift net permits registered in the Nushagak District, 1992-2021.**

Compounding the increase in effort, the peak registration date also appears to have trended earlier over time (Figure 7), consistent with the increasing size of sockeye runs in recent years.

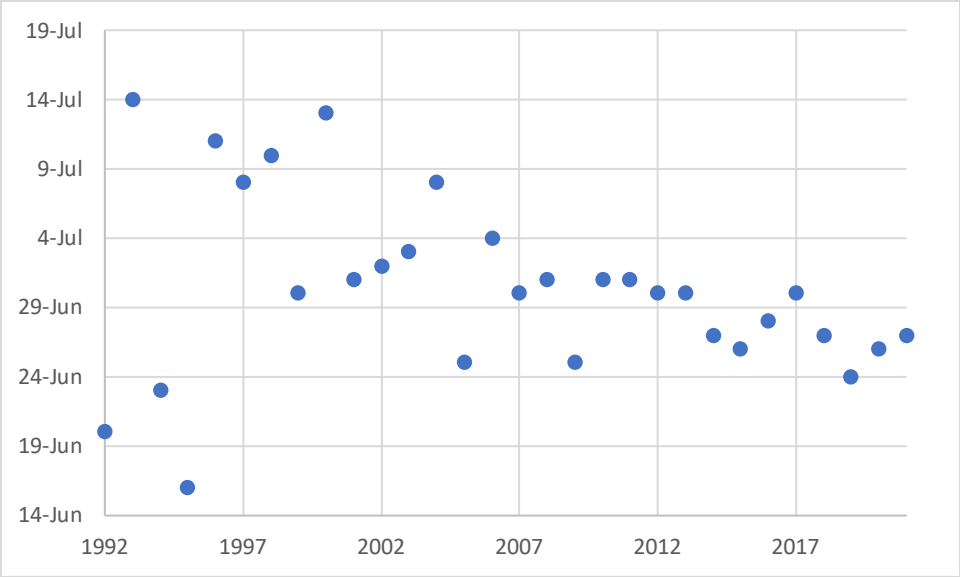


**Figure 7. Peak daily drift permit registration dates, 1992-2021.**

## *Sport Fishery*

### Regulations

Sport fishing regulations pertaining to Nushagak River king salmon – which consist of Bristol Bay-wide regulations, Nushagak River specific regulations, and Plan provisions - have been modified six times since the Plan was adopted (Table 5). Regulations governing the sport fishery for king salmon have generally become increasingly restrictive, conservative, and complex throughout the life of the Plan.

Most changes consisted of gear restrictions, season closures, bag limit reductions, and imposition of annual limits adopted for a combination of conservation (e.g., spawning season closures) and/or social or allocative reasons (guideline harvest of 5,000 fish). One notable relaxation of restrictive regulations is the most recent change made December 2018 that repealed Plan provisions directing the ADF&G to restrict the sport fishery under inriver run projection scenarios between 55,000-95,000 fish.

Emergency orders were issued during 12 seasons to restrict the sport fishery as directed by the Plan (Table 6). Within the past 15 seasons, the king salmon fishery was restricted inseason for conservation purposes during nine. Bag limit reductions, followed by reductions in the annual limit, were the most common restrictions enacted. Fishing was restricted inseason to catch-and-release during four years (1996, 1997, 2010, and 2019) and the season was closed to fishing for king salmon during two (1999 and 2010). During three of the years when the fishery was restricted (1999, 2011, and 2012), subsequent

increases in the projected inriver run led managers to ease restrictions partially or completely.

**Effort**

Sport fishing effort for king salmon is concentrated in three areas: the lower Nushagak River near the village of Portage Creek, the middle section of the Nushagak River near the village of Ekwok, and the midsection of the Mulchatna River between the Stuyahok and Koktuli rivers (Dye and Borden, 2018). Between 1992 and 1997, effort in the Ekwok area was highly variable. Since about 1999, the lower river fishery has steadily expanded upriver to Ekwok and the 2 areas are merging into a single fishery. Most effort for king salmon in the Nushagak River drainage is concentrated near Portage Creek; areas near Ekwok and in the Mulchatna River support lower levels.

Figure 8 and Table 7 depict sport fishing effort in the Nushagak River for all salmon and freshwater species. Dye and Borden (2018) reported that angling for king salmon in the middle section of the Mulchatna River seemed to have diminished since bait was prohibited there in 1992. In the mainstem Nushagak River, effort varied from approximately 10,000 to 20,000 angler days until 2020, the first year of the Covid-19 pandemic, when it fell to 3,400 angler days.

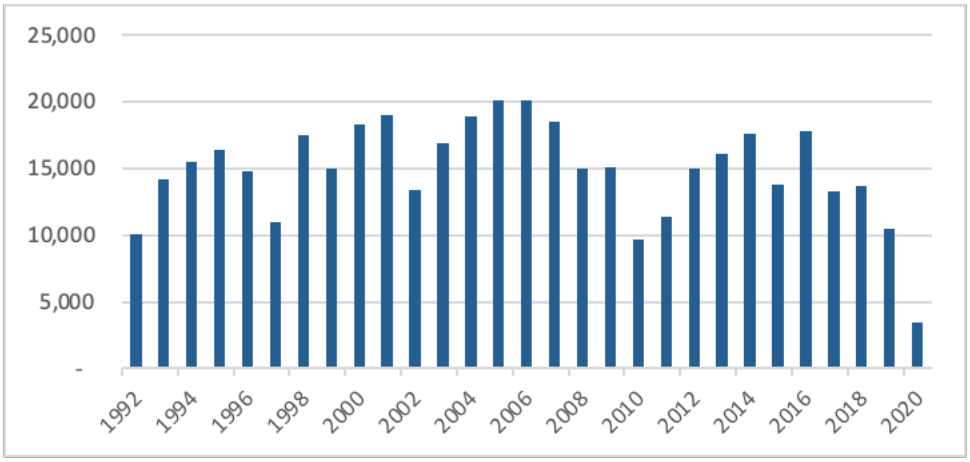


**Figure 8. Sport fishing effort (angler-days) in the Nushagak River, 1992-2020.**

Based on freshwater logbook data from the period 2006-2018, 41 to 65 (average 51) guide businesses and 155-250 (average 213) guides have operated on the Nushagak River (all species) (Figure 9; Table 8). During any given year, the guide industry served approximately 1,400 to 3,100 clients (average 2,505), many of whom fished for king salmon. Business and guide activity were at their highest early during this period. Like trends observed above for angling effort, the number of guides and businesses declined through about 2010-2012 and then increased to a level slightly lower than that observed in 2006-2007. Guided effort (client days) and harvest followed a very similar trend. Reasons for the decline in participation between 2005-2010 are varied. However, national economic downturns experienced during that time likely played a primary role in the dynamics observed in

guided fishing activity. The ADF&G logbook program was discontinued following the 2018 season.

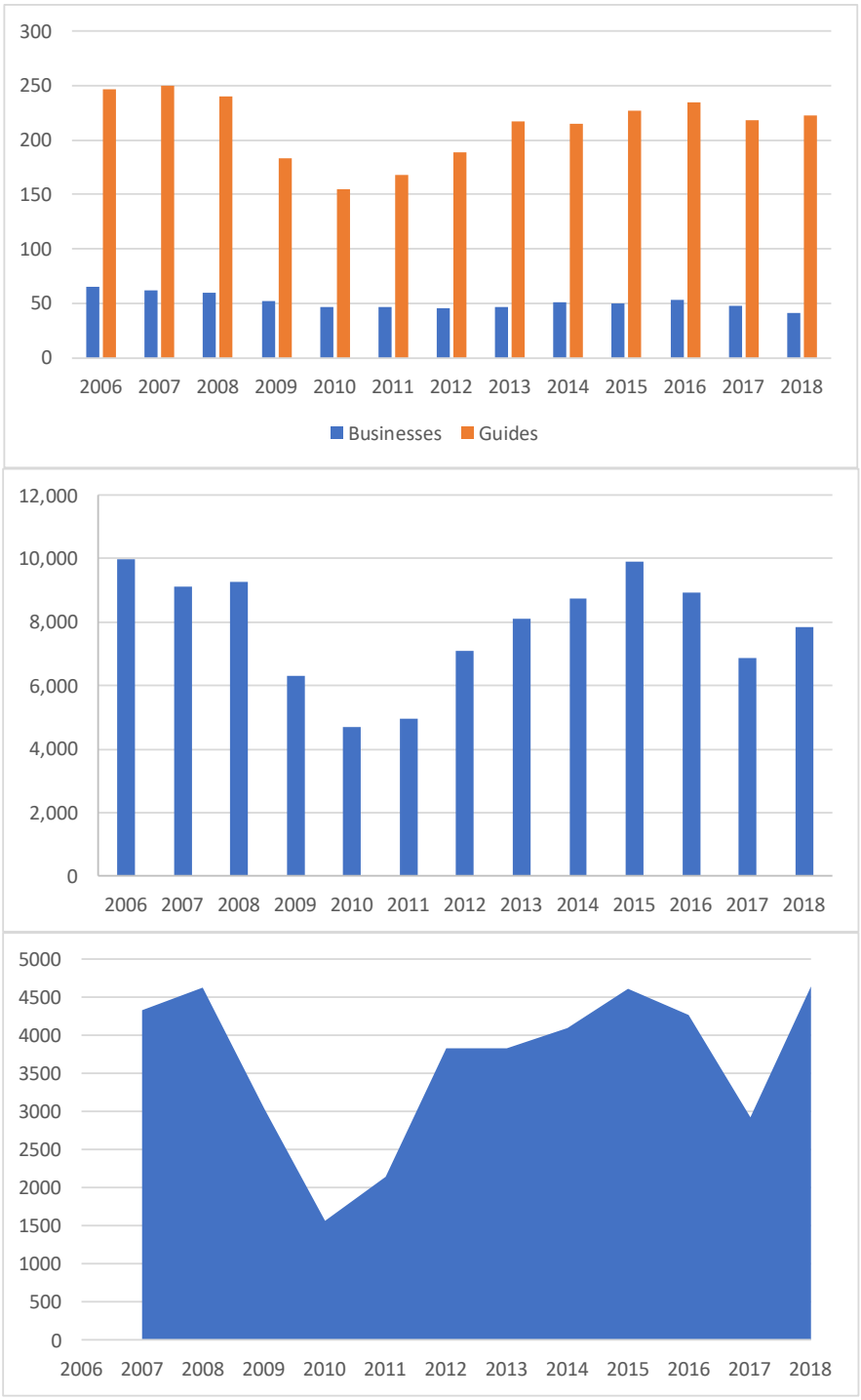


**Figure 9. Number of sport fishing businesses and guides (top), client days (middle), and king salmon harvest by clients (bottom) as estimated by the ADF&G Freshwater Logbook program for the Nushagak River, 2006-2018.**

### Harvests

Sport harvests of king salmon (guided and unguided) in the Nushagak River ranged from approximately 1,950 (2020) to 10,600 (1994) and averaged 6,130 fish (Figure 10; Table 7). Approximately one-third (39%) of the harvest occurs below the sonar. Like trends in sport fishing effort, annual harvests have varied but have remained generally stable. Prior to 2020, early in the Covid pandemic, no less than 3,500 king salmon were harvested in the fishery during any given year since the Plan was adopted.

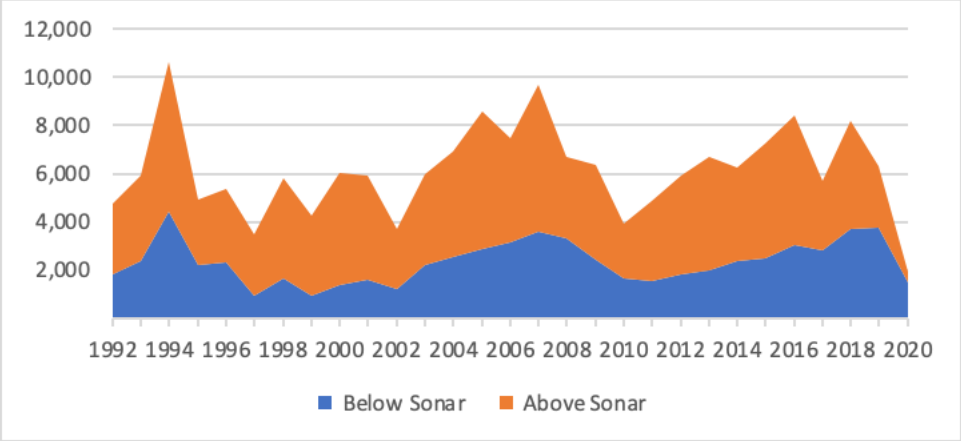


**Figure 10. Sport harvests of king salmon in the Nushagak River, 1992-2020.**

## *Subsistence Fishery*

### Regulations, Effort, and Harvest

Nelson (1987) noted that, compared to commercial fishing regulations, few restrictions had been imposed on the subsistence fisheries in Bristol Bay. Of the restrictions that had been enacted prior to the mid-1980s, Nelson noted that the 1974 limit on fishing time (3 days/week) and net length (10 fathoms) on the Dillingham beaches from June 16 to July 17 had the most impact on king salmon harvest rates. Relatively few regulatory changes to the Nushagak subsistence fishery have been enacted since the adoption of the Plan, with two notable exceptions. In 2018, the Board repealed the limits to subsistence fishing periods (i.e., weekly 3-day schedule) and allowed subsistence fishing with dip nets near Dillingham.

Participation in the subsistence fishery (for all salmon species), based on the number of permits issued, appears to have increased steadily but incrementally since adoption of the Plan (Halas and Neufeld, 2018). Comparing average figures for 1992-1996 against those for 2017-2021 indicates the number of subsistence salmon permits issued increased by about 22% (Figure 11, Table 9; Note: estimates for 2020 and 2021 are preliminary). Between the same two time periods, the number of king salmon harvested annually declined by over 38%, and the number per permit decreased by about 49%. Annual harvests and harvest rates began a steady decline in 2018, and in 2020 and 2021 were the lowest since the adoption of the Plan. These recent declines correlate with record large sockeye salmon runs

which have contributed to increased subsistence harvests of sockeye salmon. Both small recent king salmon runs and increased harvests of sockeye salmon in the subsistence fishery likely contributed to the recent decrease in king salmon harvest rates in the subsistence fishery.

Trends in the subsistence fishery, apart from recent low king salmon harvests, are not unlike those observed by Nelson over 30 years ago. He stated then: “Since subsistence fishing is considered a priority use of the resource in Alaska, subsistence use can be expected to continue at near record levels of effort. Harvest levels are expected to remain high, and will continue to be somewhat independent of stock abundance…” It is likely the same outlook holds true today, albeit with a question concerning harvest levels in the near future.

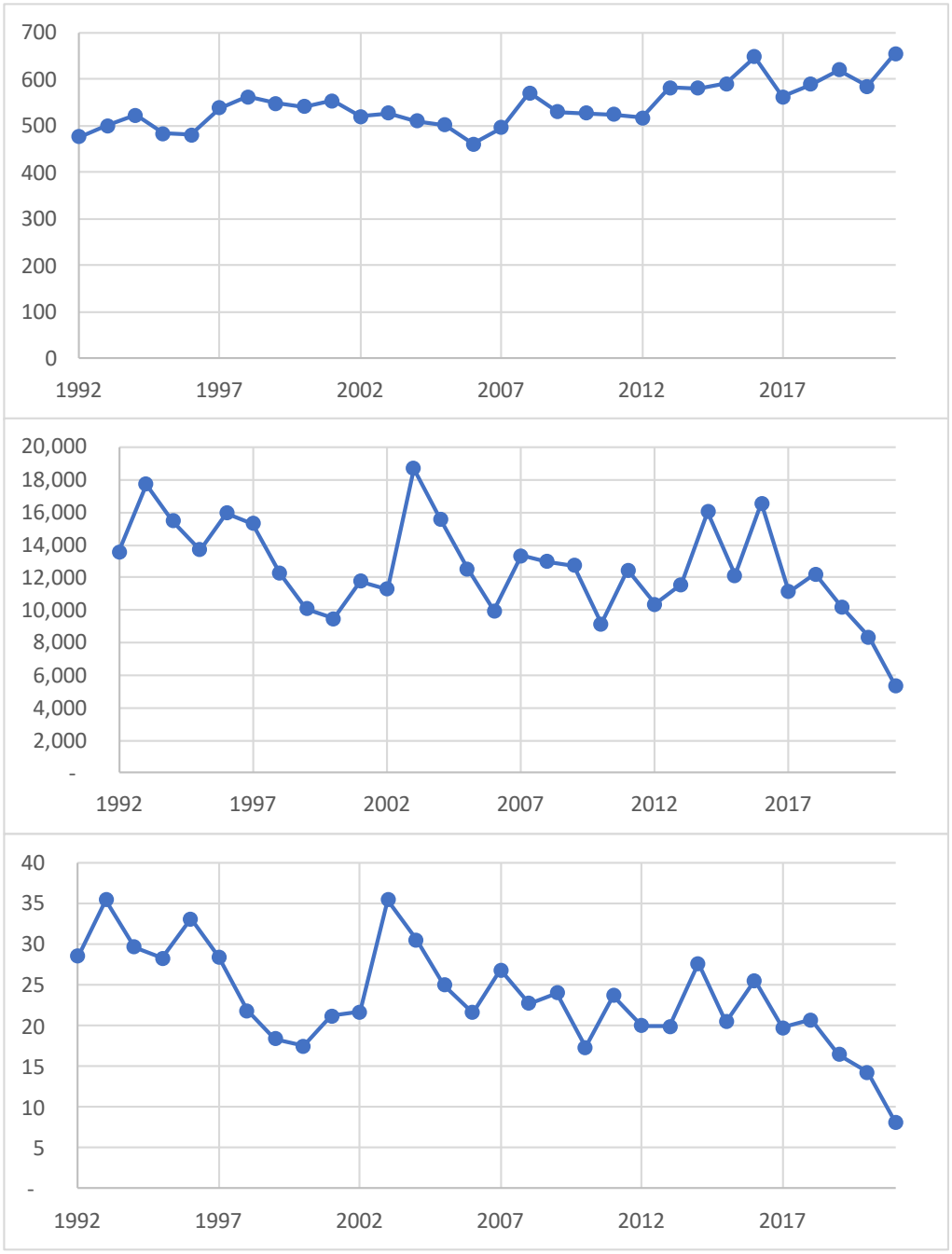


**Figure 11. Number of subsistence fishing permits issued (top), estimated king salmon harvest (middle), and harvest per permit (bottom) in the Nushagak District, 1992-2021.**

## *Plan Performance*

This section will discuss how the fisheries have performed with respect to management objectives within the Plan.

**Changes in Escapement Assessment Tool**

Before going further, some discussion is needed regarding the inriver assessment of king salmon because two objectives (inriver run goal and biological escapement goal) rely directly on it and significant uncertainties surround the sonar project and its results.

In 1997, aerial surveys of king salmon spawners raised concern over the accuracy of the sonar counts (Brookover et al., 1997). A distribution study on coho salmon that year coupled with low water conditions indicated that a substantial number of king salmon migrated offshore of the effective reach of the sonar and, as a result, the ADF&G committed to assessing offshore distribution of salmon as an integral component of the project in the future.

Beginning 2002, the ADF&G began using dual frequency identification sonar (DIDSON) concurrently with the Bendix acoustic system then in use (Buck et al., 2012). DIDSON is a type of imaging sonar considered to be generally superior to the 1960s technology used for the Bendix equipment[2]. Comparisons over the next few years found that the DIDSON detected a higher number of fish than the Bendix system, particularly in the more distant-from-shore areas that had been ensonified. In 2005, after a few partial-year, partial-river-segment comparisons of counts from each sonar the ADF&G transitioned to using the DIDSON technology to measure the inriver salmon runs at Portage Creek, and discontinued use of the aging and increasingly difficult-to-service Bendix equipment. Conversion factors for king salmon and other species were subsequently calculated from the relationship between DIDSON and Bendix passage and applied to historical Bendix passage estimates. The revised estimates were then used to produce revised total run and brood tables for Nushagak salmon composed of DIDSON or equivalent estimates.

More recently, ADF&G updated the time series for Nushagak River king salmon to include various sources of historical harvest and escapement data and conducted a run reconstruction and stock recruit analysis using the updated time series (ADF&G Nushagak escapement goal memo, July 11, 2019). During the review, it had become apparent to ADF&G that the run reconstruction and analysis were compromised by a lack of year-to-year overlap among the methods used to estimate escapement. Paired Bendix and DIDSON counts for both riverbanks and multiple years were lacking, Bendix estimates did not align well with paired aerial survey data, and aerial survey data did not overlap in time with DIDSON estimates.

Erickson et al. (2018) summed up uncertainties associated with the current sonar program in a report to the Board in December 2018. A 2011–2014 acoustic tagging study estimated that the sonar beam covered less than a third of the Nushagak River channel. “Preliminary results from the 2011–2014 acoustic tagging study estimated the proportion of king salmon

[2] In addition, the Bendix equipment was becoming more and more difficult to service and maintain. Al Menin, who invented the Bendix sonar, continued to service the Bendix equipment until 2005.

traveling outside the sonar beam range was 47–65% with a mean of 57%. Similarly, a 2014–2016 mark–recapture study estimated the abundance of adult king salmon in the Nushagak River independently from the sonar estimate. Both studies indicated that a substantial number of king salmon are not enumerated by the existing sonar assessment and that the current sonar assessment is an index of abundance. At this time, ADF&G has not quantified the consistency of the sonar index."

This assessment of Plan performance takes the current inriver abundance estimates, and resulting spawning escapement and total run estimates, at face value (Table 10). This is problematic in that inriver abundance estimates prior to 2013 were revised by Buck et al. (2012). As a result, management performance in achieving an inriver or escapement goal, for example, can not readily be assessed, at least using the revised estimates, for years prior to 2013. The 1997 season provides a good example of the challenges. In 1997, spawning escapement estimated by aerial surveys (82,000) was twice the sonar count, indicating a problem with the sonar. The revised inriver run estimate presented in Buck et al. (2012) is 170,610. Using the original sonar count, the inriver goal of 75,000 at the time was not met. Using the aerial survey count, the inriver goal was met. And using the current estimate the inriver goal was far exceeded.

Figure 12 and Table 10 depict the Nushagak River king salmon total run estimates. Based on these estimates, runs have generally declined since the Plan was adopted. Recent runs (2016-2020) have averaged about 111,000 fish which is about 42% less than the long-term (1992-2020) average. The most recent three runs (2019-2021) are the smallest since the Plan was adopted. The 2020 king salmon run is the smallest on record, followed by the 2019 run. Once harvest estimates become available for the sport fishery, the 2021 run is likely to replace the 2019 run as the second lowest. Harvest among the fisheries has generally followed the same downward trend throughout the period. This includes the recent three years, and particularly 2020 and 2021 for which total harvests were the lowest observed since the plan was adopted.

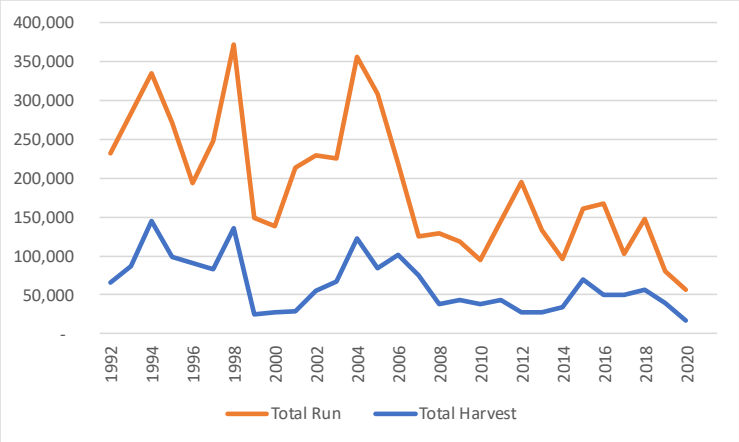


**Figure 12. Nushagak king salmon total run and harvest (all fisheries combined), 1992-2020.**

**Plan Objectives:**

*The department shall manage the commercial and sport fisheries in the Nushagak District to achieve an inriver goal of 95,000 king salmon in the Nushagak River upstream from the department sonar counter.*

Inriver run performance can be assessed by a simple comparison of the estimated inriver run as enumerated at the sonar with the inriver run goal. The combination of changes to the inriver run goal and as stated above, the Bendix-DIDSON conversion makes assessment difficult for years prior to 2013. For this reason, only 2013 through the current year is assessed. Since 2013, the estimated inriver run exceeded the inriver run goal four times but fell short five, including the three most recent years (Figure 13). In 2019-2021, estimated total runs were not large enough to provide for the inriver goal even if no king salmon would have been harvested.

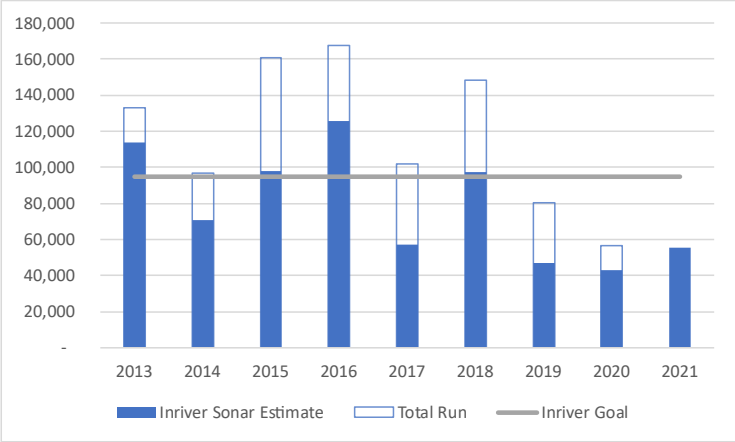


**Figure 13. Inriver (and total) run estimates compared to the inriver run goal, 2013-2021.**

*Provide for a biological escapement goal of 55,000 - 120,000 fish.*

Since 2013, estimated spawning escapement fell within the goal range (55,000-120,000 spawners) in five years and fell short in three (Figure 14). Although the spawning escapement estimate is not yet available for 2021, it very likely fell short of the lower bound considering harvests that occur upstream of the sonar, where inriver abundance was estimated at 55,222 king salmon. Aerial surveys conducted in 2017, 2019 and 2021 indicated that actual spawning escapement was likely greater than estimated by sonar; surveys conducted in 2020 seemed to corroborate the low (sonar-based) estimate that year (J. Head, ADF&G, personal communication). From a biological standpoint, the Plan appears to be working generally well in ensuring spawning goals are achieved over the long term. However, should future king salmon runs continue near current levels, achieving inriver goals will likely pose a continued challenge.

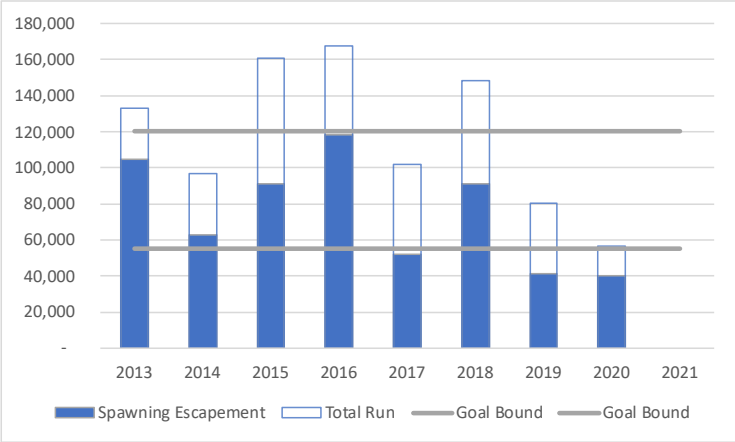


**Figure 14. Spawning escapement (and total run) estimates compared to the escapement goal (55,000-120,000), 2013-2021.**

*Provide for reasonable opportunity for subsistence harvest of king salmon; and a king salmon sport fishery guideline harvest level of 5,000 fish, 20 inches or greater in length.*

King salmon harvests have declined in the commercial fishery and have remained relatively stable in subsistence and sport fisheries until 2020, when harvests in both fisheries sharply declined (Figure 15; Table 10).

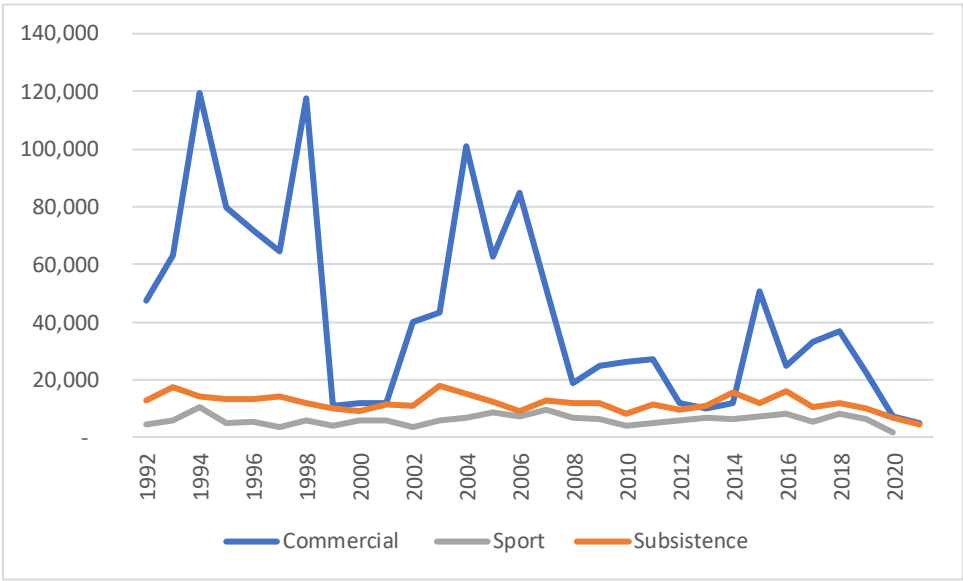


**Figure 15. Trends in harvests of Nushagak River king salmon among the commercial, subsistence and sport fisheries, 1992-2021.**

The sport fishery guideline harvest level (5,000 king salmon) applies when projected inriver runs do not exceed the inriver goal of 95,000 king salmon. Since 2013, inriver run estimates fell at or below the inriver run goal in 5 years: 2014, 2017 and 2019-2021. Sport harvest estimates are not available for 2021. Harvests in the remaining four years exceeded the guideline harvest level in three years (2014, 2017 and 2019) and fell below in 2020.

*Maintain a natural representation of age classes in the escapement.*

The Plan's objective to maintain a natural representation of age classes in the escapement has not been addressed in this analysis. Nor has the objective of providing reasonable opportunity for subsistence harvest of king salmon. Addressing the first was beyond the time available to prepare this draft report. The second was beyond the scope. Both, however, are core Plan objectives and should be assessed.

## Management Challenges

Many of the recommendations Nelson made in 1987 have been partially or fully carried out. A biological escapement goal was developed in 1992 and subsequently refined in 2012. Development of the Portage Creek sonar has continued through conversion to DIDSON technology, which expanded the portion of the river width ensonified, and the commercial fishery is managed as recommended – by emergency order and using mesh size restrictions to reduce catch rates and achieve a better distribution of escapement through time.

However, several challenges Nelson identified in 1987 – inriver run abundance assessment, overlap between king salmon and sockeye salmon run timing, and size selectivity - remain today. More recently, dynamics have emerged creating new types of challenges. Large record-setting sockeye runs to the Wood and Nushagak Rivers have coincided with poor king salmon runs and exacerbated the difficulties inherent to managing the two species for independent inriver abundance goals. Recent tagging studies and aerial surveys cast considerable uncertainty on the use of sonar-based inriver abundance estimates for managing the Nushagak River fisheries and raised questions after-the-fact on some restrictions predicated on the sonar.

To address these challenges and develop comprehensive recommendations to the Board, the working committee met on numerous occasions over the past three years and discussed possible changes to the NMKSMP for consideration at the November 2022 Bristol Bay meeting. Findings of the committee, including a more robust assessment of current challenges associated with Nushagak River king salmon, will be presented in a separate report.

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# Appendix A. 1992 Version, Nushagak-Mulchatna Chinook Salmon Management Plan.

**5 AAC 06.361. NUSHAGAK-MULCHATNA CHINOOK SALMON MANAGEMENT PLAN.** (a) The purpose of this management plan is to ensure adequate spawning escapement of chinook salmon into the Nushagak-Mulchatna river systems. It is the intent of the Board of Fisheries that Nushagak-Mulchatna chinook salmon be harvested in the fisheries that have historically harvested them. The plan in this section provides management guidelines to the department in an effort to preclude allocation conflicts between the various users of this resource. The department shall manage Nushagak-Mulchatna chinook salmon stocks in a conservative manner consistent with sustained yield principles and the subsistence priority.

(b) The department shall manage the commercial fishery in the Nushagak District to achieve an inriver goal of 75,000 chinook salmon present in the Nushagak River upstream from the department sonar. The inriver goal provides for:

(1) a biological escapement requirement of 65,000 fish;

(2) reasonable opportunity for subsistence harvest, and;

(3) a chinook salmon sport fishery harvest of not more than 5,000 fish.

(c) If the total inriver chinook salmon return in the Nushagak River is projected between 75,000 and 95,000 fish, the inriver chinook salmon sport fishery harvest shall not exceed 6,000 fish.

(d) If the total inriver chinook salmon return in the Nushagak River is projected to be between 40,000 and 74,999 fish, the department shall;

(1) by emergency order, close the directed chinook salmon commercial fishery in the Nushagak District; during a closure under this paragraph, the use of a commercial gillnets with webbing larger than 5 1/2 inches, is prohibited; and

(2) if the projected inriver return of chinook salmon in the Nushagak River is less than 65,000 fish, restrict the chinook salmon sport fishery in the Nushagak River by establishing periods by emergency order during which, at the departments discretion, one or more of the following is in effect;

(A) bag and possession limits are reduced to one (1) fish;

(B) the use of bait is prohibited;

(C) time or area for fishing is reduced;

(D) the chinook salmon sport fishery is closed.

(e) If the total inriver chinook salmon return in the Nushagak River is projected to be less than 40,000, the department shall;

(1) close the sockeye salmon commercial fishery in the Nushagak District until the projected sockeye salmon escapement into the Wood River exceeds 100,000 fish;

(2) close the sport fishery in the Nushagak River to the taking of chinook salmon; and

(3) by emergency order, establish periods during which time or area is reduced for the inriver chinook salmon subsistence fishery in the Nushagak River.

## Appendix B. 2019 Version, Nushagak-Mulchatna King Salmon Management Plan.

**5 AAC 06.361. Nushagak-Mulchatna King Salmon Management Plan** (a) The purpose of this management plan is to ensure biological spawning escapement requirements of king salmon into the Nushagak-Mulchatna river systems. It is the intent of the Alaska Board of Fisheries (board) that Nushagak-Mulchatna king salmon be harvested in the fisheries that have historically harvested them. This management plan provides guidelines to the department in an effort to preclude allocation conflicts between the various users of this resource. The department shall manage Nushagak-Mulchatna king salmon stocks in a conservative manner consistent with sustained yield principles and the subsistence priority.

(b) The department shall manage the commercial and sport fisheries in the Nushagak District as follows:

(1) to achieve an inriver goal of 95,000 king salmon present in the Nushagak River upstream from the department sonar counter; the inriver goal provides for

(A) a biological escapement goal of 55,000 - 120,000 fish;

(B) reasonable opportunity for subsistence harvest of king salmon; and

(C) a king salmon sport fishery guideline harvest level of 5,000 fish, 20 inches or greater in length;

(2) in order to maintain a natural representation of age classes in the escapement, the department shall attempt to schedule commercial openings to provide pulses of fish into the river that have not been subject to harvest by commercial gear;

(3) the department may close the commercial drift or set gillnet fishery if the harvest in the directed commercial king salmon fishery for either gear group is more than two sockeye salmon for every one king salmon.

(c) If the total inriver king salmon return in the Nushagak River is projected to exceed 95,000 fish, the guideline harvest level described in (b)(1)(C) of this section does not apply. (d) If the spawning escapement of king salmon in the Nushagak River is projected to be more than 55,000 fish and the projected inriver return is less than 95,000 fish, the commissioner

(1) shall close, by emergency order, the directed king salmon commercial fishery in the Nushagak District; during a closure under this paragraph, the use of a commercial gillnet with webbing larger than five and one-half inches in another commercial salmon fishery is prohibited;

(2) repealed 5/31/2019;

(3) repealed 5/31/2019;

(e) If the spawning escapement of king salmon in the Nushagak River is projected to be less than 55,000 fish, the commissioner

(1) shall close, by emergency order, the sockeye salmon commercial fishery in the Nushagak District until the projected sockeye salmon escapement into the Wood River exceeds 100,000 fish;

(2) shall close, by emergency order, the sport fishery in the Nushagak River to the taking of salmon and prohibit the use of bait for fishing for all species of fish until the end of the king salmon season specified in 5 AAC 67.020 and 5 AAC 67.022(g); and

(3) shall establish, by emergency order, fishing periods during which the time or area is reduced for the inriver king salmon subsistence fishery in the Nushagak River.

(f) Notwithstanding 5 AAC 06.200, in a directed king salmon commercial fishery, the southern boundary of the Nushagak District is a line from an ADF&G regulatory marker located at Etolin Point at 58° 39.37' N. lat., 158° 19.31' W. long., to 58° 33.92' N. lat., 158° 24.94' W. long. to Protection Point at 58° 29.27' N. lat., 158° 41.78' W. long.

(g) During a directed king salmon commercial fishery in the Nushagak District, drift gillnet and set gillnet fishing periods will be of equal length, but do not have to be open concurrently.

## Appendix C. Tables.

**Table 1. A chronology of regulatory changes to the Nushagak-Mulchatna River King Salmon Management Plan, 1992-2021.**

| Year | | Modification |
|---|---|---|
| 1992 | | Nushagak and Mulchatna King Salmon Management Plan (5 AAC 06.361; Appendix A) is adopted. |
| | | |
| 1994 | | Set the sport harvest allocation of 5,000 as a guideline harvest rather than a cap. |
| | | |
| 1997 | | Modified the plan directing the department to attempt to schedule commercial openings to provide pulses of chinook salmon into the river that have not been exposed to commercial gear. |
| | | |
| | | Established an escapement projection of 55,000 king salmon below which inseason restrictions in the sport fishery must be imposed. |
| | | |
| 2001 | | Allowed a catch-and-release fishery when the final inriver abundance is projected to be below 55,000 fish but above 40,000 fish. When the king salmon sport fishery is restricted to catch-and-release or is closed for conservation, the use of bait must be prohibited. |
| | | |
| 2003 | | Modified provision (d) directing the department to reduce the sport fishing bag limit to 1 per day and in possession, any size, if the projected inrver return falls between 55,000 and 75,000 king salmon. |
| | | |
| | | Added provision allowing the department to close the commercial drift or set gillnet fishery if the harvest in the directed commercial fishery for either gear group is more than two sockeye salmon for every one king salmon. |
| | | |
| 2006 | | Provision added to require, during a directed commercial opening, drift and set gillnet fishing periods to be of equal length, but do not have to be open concurrently. |
| | | |
| 2012 | | Modified the biological escapement requirement, inriver goal, and management triggers to reflect changes in inriver sonar operations (Bendix to DIDSON conversion). |
| | | |
| 2018 | | Repealed provisions (d)(2) and (3) directing the department to restrict the sport fishery if the projected inriver return falls between 55,000 and 95,000 king salmon. |

[a] Source: Dye & Borden (2018), Alaska Board of Fisheries Meeting Information [Internet].

**Table 2. Fishery statistics for Nushagak District commercial fishing periods targeting king salmon (directed king salmon openings), 1992-2021. All data are preliminary, as reported in annual management reports.**

| Year | Number of Openings | Opening Duration (Hrs) | | Peak Drift Boat Count | # of Deliveries | | # Chinook Harvested (Drift & Set) | | Source |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Drift | Set | Directed Fishery | Entire Season | |
| 1992 | 4 | 32 | | 200 | | | 33,905 | 47,897 | *ADF&G (1993)* |
| 1993 | 3 | 23 | | 211 | | | 39,536 | 62,294 | *ADF&G (1994)* |
| 1994 | 5 | 122.5 | | 290 | | | 111,886 | 118,643 | *Browning and Miller (1995)* |
| 1995 | 7 | 70 | | 347 | | | 64,745 | 80,180 | *ADF&G (1996)* |
| 1996 | 4 | 34 | | 252 | | | 56,256 | 73,365 | *ADF&G (1997)* |
| 1997 | 2 | 16 | | 278 | | | 39,003 | 64,294 | *ADF&G (1998)* |
| 1998 | 5 | 40 | | - | | | 97,169 | 108,486 | *ADF&G (1999)* |
| 1999 | 1 | 6 | | 279 | 125 | 23 | 563 | 11,008 | *Morstad (2000)* |
| 2000 | - | - | | | - | - | - | 12,055 | *ADF&G (2001)* |
| 2001 | - | - | | | - | - | - | 11,050 | *Fair (2002)* |
| 2002 | 4 | 30 | | - | 519 | 594 | 33,447 | 39,382 | *Weiland et al. (2003)* |
| 2003 | 2 | 11 | | - | 140 | 48 | 23,008 | 42,615 | *Fair et al. (2004)* |
| 2004 | 2 | 9 | | - | 153 | 58 | 21,233 | 93,414 | *Westing et al. (2005)* |
| 2005 | 7 | 48 | | - | 731 | 100 | 30,003 | 61,854 | *Westing et al. (2006)* |
| 2006 | 9 | 66 | [a] | - | 1,000 | 194 | 40,503 | 83,679 | *Salomone et al. (2007)* |
| 2007 | 6 | 74 | | - | 125 | 2 | 2,049 | 51,350 | *Sands et al. (2008)* |
| 2008 | 2 | 24 | | - | 26 | - | 496 | 18,634 | *Jones et al. (2009)* |
| 2009 | 3 | 27 | | - | 122 | 156 | 2,575 | 24,058 | *Morstad et al. (2010)* |
| 2010 | 3 | 21 | | - | 33 | 35 | 1,143 | 25,580 | *Salomone et al. (2011)* |
| 2011 | - | - | | | - | - | - | 29,811 | *Jones et al. (2012)* |
| 2012 | - | - | | | - | - | - | 11,501 | *Jones et al. (2013)* |
| 2013 | 1 | 5 | | | 8 | 9 | 518 | 15,175 | *Jones et al. (2014)* |
| 2014 | 4 | 26 | [b] | | 197 | 49 | 3,985 | 11,448 | *Elison et al. (2015)* |
| 2015 | - | - | | | - | - | - | 48,968 | *Jones et al. (2016)* |
| 2016 | - | - | | | - | - | - | 23,783 | *Salomone et al. (2017)* |
| 2017 | - | - | | | - | - | - | 32,194 | *Elison et al. (2017)* |
| 2018 | - | - | | | - | - | - | 35,938 | *Salomone et al. (2019)* |
| 2019 | - | - | | | - | - | - | 21,509 | *Tiernan et al. (2021a)* |
| 2020 | - | - | | | - | - | - | 6,363 | *Tiernan et al. (2021b)* |
| 2021 | - | - | | | - | - | - | 4,103 | *ADF&G (2021)* |

[a] drift and setnet openings managed separately; drift and setnet hours totaled 66 and 108.

[b] drift and setnet openings managed separately; drift and setnet hours totaled 26 and 8.

**Table 3. Annual drift gill net permit registration statistics, Nushagak District commercial fishery, 1992-2021.**

| | Average Daily Registration | | | Peak Daily Registration | | | |
|---|---|---|---|---|---|---|---|
| | Total Permits[a] | Dual Permits | | Total Permits[a] | Dual Permits | Peak Date | Source |
| 1992 | 317 | | | 360 | | 20-Jun | *ADF&G (1993)* |
| 1993 | 250 | | | 326 | | 14-Jul | *ADF&G (1994)* |
| 1994 | 269 | | | 304 | | 23-Jun | *Browning and Miller (1995)* |
| 1995 | 225 | | | 374 | | 16-Jun | *ADF&G (1996)* |
| 1996 | 357 | | | 465 | | 11-Jul | *ADF&G (1997)* |
| 1997 | 386 | | | 499 | | 8-Jul | *ADF&G (1998)* |
| 1998 | 404 | | | 526 | | 10-Jul | *ADF&G (1999)* |
| 1999 | 358 | | | 383 | | 30-Jun | *Morstad (2000)* |
| 2000 | 402 | | | 598 | | 13-Jul | *ADF&G (2001)* |
| 2001 | 467 | | | 705 | | 1-Jul | *Fair (2002)* |
| 2002 | 279 | | | 465 | | 2-Jul | *Weiland et al. (2003)* |
| 2003 | 407 | | | 512 | | 3-Jul | *Fair et al. (2004)* |
| 2004 | 362 | | | 399 | | 8-Jul | *Westing et al. (2005)* |
| 2005 | 527 | | | 678 | | 25-Jun | *Westing et al. (2006)* |
| 2006 | 564 | | | 687 | | 4-Jul | *Salomone et al. (2007)* |
| 2007 | 475 | | | 741 | | 30-Jun | *Sands et al. (2008)* |
| 2008 | 354 | | | 470 | | 1-Jul | *Jones et al. (2009)* |
| 2009 | 342 | | | 431 | | 25-Jun | *Morstad et al. (2010)* |
| 2010 | 405 | | | 453 | | 1-Jul | *Salomone et al. (2011)* |
| 2011 | 424 | | | 508 | | 1-Jul | *Jones et al. (2012)* |
| 2012 | 282 | | | 395 | | 30-Jun | *Jones et al. (2013)* |
| 2013 | 313 | 49 | | 372 | 60 | 30-Jun | *Jones et al. (2014)* |
| 2014 | 389 | 65 | | 590 | 119 | 27-Jun | *Elison et al. (2015)* |
| 2015 | 332 | 53 | | 474 | 84 | 26-Jun | *Jones et al. (2016)* |
| 2016 | 364 | 167 | | 518 | 244 | 28-Jun | *Salomone et al. (2017)* |
| 2017 | 403 | 167 | | 636 | 244 | 30-Jun | *Elison et al. (2017)* |
| 2018 | 803 | 412 | | 1053 | 548 | 27-Jun | *Salomone et al. (2019)* |
| 2019 | 603 | 140 | | 861 | 207 | 24-Jun | *Tiernan et al. (2021a)* |
| 2020 | 402 | 84 | | 697 | 168 | 26-Jun | *Tiernan et al. (2021b)* |
| 2021 | 619 | 151 | | 855 | 225 | 27-Jun | *Tim Sands, pers. comm.* |

[a] Total permit sum includes dual boat registrations.

**Table 4. Start dates for initial, intensive, and continuous fishing periods in the commercial fishery for sockeye salmon, and total sockeye run, Nushagak District, 1992-2021. All data are preliminary, as reported in annual management reports (See Table 3 for data sources).**

| | Start Date[a] | | Intensive Fishing[b] Start Date | | Continuous Fishing[c] Start Date | | Sockeye Salmon Total Run | |
|---|---|---|---|---|---|---|---|---|
| Year | Drift | Setnet | Drift | Setnet | Drift | Setnet | Pre-season Forecast | Actual |
| 1992 | 27-Jun | 27-Jun | 10-Jul | 10-Jul | 12-Jul | 12-Jul | 4,600,000 | 5,187,351 |
| 1993 | 23-Jun | 23-Jun | 30-Jun | 30-Jun | 7-Jul | 7-Jul | 5,100,000 | 7,624,224 |
| 1994 | 2-Jul | 2-Jul | 9-Jul | 9-Jul | 15-Jul | 15-Jul | 5,300,000 | 5,881,064 |
| 1995 | 26-Jun | 26-Jun | 7-Jul | 7-Jul | | | 5,300,000 | 6,704,568 |
| 1996 | 24-Jun | 24-Jun | 10-Jul | 10-Jul | | | 5,800,000 | 8,303,614 |
| 1997 | 30-Jun | 30-Jun [d] | | | | | 5,700,000 | 4,639,699 |
| 1998 | 5-Jul | 5-Jul | 15-Jul | 15-Jul | | | 5,300,000 | 5,402,866 |
| 1999 | 2-Jul | 2-Jul | 6-Jul | 6-Jul | | | 4,900,000 | 8,533,542 |
| 2000 | 28-Jun | 28-Jun | | 12-Jul | 17-Jul | 14-Jul | 5,490,000 | 8,484,050 |
| 2001 | 24-Jun | 24-Jun | | 2-Jul | 15-Jul | 10-Jul | 7,800,000 | 7,289,194 |
| 2002 | 28-Jun | 27-Jun [d] | | 29-Jun | | | 5,200,000 | 4,538,394 |
| 2003 | 22-Jun | 23-Jun | 24-Jun | 24-Jun | 12-Jul | 29-Jun | 6,700,000 | 8,907,474 |
| 2004 | 21-Jun | 20-Jun | 29-Jun | 24-Jun [e] | 17-Jul | 1-Jul | 7,300,000 | 8,232,466 |
| 2005 | 21-Jun | 21-Jun | 25-Jun | 26-Jun [e] | 17-Jul | 30-Jun | 7,400,000 | 10,090,869 |
| 2006 | 25-Jun | 25-Jun | 26-Jun | 26-Jun | 12-Jul | 27-Jun | 7,500,000 | 15,923,444 |
| 2007 | 25-Jun | 24-Jun | 5-Jul | 25-Jun | 15-Jul | 6-Jul | 8,900,000 | 10,604,183 |
| 2008 | 26-Jun | 26-Jun | 30-Jun | 27-Jun | 14-Jul | 2-Jul | 10,410,000 | 10,160,079 |
| 2009 | 23-Jun | 22-Jun | 24-Jun | 23-Jun [f] | 12-Jul | 3-Jul | 8,930,000 | 9,988,322 |
| 2010 | 25-Jun | 25-Jun | 9-Jul | 8-Jul | 15-Jul | 12-Jul | 10,600,000 | 11,100,363 |
| 2011 | 26-Jun | 25-Jun | 26-Jun | 25-Jun [e] | 9-Jul | 2-Jul | 9,500,000 | 6,922,015 |
| 2012 | 28-Jun | 26-Jun | 7-Jul | 11-Jul | 13-Jul | 13-Jul | 6,800,000 | 4,098,632 |
| 2013 | 22-Jun | 21-Jun | 22-Jun | 21-Jun | 5-Jul | 25-Jun | 5,100,000 | 5,648,859 |
| 2014 | 25-Jun | 24-Jun | 25-Jun | 25-Jun | 7-Jul | 30-Jun | 8,900,000 | 10,171,331 |
| 2015 | 22-Jun | 21-Jun | 27-Jun | 27-Jun | 9-Jul | 3-Jul | 8,100,000 | 8,987,563 |
| 2016 | 19-Jun | 19-Jun | 26-Jun | 26-Jun | 16-Jul | 9-Jul | 10,300,000 | 10,569,247 |
| 2017 | 22-Jun | 21-Jun | 22-Jun | 22-Jun | 6-Jul | 26-Jun | 8,300,000 | 20,027,749 |
| 2018 | 20-Jun | 19-Jun | 24-Jun | 19-Jun | 16-Jul | 13-Jul | 21,200,000 | 33,755,636 |
| 2019 | 20-Jun | 20-Jun | 22-Jun | 20-Jun | 16-Jul | 23-Jun | 9,990,000 | 17,794,604 |
| 2020 | 25-Jun | 25-Jun | 4-Jul | 1-Jul | 12-Jul | 6-Jul | 12,030,000 | 12,656,061 |
| 2021 | 24-Jun | 24-Jun | 25-Jun | 25-Jun [e] | 11-Jul | 29-Jun | 14,760,000 | 27,637,560 |

[a] Dates represent the day on which the Nushagak Section opened to commercial fishing for sockeye salmon. From 1992-1998, the entire district including Nushagak Section was opened to both gear types. Beginning in 1998, openings were established for each gear type and section independently.

[b] Dates represent the day on which fishing began to occur on an every-tide basis, regardless of number of hours fished per tide.

[c] Dates represent the day on which fishing was extended 'until further notice' by EO.

[d] After July 5 (in both 1997 and 2002), all fishing occurred in the WRSHA; the district did not re-open.

[e] A 1-tide break in fishing occurred for the drift fleet (July 5, 2004; June 30, 2005; July 1, 2011, June 29, 2021).

[f] Two breaks in fishing occurred for the drift fleet (June 27 and July 8, 2009).

**Table 5. A chronology of significant sport fishing regulation changes for the Nushagak and Mulchatna Rivers, 1990-2021.[a]**

| Effective year | Bay-Wide Sport | Nushagak-Mulchatna Sport | Nushagak-Mulchatna King Salmon Plan |
|---|---|---|---|
| 1990 | | Season established from January 1 to July 25 upstream of and including the Iowithla River. | |
| 1992 | | Gear restricted to single-hook artificial lures for the portion of the Mulchatna River between the Koktuli and Stuyahok rivers. | |
| 1992 | | | Nushagak and Mulchatna King Salmon Management Plan (5 AAC 06.361) is adopted.<br><br>Sport harvest capped at 5,000 fish; escapement projection of 65,000 established as trigger for inseason restrictions in the sport fishery. |
| 1994 | | | Sport allocation set as aguideline harvest rather than a cap. |
| 1997 | Bay-wide annual harvest limit of 5 king salmon was adopted.<br><br>Guides prohibited from retaining any species of fish while guiding. | Bag and possession limit reduced to 2 king salmon per day, only 1 over 28 inches.<br><br>Annual harvest limit of 4 king salmon adopted for the entire Nushagak–Mulchatna drainage.<br><br>Kokwok River and Nushagak River upstream from its confluence with Harris Creek closed to fishing for king salmon.<br><br>July 31 spawning season closure adopted for Nushagak River drainage downstream of Iowithla River outlet. | Escapement projection of 55,000 king salmon established as trigger below which inseason restrictions in the sport fishery must be imposed. |
| 2001 | Anglers prohibited from removing king salmon from the water if the fish were to be released.<br><br>Bag and possession limit for king salmon under 20 inches of 10 per day is adopted bay-wide except Nushagak drainage. | | Allow a catch-and-release fishery when the final inriver abundance is projected to be below 55,000 fish but above 40,000 fish.<br><br>Stipulates that when the king salmon sport fishery is restricted to catch-and-release or is closed for conservation, the use of bait must be prohibited. |
| 2003 | | Bag and possession limit for king salmon under 20 inches of 5 per day is implemented on the Nushagak drainage. King salmon under 20 inches do not count toward the annual limit of 4 and are in addition to the bag limit for king salmon 20 inches or longer. | If inriver projections fall below 75,000, a bag limit of 1 per day, 1 in possession, no size limit, is implemented. |
| 2012 | | From May 1 to July 31 only 1 single-hook or single-hook lure may be used and the use of bait is allowed UNTIL an angler harvests a daily bag limit of king salmon 20 inches or greater in length, then that angler can only fish with 1 UNBAITED, single-hook or single-hook lure for the remainder of that day. | Plan amended to reflect counts from the new dual frequency identification sonar counter. |
| 2018 | | | Repealed provisions (d)(2) and (3) directing the department to restrict the sport fishery if the projected inriver return falls between 55,000 and 95,000 king salmon. |

[a] Source: Dye & Borden (2018), Alaska Board of Fisheries Meeting Information [Internet].

**Table 6. Emergency orders issued for the sport and subsistence fisheries under direction of the Nushagak-Mulchatna King Salmon Management Plan, 1992-2021.[a]**

| Year | Effective Date | Sport | Subsistence |
|---|---|---|---|
| 1992 | | | |
| 1993 | | | |
| 1994 | | | |
| 1995 | | | |
| 1996 | Preseason | Preseason: Bag and possession limit reduced from 3, 2 over 28 inches, to one of any size. | |
| | 9-Jul | Catch and release only for king salmon. | |
| 1997 | Preseason | Bag and possession limit reduced from 3, 2 over 28 inches, to one of any size. | |
| | 30-Jun | Catch and release only for king salmon. | |
| 1998 | | | |
| 1999 | 30-Jun | Seasonal limit reduced from 4 to 2 fish. | |
| | 2-Jul | Fishing for king salmon closed. | |
| | 6-Jul | Season re-opened with seasonal limit of 2 fish. | |
| | 2-Jul | | Fishing in the Nushagak River drainage reduced to 3 days per week until August 1. |
| 2000 | | | |
| 2001 | | | |
| 2002 | | | |
| 2003 | | | |
| 2004 | | | |
| 2005 | | | |
| 2006 | | | |
| 2007 | 7-Jul | Bag and possession limit reduced from 2, 1 over 28 inches, to one of any size. | |
| 2008 | | | |
| 2009 | | | |
| 2010 | 27-Jun | Bag and possession limit reduced from 2, 1 over 28 inches, to one of any size. | |
| | 30-Jun | Retention and use of bait prohibited. | |
| | 5-Jul | Fishing for king salmon closed, bait prohibited. | |
| | 6-Jul | | Fishing in the Nushagak River drainage reduced to 3 days per week until August 1. |
| 2011 | 24-Jun | Bag and possession limit reduced from 2, 1 over 28 inches, to one of any size. Annual limit reduced from 4 to 2 fish. | |
| | 13-Jul | Annual limit restored to 4 fish. | |
| 2012 | 28-Jun | Bag and possession limit reduced from 2, 1 over 28 inches, to one of any size. Annual limit reduced from 4 to 2 fish. | |
| | 3-Jul | Annual limit restored to 4 fish. | |
| | 7-Jul | Bag and possession limit restored to 2, 1 over 28 inches. | |
| 2013 | | | |
| 2014 | 7-Jul | Bag and possession limit reduced from 2, 1 over 28 inches, to one of any size. | |
| 2015 | | | |
| 2016 | | | |
| 2017 | 23-Jun | Bag and possession limit reduced from 2, 1 over 28 inches, to one of any size. Annual limit reduced from 4 to 2 fish. | |
| 2018 | | | |
| 2019 | 3-Jul | Bag and possession limit reduced from 2, 1 over 28 inches, to one of any size. Annual limit reduced from 4 to 2 fish. | |
| | 10-Jul | Retention and use of bait prohibited. | |
| 2020 | 10-Jul | Bag and possession limit reduced from 2, 1 over 28 inches, to one of any size. Annual limit reduced from 4 to 2 fish. | |
| 2021 | 27-Jun | Bag and possession limit reduced from 2, 1 over 28 inches, to one of any size. Annual limit reduced from 4 to 2 fish. | |

[a] Source: Alaska Department of Fish and Game Emergency Orders and Press Releases [Internet], Morstad (2000), Salomone et al. (2011).

**Table 7. ADF&G Alaska Sport Fishing Survey summary of angler effort and harvest in the Nushagak River, 1992-2020.**

| | | Harvest[b] | | |
|---|---|---|---|---|
| Year | Angler Days[a] | Below Sonar | Above Sonar | Total |
| 1992 | 10,031 | 1,844 | 2,911 | 4,755 |
| 1993 | 14,168 | 2,408 | 3,492 | 5,899 |
| 1994 | 15,460 | 4,436 | 6,191 | 10,626 |
| 1995 | 16,410 | 2,238 | 2,713 | 4,951 |
| 1996 | 14,736 | 2,346 | 3,045 | 5,390 |
| 1997 | 10,958 | 931 | 2,567 | 3,497 |
| 1998 | 17,480 | 1,640 | 4,188 | 5,827 |
| 1999 | 15,028 | 934 | 3,304 | 4,237 |
| 2000 | 18,285 | 1,389 | 4,628 | 6,016 |
| 2001 | 18,951 | 1,600 | 4,299 | 5,899 |
| 2002 | 13,396 | 1,193 | 2,500 | 3,693 |
| 2003 | 16,834 | 2,203 | 3,752 | 5,955 |
| 2004 | 18,869 | 2,567 | 4,339 | 6,906 |
| 2005 | 20,050 | 2,863 | 5,702 | 8,565 |
| 2006 | 20,045 | 3,166 | 4,307 | 7,473 |
| 2007 | 18,457 | 3,581 | 6,088 | 9,669 |
| 2008 | 14,936 | 3,305 | 3,395 | 6,700 |
| 2009 | 15,051 | 2,451 | 3,903 | 6,354 |
| 2010 | 9,668 | 1,659 | 2,248 | 3,907 |
| 2011 | 11,329 | 1,542 | 3,302 | 4,844 |
| 2012 | 14,973 | 1,833 | 4,098 | 5,931 |
| 2013 | 16,082 | 1,971 | 4,714 | 6,685 |
| 2014 | 17,576 | 2,369 | 3,891 | 6,260 |
| 2015 | 13,766 | 2,514 | 4,720 | 7,234 |
| 2016 | 17,737 | 3,053 | 5,358 | 8,411 |
| 2017 | 13,299 | 2,834 | 2,837 | 5,671 |
| 2018 | 13,705 | 3,715 | 4,477 | 8,192 |
| 2019 | 10,460 | 3,768 | 2,538 | 6,306 |
| 2020 | 3,427 | 1,496 | 454 | 1,950 |
| | | | | |
| Mean 92-96 | 14,161 | 2,654 | 3,670 | 6,324 |
| Mean 16-20 | 11,726 | 2,973 | 3,133 | 6,106 |
| Mean 92-20 | 14,868 | 2,340 | 3,792 | 6,131 |

[a] 1996-2020; Alaska Sport Fishing Survey database [Internet], 1995; Howe et al.(1996), 1994; Howe et al.(1995), 1993: Mills (1994), 1992; Mills (1993). Only estimates for Nushagak River proper were included, i.e. estimates exclude Mulchatna and Nuyakuk Rivers.

[b] 1992-2017; Dye and Borden (2018), 2018 and 2019; Jason Dye personal communication, 2020; Lee Borden personal communication.

**Table 8. ADF&G Freshwater logbook summary of guided sport fishing in the Nushagak drainage, 2006-2018.**

| Year | Businesses | Guides | Trips | Clients[a] | Client Days | Crew Days[b] | Harvest[c] |
|---|---|---|---|---|---|---|---|
| 2006 | 65 | 247 | 3,422 | 2,971 | 9,960 | 395 | |
| 2007 | 62 | 250 | 3,147 | 2,891 | 9,111 | 124 | 4,324 |
| 2008 | 60 | 240 | 3,140 | 2,836 | 9,259 | 143 | 4,621 |
| 2009 | 52 | 183 | 2,163 | 1,931 | 6,309 | 124 | 3,030 |
| 2010 | 47 | 155 | 1,697 | 1,401 | 4,715 | 136 | 1,567 |
| 2011 | 47 | 168 | 1,864 | 1,895 | 4,970 | 74 | 2,140 |
| 2012 | 46 | 189 | 2,504 | 2,299 | 7,105 | 102 | 3,827 |
| 2013 | 47 | 217 | 2,932 | 2,553 | 8,096 | 174 | 3,823 |
| 2014 | 51 | 215 | 3,066 | 2,883 | 8,760 | 181 | 4,095 |
| 2015 | 50 | 227 | 3,492 | 3,091 | 9,903 | 193 | 4,613 |
| 2016 | 53 | 234 | 3,186 | 2,770 | 8,934 | 159 | 4,273 |
| 2017 | 48 | 218 | 2,468 | 2,395 | 6,878 | 125 | 2,925 |
| 2018 | 41 | 223 | 2,786 | 2,644 | 7,827 | 136 | 4,647 |
| | | | | | | | |
| Mean | 51 | 213 | 2,759 | 2,505 | 7,833 | 159 | 3,657 |

[a] Clients excludes youth anglers and anglers without a sport fishing license written. Crew is also excluded, since they aren't clients.

[b] Crew days are the number of days crew fished and excludes client days.

[c] Source: 2006-2016; Dye and Borden (2018), 2017 and 2018; Jason Dye personal communication.

**Table 9. Nushagak Bay watershed subsistence fishery parameter estimates, 1992-2021.[a]**

| Year | Subsistence Permits Issued | King Salmon Harvest | Harvest/ Permit |
|---|---|---|---|
| 1992 | 476 | 13,588 | 29 |
| 1993 | 500 | 17,709 | 35 |
| 1994 | 523 | 15,490 | 30 |
| 1995 | 484 | 13,701 | 28 |
| 1996 | 481 | 15,941 | 33 |
| 1997 | 538 | 15,318 | 28 |
| 1998 | 562 | 12,258 | 22 |
| 1999 | 548 | 10,057 | 18 |
| 2000 | 541 | 9,470 | 18 |
| 2001 | 554 | 11,760 | 21 |
| 2002 | 520 | 11,281 | 22 |
| 2003 | 527 | 18,686 | 35 |
| 2004 | 511 | 15,610 | 31 |
| 2005 | 502 | 12,529 | 25 |
| 2006 | 461 | 9,971 | 22 |
| 2007 | 496 | 13,330 | 27 |
| 2008 | 571 | 12,960 | 23 |
| 2009 | 530 | 12,737 | 24 |
| 2010 | 528 | 9,150 | 17 |
| 2011 | 525 | 12,461 | 24 |
| 2012 | 517 | 10,350 | 20 |
| 2013 | 582 | 11,567 | 20 |
| 2014 | 581 | 16,049 | 28 |
| 2015 | 591 | 12,117 | 21 |
| 2016 | 649 | 16,576 | 26 |
| 2017 | 563 | 11,122 | 20 |
| 2018 | 589 | 12,206 | 21 |
| 2019 | 620 | 10,206 | 16 |
| 2020 | 585 | 8,350 | 14 |
| 2021 | 656 | 5,349 | 8 |
| | | | |
| Mean 92-96 | 493 | 15,286 | 31 |
| Mean 17-21 | 603 | 9,447 | 16 |
| Mean 92-21 | 544 | 12,597 | 23 |

[a] Source: 1992-2015; Halas and Neufeld (2018), 2016-2019; Gayle Neufeld, ADF&G, personal communication, 2020-2021; Terri Lemons, ADF&G, personal communication. Estimates include the Nushagak, Wood, Snake and Igushik River drainages. 2020 and 2021 data is preliminary.

**Table 10. King salmon commercial, subsistence, and sport harvest, and escapement for the Nushagak River drainage, 1992-2021.[a]**

| | | Harvests Below Sonar | | | | Harvests Above Sonar | | |
|---|---|---|---|---|---|---|---|---|
| Year | Total Run | Commercial | Subsistence | Sport | Inriver Sonar Estimate | Subsistence | Sport | Spawning Escapement[b] |
| 1992 | 232,103 | 47,563 | 10,322 | 1,844 | 172,374 | 2,498 | 2,911 | 166,965 |
| 1993 | 283,393 | 62,979 | 14,498 | 2,408 | 203,508 | 2,919 | 3,492 | 197,098 |
| 1994 | 334,606 | 119,480 | 11,048 | 4,436 | 199,643 | 3,331 | 6,191 | 190,121 |
| 1995 | 271,127 | 79,943 | 10,800 | 2,238 | 178,146 | 2,419 | 2,713 | 173,014 |
| 1996 | 193,141 | 72,123 | 10,217 | 2,346 | 108,456 | 3,063 | 3,045 | 102,348 |
| 1997 | 247,327 | 64,390 | 11,397 | 931 | 170,610 | 2,981 | 2,567 | 165,062 |
| 1998 | 371,638 | 117,820 | 7,717 | 1,640 | 244,461 | 4,429 | 4,188 | 235,845 |
| 1999 | 149,248 | 11,178 | 7,450 | 934 | 129,686 | 2,477 | 3,304 | 123,906 |
| 2000 | 138,044 | 12,120 | 7,247 | 1,389 | 117,288 | 1,979 | 4,628 | 110,682 |
| 2001 | 213,306 | 11,746 | 7,972 | 1,600 | 191,988 | 3,372 | 4,299 | 184,317 |
| 2002 | 229,485 | 40,039 | 6,946 | 1,193 | 181,307 | 4,103 | 2,500 | 174,704 |
| 2003 | 225,594 | 43,485 | 13,399 | 2,203 | 166,507 | 4,448 | 3,752 | 158,307 |
| 2004 | 356,240 | 100,846 [c] | 10,644 | 2,567 | 242,183 | 4,422 | 4,339 | 233,422 |
| 2005 | 307,701 | 62,764 | 7,951 | 2,863 | 234,123 | 4,471 | 5,702 | 223,950 |
| 2006 | 218,861 | 84,881 | 6,131 | 3,166 | 124,683 | 3,012 | 4,307 | 117,364 |
| 2007 | 125,435 | 51,831 | 9,564 | 3,581 | 60,459 | 3,411 | 6,088 | 50,960 |
| 2008 | 128,752 | 18,968 | 9,149 | 3,305 | 97,330 | 2,571 | 3,395 | 91,364 |
| 2009 | 117,936 | 24,693 | 9,312 | 2,451 | 81,480 | 2,796 | 3,903 | 74,781 |
| 2010 | 94,245 | 26,056 | 6,345 | 1,659 | 60,185 | 1,845 | 2,248 | 56,092 |
| 2011 | 145,232 | 26,927 | 8,485 | 1,542 | 108,278 | 2,981 | 3,302 | 101,995 |
| 2012 | 195,106 | 11,952 | 7,236 | 1,833 | 174,085 | 2,398 | 4,098 | 167,589 |
| 2013 | 132,782 | 10,213 | 6,889 | 1,971 | 113,709 | 4,201 | 4,714 | 104,794 |
| 2014 | 96,639 | 11,868 | 11,942 | 2,369 | 70,460 | 3,890 | 3,891 | 62,679 |
| 2015 | 160,713 | 50,675 | 9,505 | 2,514 | 98,019 | 2,209 | 4,720 | 91,090 |
| 2016 | 167,540 | 24,937 | 14,182 | 3,053 | 125,368 | 1,933 | 5,358 | 118,077 |
| 2017 | 102,083 | 33,376 | 8,912 | 2,834 | 56,961 | 1,827 | 2,837 | 52,297 |
| 2018 | 148,007 | 36,626 | 10,427 | 3,715 | 97,239 | 1,408 | 4,477 | 91,354 |
| 2019 | 80,418 | 22,725 | 7,162 | 3,768 | 46,763 | 2,967 | 2,538 | 41,258 |
| 2020 | 56,705 | 7,452 | 4,725 | 1,496 | 43,032 | 2,265 | 454 | 40,313 |
| 2021 | | 4,820 | 3,159 | | 55,222 | 1,297 | | |
| Average | | | | | | | | |
| 1992-1996 | 262,874 | 76,418 | 11,377 | 2,654 | 172,425 | 2,846 | 3,670 | 165,909 |
| 2016-2020 | 110,951 | 25,023 | 9,082 | 2,973 | 73,873 | 2,080 | 3,133 | 68,660 |
| 1992-2020 | 190,462 | 44,471 | 9,227 | 2,340 | 134,425 | 2,987 | 3,792 | 127,647 |
| Percent | | | | | | | | |
| 1992-1996 | | 79% | 12% | 3% | | 3% | 4% | |
| 2015-2019 | | 59% | 21% | 7% | | 5% | 7% | |
| 1992-2019 | | 71% | 15% | 4% | | 5% | 6% | |

[a] Source: 1992-2011 Buck et. al 2012 with the following exceptions: Commercial Harvest data source; ADF&G Fish Ticket Data, Subsistence Harvest data for 2004, 2006, 2008, 2010 and 2011; Jordan Head (ADF&G) personal communication, 2012-2021; Jordan Head (ADF&G) personal communication, 2021 Subsistence Harvest data; Terri Lemons (ADF&G) personal communication.

[b] Spawning escapement estimated from inriver sonar abundance less upriver harvest for all years except 1997. 1997 estimate based on aerial surveys that have been expanded to DIDSON Equivilants (Buck et al. 2012).

[c] Commercial Harvest includes harvest of 4,087 Chinook salmon that were caught in General District 320-05 as they are most likely of Nushagak origin. (Buck et al 2012)

PC55

**Name:** John O'Connor

**Community of Residence:** Wasilla, Alaska

**Comment:**

Way point map for proposal No. 41

# BRISTOL BAY PROPOSAL No. 41 WAY POINT MAP


HORIZONTAL CONTROL FOR THIS SURVEY IS BASED ON A NGS OPUS STATIC SOLUTION.
NGS POST PROCESSED DATA COLLECTED AND COMPUTED LAT, AND LON FOR GPS SETUP.

ELEVATION CONTROL NOTE:
THE ELEVATIONS ON THIS SURVEY ARE BASED ON NOAA TIDAL BENCH MARK 5621 B 2012
ELEVATION=1.399 METERS ABOVE MHW
MHW= 5.757 METERS
PER NOAA'S DATA SHEET FOR CLARKS POINT TIDAL BENCH MARKS
DATA SHEET ATTACHED.

## SURVEYOR'S CERTIFICATE:

I, JOHN O'CONNOR, PROFESSIONAL LAND SURVEYOR, DO HEREBY CERTIFY THAT I AM DULY LICENSED TO PRACTICE LAND SURVEYING IN THE STATE OF ALASKA AND THAT THIS PLAT REPRESENTS A SURVEY MADE BY ME, THAT THE MONUMENTS SHOWN HEREON ACTUALLY EXIST AS DESCRIBED, AND THAT ALL DIMENSIONS AND OTHER DETAILS ARE CORRECT.

John O'Connor 11/14/2022

JOHN P. O'CONNOR LS 10406 DATE

STATE OF ALASKA
JOHN P. O'CONNOR
LS-10406
DATE11/14/2022
REGISTERED PROFESSIONAL LAND SURVEYOR

PC56

# United States Department of the Interior

Office of Subsistence Management
1011 East Tudor Road MS 121
Anchorage, Alaska 99503-6199

IN REPLY REFER TO:
OSM.22117.JK

NOV 10 2022

Ms. Märit Carlson-Van Dort, Chair
Alaska Board of Fisheries
Alaska Department of Fish and Game
P.O. Box 115526
Juneau, Alaska 99811-5526

Dear Chair Carlson-Van Dort:

The Alaska Board of Fisheries will consider 52 proposals at its Bristol Bay Finfish Meeting from November 29-December 3, 2022.

The Office of Subsistence Management (OSM), working with other Federal agencies, has reviewed the proposals and believes that adoption of any of these proposals will not have significant impacts on Federal subsistence users or fisheries. During the meeting, OSM may wish to comment on other agenda items that may impact Federally qualified subsistence users.

We appreciate the opportunity to comment on these important regulatory matters and look forward to continuing to work with the Alaska Board of Fisheries and the Alaska Department of Fish and Game.

Sincerely,

Amee R. Howard
Assistant Regional Director, Acting
Office of Subsistence Management

cc: Anthony Christianson, Chair, Federal Subsistence Board
Interagency Staff Committee
Benjamin Mulligan, Alaska Department of Fish and Game, Anchorage
Art Nelson, Alaska Department of Fish and Game, Juneau
Mark Burch, Alaska Department of Fish and Game, Palmer
Administrative Record, Office of Subsistence Management, Anchorage

Proposal 17: I am in support of this. I have guided in Bristol Bay for 4 seasons now and have seen overpopulated rivers and creeks. This is supposed to be a wilderness experience in remote Alaska. It sounds like the Naknek is headed in the direction of a present-day Kenai River which is a monstrosity of a fishery with the amount of angler per day.

Personally, I think with how many lodges fish the Naknek, 8 anglers might be too many still. I will leave that up to the board to decide. But overall, something needs to be done to keep the fishery from getting pounded into extinction.

Proposal 19: I am not in support of this. Although I believe making it a single, barbless fishery would accomplish what Mr. Klutsch is going for.

Proposal 21: I support this. It is safe to say non-residents come to this part of Alaska for catch and release fisheries. So why not just add it to the regulation?

Proposal 24: I am in support of this.

Proposal 28: I am in support of this. It is clear that the King numbers in the Nush are declining over the past decades so this new regulation will only help increase those numbers and let those fish spawn in peace. If this is not past I will be really surprised.

Proposal 30: I am in support of this. Four days throughout the summer is not asking too much. It will boost morale in the community along with getting kids outside and enjoy their ancestorial lands.

Proposal 163: I am against this.

PC58

PVOA BOF Bristol Bay Finfish
PO Box 232 Petersburg, AK 99833
Petersburg Vessel Owner's Association
(907) 772-9323
email: pvoa@gci.net

November 12, 2022

Alaska Department of Fish and Game
Board of Fisheries
PO Box 115526
Juneau, AK 99811
Via email: dfg.bof.comments@alaska.gov

RE: Comments on Bristol Bay Finfish November 29-December 3, 2022

Dear Madam Chair Carlson-Van Dort and Board of Fisheries Members,

Petersburg Vessel Owner's Association (PVOA) is composed of 85 members participating in a wide variety of species and gear type fisheries in state and federally managed waters and businesses supportive to the industry. PVOA members fish throughout Alaska from Southeast to the Bering Sea. Targeted species include salmon, herring, halibut, sablefish, crab, shrimp, sea cucumbers, and geoducks.

Thank you for the opportunity to comment on the following proposals:

Proposals 11-13 – Oppose

PVOA Members believe these changes in mesh size and time/area may not have big impacts on the sockeye fishery during this current period of large returns. However, we are concerned for the effectiveness of the fleet in future, smaller runs when salmon will be larger. Additionally, we believe changes in time/dates are not warranted as ADF&G currently uses precaution in selecting opening days and times to ensure king salmon escapement while trying to prevent sockeye over escapement.

Proposals 33-35 – Oppose

PVOA members support the current time/area allocation in regulation for the drift gillnet and set gillnet fleets.

Proposals 42-45 – Oppose

These proposals would be a major disruption to established fishing practices that vessel owners and crew have built businesses on. PVOA members don't want to disincentivize the practice of using dual permits as it is often an entry level avenue for the next generation of fishermen. The evolution of a fishing business often begins by crewing, followed by investing in permits/quota, and ultimately leasing/purchasing boats. Bristol Bay's dual permit regulations are an important intermediate step for hundreds of crewmen to take the plunge from crew to captain.

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Additionally, under current regulations, dual permits significantly reduce the amount of gear in the water and therefore opportunity to lose gear.

Proposals 46-47 – Oppose

As mentioned in previous proposals, dual regulations are an important entry level step for many crewmen to grow a fishing business for themselves. PVOA is opposed to these proposals that would undermine that practice and lead to consolidation of assets within the fleet.

Proposal 58 – Support

ADF&G managers already have the authority to do this under Emergency Order regulations. However, we support the intention of the proposal to provide increased commercial harvest opportunity in the Naknek River Special Harvest Area to prevent over escapement.

Thank you for your time and dedication in considering public comments. We are happy to answer any question in by phone or by email at: pvoa@gci.net.

Respectfully,

Megan O'Neil

Megan O'Neil
Executive Director

PC59

**Name:** kim rice

**Community of Residence:** girdwood alaska

**Comment:**

Proposal 35 yes. support proposal as written

38. yes. 150 ft is enough

39 no. lease covers net location only

43 yes.

46 no. no stacking

47 no. no stacking

49-54 no. our management plans are based on terminal fisheries

56 no. drop card

59 no. this is part of Egegik allocation plan it allows some fish to enter river to spread harvest out among setnets. it works

PC60

**Name:** Chris Roach

**Community of Residence:** Little falls, Minnesota

**Comment:**

Supporting my ugashik set net association being a member and a set netter in the ugashik district.