

**Coho and sockeye salmon escapement:
Bartlett River DIDSON Sonar Installation
in Glacier Bay National Park's Wilderness
MINIMUM REQUIREMENT ANALYSIS
February 2011**

Step 1: Determine if any administrative action is necessary.

Description: Briefly describe the situation that may prompt action.

Glacier Bay National Park's Bartlett River has a popular recreational fishery for sockeye and coho salmon. This complex lake-stream system provides habitat for a diverse array of salmonids including pink and chum salmon, Dolly Varden char, steelhead and cutthroat trout in addition to both sockeye and coho salmon. The Bartlett River is accessed either by foot or by boat from Bartlett Cove. Angler effort and harvest is increasing; Bartlett River angler counts conducted periodically since 2005 indicate a two fold increase in angler effort since creel surveys were conducted in the late 90's. There is growing concern about the sustainability of recreational fishing harvest. Estimates of angler effort and coho salmon harvest exist from creel surveys conducted by the NPS during the coho salmon run in the mid 1990s determined that anglers harvested between 400-800 coho salmon annually during the 1996-98 period.

Accurate quantitative salmonid escapement information for the Bartlett River is extremely limited. Estimates of sockeye abundance obtained via visual enumeration methods have ranged from 1,000 to 100,000 fish and no estimates of coho salmon escapement exist. This is due to the fact that coho salmon runs typically occur late in the season during high discharge and turbidity and abbreviated daylight levels.

Anecdotal information (Buschmann, 1960) suggests a once productive commercial sockeye fishery with estimates of 75,000 to 100,000 fish in this system around the turn of the 20th century. In 1924, federal legislation closed 15 areas in Southeast Alaska, because the salmon stocks were considered depleted; lower Glacier Bay and Bartlett Cove was one of these closed areas (Mavkovjak, 2010). Blackie et al. (1989) and Lentfer and Sharman (1991) enumerated 800-1,800 sockeye during single foot surveys of the mid basin lakes and outlet of the Bartlett River during late September and mid August respectively. In 2007, an effort to accurately enumerate the Bartlett River sockeye and coho salmon resulted in the determination that accurate visual estimation of coho in the Bartlett River system is not possible due to chronic low water clarity, likely dispersed spawning grounds, and spawning during the rainy and snowy late fall season. Estimating sockeye abundance was also not possible in the lower Bartlett River, but abundance was estimated in the mid basin lakes, where water clarity is much higher, and sockeye spawning is concentrated in space and time

Accurate stock assessments are critical in determining whether increased fishing pressure can be sustained; or whether management action such as decreased bag limits are needed. Understanding fish abundance and year to year variation provides context against which harvest can be compared to evaluate sustainability. Accurate and reliable quantitative information will assist the NPS and Alaska Department of Fish and Game to make and justify management decisions to adequately protect the Bartlett River coho and sockeye salmon populations.

A. Describe Options Outside of Wilderness

Is action necessary within wilderness?

Yes: **No:** **Not Applicable:**

Explain:

The Bartlett River Coho and sockeye populations are the stock in question and the river is entirely within designated wilderness.

B. Describe Valid Existing Rights or Special Provisions of Wilderness Legislation

Is action necessary to satisfy valid existing rights or a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that allows or requires consideration of the Section 4(c) prohibited uses? Cite law and section.

Yes: No: Not Applicable:

Explain:

There are no valid existing rights or special provisions that apply.

C. Describe Requirements of Other Legislation

Is action necessary to meet the requirements of other laws?

Yes: No: Not Applicable:

Explain:

There are no other laws that pertain to this action.

D. Describe Other Guidance

Is action necessary to conform to direction contained in agency policy, unit and wilderness management plans, species recovery plans, or agreements with tribal, state and local governments or other federal agencies?

Yes: No: Not Applicable:

Explain:

NPS NATURAL RESOURCES MANAGEMENT POLICY (NPS-77) requires park managers to “*allow recreational fishing activities only when ecosystem impacts are minimal.*” And further states that harvest should not “*be allowed to reduce the reproductive potential of the population or radically alter its natural age structure.*”

The 1984 Glacier Bay National Park and Preserve General Management Plan sets even more specific policy regarding the protection and surveys of aquatic species. It states:

“Sport fishing will continue to be allowed subject to ADF&G and NPS regulations. Sport harvest of any aquatic species threatened by excessive harvest pressure may be regulated in the future. However, the National Park Service will work closely with the Alaska Department of Fish and Game for the establishment of such regulations. Stream surveys will be conducted by the Park Service or the Department of Fish and Game to ascertain their importance as spawning rivers.”

And, during congressional hearings before the passage of ANILCA, the following policy statement was made:

It is expected that the National Park Service will take appropriate steps when necessary to insure that consumptive uses of fish and wildlife populations within National Park Service units not be allowed to adversely disrupt the natural balance which has been maintained for thousands of years. (Congressional Record, Aug. 18, 1980, p. S 11135-36.)

E. Wilderness Character

Is action necessary to preserve one or more of the qualities of wilderness character including: Untrammeled, Undeveloped, Natural, Outstanding opportunities for solitude or a primitive and unconfined type of recreation, or other unique components that reflect the character of this wilderness area?

Untrammeled: Yes: No: Not Applicable:

Explain: Untrammeled means uncontrolled or unmanipulated; free from human influence. Normally, impacts to a single species would be captured in the “natural quality”, but salmon are a keystone species within Glacier Bay’s ecosystems, and should a population decline or become extinct due to overfishing, then the other species that depend on the salmon’s lifecycle could also be impacted. Without accurate escapement estimates, it is unknown whether the current (or anticipated) fishing pressure on

salmon runs in the Bartlett River is having an adverse ecological impact. If the information gathered is accurate and reliable enough to assist with the long-term preservation of native fish populations in the Bartlett River the untrammled quality could be sustained.

Undeveloped: **Yes:** **No:** **Not Applicable:**

Explain: The need to enumerate salmon does not pertain to an administratively authorized or unauthorized development or use of motorized equipment which would impact the undeveloped quality and it is not necessary to take action to preserve this quality.

Natural: **Yes:** **No:** **Not Applicable:**

Explain: Without accurate escapement estimates, it is unknown whether the current (or anticipated) fishing pressure on the salmon runs in the Bartlett River is having an adverse ecological impact on these populations. If the information gathered is accurate and reliable enough to assist with the long-term preservation of native fish populations in wilderness there could be a benefit to the natural quality of wilderness character.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation:

Yes: **No:** **Not Applicable:**

By collecting information that could lead to sustained harvest of salmon runs, the NPS will be ensuring that the fishery will be available for ongoing recreational use. Since sport fishing is already regulated and enforced on the Bartlett River, additional regulations or changes in existing regulations that might be promulgated would not decrease the unconfined nature of recreating in this area. If the information gathered through accurate salmon escapement is reliable enough to assist with the long-term preservation of native fish and wildlife populations in wilderness, collecting that information would sustain opportunities for wilderness visitor experiences that are dependent on fish and wildlife populations.

Other unique components that reflect the character of this wilderness:

Yes: **No:** **Not Applicable:**

Salmon are a keystone species and as such have tremendous symbolic value. They represent intact ecosystems, wildness and abundance. Should overfishing result in degradation of a Bartlett River salmon run, many people will view this as a symbolic blow to the wildness of Glacier Bay and the abundance of Alaska's rivers and forests.

F. Describe Effects to the Public Purposes of Wilderness

Is action necessary to be consistent with one or more of the public purposes for wilderness (as stated in Section 4(b) of the Wilderness Act) of recreation, scenic, scientific, education, conservation, and historical use?

Recreation: **Yes:** **No:** **Not Applicable:**

Explain: Information gathered through use of accurate and reliable enumeration methods could contribute to long-term protection of the Bartlett River salmon runs and protection of the recreation experience. If the information gathered through accurate salmon escapement is reliable enough to assist with the long-term preservation of native fish and wildlife populations in wilderness, collecting that information would sustain opportunities for wilderness visitor experiences that are dependent on fish and wildlife populations.

Scenic: Yes: No: Not Applicable:

Scientific: Yes: No: Not Applicable:

Explain: The Wilderness Act, in Section 2 (a) includes "...gathering and dissemination of information regarding their use and enjoyment..." as part of the necessary administration of the area. In addition, Section 2 (c) lists "scientific" as one of several values that may be found in wilderness. Gathering information to accurately and reliably assess salmon stock escapement and harvest sustainability is consistent with the scientific purpose of wilderness.

Education: Yes: No: Not Applicable:

Explain: The education purpose of wilderness could be enhanced for the public through interpretation of the project and the information gathered.

Conservation: Yes: No: Not Applicable:

Explain: Gathering information for use in preservation of the wilderness character of the wilderness resource is part of this public purpose of wilderness. Management action to protect the fisheries would be informed by accurate and reliable data and would be consistent with the conservation use public purpose.

Historical use: Yes: No: Not Applicable:

Explain: Information gathered through accurate and reliable enumeration of the salmon stocks could contribute to sustaining the traditional uses of wilderness (i.e. recreational fishing). Recreational fishing has been a longstanding cultural tradition throughout the national parks and in National Park Wilderness.

Step 1 Decision: Is any administrative action necessary in wilderness?

Yes: No: Not Applicable:

Explain:

It is necessary to achieve accurate and reliable escapement counts of the coho and sockeye populations in the Bartlett River system in order to ensure that current and anticipated fishing pressure is not adversely impacting these populations. Management actions to protect the fisheries would be informed by accurate and reliable data. Depending on the outcome of the salmon surveys, management action may be necessary to protect the wilderness character and the natural function of ecological processes in the Bartlett River system.

There is a need to determine the minimum tool from the listed alternatives to carry out the research in the least intrusive manner.

If action is necessary, proceed to Step 2 to determine the minimum activity.

Step 2: Determine the minimum activity.

Description of Alternatives

For each alternative, describe what methods and techniques will be used, when the activity will take place, where the activity will take place, what mitigation measures are necessary, and the general effects to the wilderness resource and character.

Alternative A – No Action

Alternative B – DIDSON Sonar

Alternative C – Floating Board Weir

Other alternatives considered but removed from evaluation – Visual Enumeration

Estimation of salmon escapement from visual surveys on foot is one of the oldest methods used for obtaining population estimates, but it is subject to a variety of factors which may introduce bias or limit reliability. The accuracy of this method varies greatly with experience of observers, stream character and conditions when surveyed, and the characteristic of run timing and duration. It is generally agreed that this method underestimates escapement. Under the most ideal conditions (i.e. experienced observers, narrow, shallow, clear water stream, with short spawning peak) this method may obtain 80 to 90 % of a total escapement determined with a weir. Under normal or less than ideal conditions (like those present in the Bartlett River) this method may produce estimates that are no better than $\pm 50\%$ (Cousins et al 1982).

Coho and sockeye salmon populations can be estimated using visual counting methods such as foot, aerial, or snorkel counts that do not require an onsite installation. These methods were piloted in 2007 on the Bartlett River system by the NPS fisheries crew. A complete description of these efforts is available in the 2007 Bartlett River Fieldwork Summary (Murdoch and Soiseth, 2007). Turbid water quality and poor visibility conditions are the biggest obstacles to obtaining accurate fish escapement numbers on the Bartlett River system and make estimating the salmon populations visually the least accurate method. The data collected via visual escapement surveys would be inaccurate and unreliable for meaningful statistical conclusions. For these reasons, this alternative is not being considered in this minimum requirement analysis.

Alternative A – No Action

Description:

No population surveys or escapement would be established for the coho or sockeye fishery on the Bartlett River. The contribution of these populations to area fisheries would not be determined. No quantifiable data would be collected to assess the sustainability of sport fishing on the Bartlett River. Visual enumeration methods could continue, but the data from these methods is inaccurate and the expense to collect the data would be unjustified. Creel surveys would continue, but this data alone would not be enough to determine whether harvest levels on the Bartlett River are sustainable.

Effects:

Wilderness Character

Untrammelled

Normally, impacts to a single species would be captured in the “natural quality”, but salmon are a keystone species within Glacier Bay’s ecosystems, and should a population fail due to overfishing, then the other species that depend on the salmon’s lifecycle would also be impacted. Without accurate escapement numbers, it is unknown whether the current (or anticipated) fishing pressure on the salmon runs in the Bartlett River are having an adverse ecological impact on these populations. If they are, then the untrammelled character is being impacted with unknown long-term consequences.

Undeveloped

No effect on the undeveloped nature of Glacier Bay's Wilderness.

Natural

Without accurate population data and escapement, it is unknown whether the current (or anticipated) fishing pressure on the salmon runs in the Bartlett River are having an adverse ecological impact on these populations and the NPS and the ADF&G will be unable to manage the fishery in a sustainable condition. Recreation harvest would continue. This could result in the loss of the native fish populations, which could result in altered nutrient cycling in the river system and altered movements and behavior of fish dependent wildlife in the Bartlett Cove area.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation

Visitor experience could be diminished if this wilderness river's salmon populations are reduced due to overharvesting. Salmon fishing is a primitive recreational activity which may not be possible or may be diminished in quality if salmon runs decline. Anglers would still need to comply with fishing regulations and submit to license checks.

Other unique components that reflect the character of this wilderness:

Symbolic Values

Salmon are a keystone species and as such have tremendous symbolic value. They represent intact ecosystems, wildness and abundance. Should overfishing result in the degradation of the Bartlett River salmon runs, many people will view this as a symbolic blow to the wildness of Glacier Bay and the abundance of Alaska's rivers and forests.

Heritage and Cultural Resources

No effect

Maintaining Traditional Skills

No effect

Economics and Timing Constraints

No effect

Special Provisions

Not applicable

Additional Wilderness-specific Comparison Criteria

Not applicable

Safety of Visitors, Personnel, Contractors

There would be no known direct safety hazards to visitors by. Should visual enumeration methods continue, NPS personnel would be at some risk for slips, trips and falls due to terrain, and bear encounters when spawning salmon are present.

Alternative B – DIDSON Sonar Installation

Description:

An emerging technology that holds promise for increased reliability and accuracy in measuring salmon escapement on the Bartlett River is the dual frequency identification sonar (DIDSON). DIDSON produces near video quality imagery of migrating salmon and can enumerate aquatic species abundance in river systems where visibility is often obscured by turbid water quality or low light conditions. This

installation would be placed at a site approximately 3.2 miles upstream from the end of the Bartlett River boardwalk (about 1.9 miles above the upper extent of most recreational harvest). The installation footprint would be approximately 35 ft² and consist of a DIDSON sonar, a fish diversion fence, fuel cell power source, 2 backup batteries and a laptop pc and data storage devices. Electronic equipment would be housed in a (48 X 36 X 24") water and bear resistant enclosure within 50 feet of the stream bank. The DIDSON unit would be placed in the water near the bank and a fish diversion fence would encompass the unit and divert the fish to the ideal distance for focused imaging. In addition, some netting of fish will need to be conducted to ensure proper species apportionment.

Because fish must pass through the ensonified cone in order to be detected, it is crucial that they be directed to pass along a specific cross section of the stream channel "seen" by the DIDSON camera. If they pass behind the DIDSON "camera" or under or behind woody debris or other channel obstructions they will not be detected. Should the proposed installation site contain instream woody debris it will need to be removed or trimmed to alleviate this concern or the site will have to be relocated.

Equipment would be installed and operated from June 1 through October 31 each season and removed each fall and winter for 4 seasons. The site would be visited 2-4 times each week on average with more site visits occurring during installation and removal. As much as possible and when the tides allow, the site will be accessed from the river in non-motorized vessels. When conditions do not allow for river access, the site will be accessed by hiking along the Bartlett River.

DIDSON Sonar is a relatively new method for estimating salmon escapement. The Alaska Department of Fish and Game (ADFG) has utilized this technology since 2002. Results from ADFG tests in 2002 and 2003 found that the DIDSON provides significant improvements in fish detection and tracking over the more conventional split and single beam sonar systems (<http://www.sf.adfg.state.ak.us/SonarProgram>). Conventional single and split beam sonar systems can achieve estimates within 5 to 10% of weir estimates (Cousens et al. 1982). Holmes et al. (2006) found that estimates of fish passage obtained with a DIDSON can be as accurate as estimates from a weir.

Species apportionment is a critical aspect of accurate salmon escapement estimates in mixed stock runs. DIDSON is capable of estimating fish length to +/- 1 cm, but species such as coho and chum have overlapping length ranges and are in the river at the same time, which makes DIDSON ineffective for species apportionment without physical sampling. Physical sampling in the Bartlett River will require using nets (fyke or sein) to capture and identify species (visual sampling methods will not be effective due to turbid water conditions). These nets will still allow the passage of fish and the amount of time the fish will be held or impeded in these nets will be as short as possible (estimated at this time to be < 5 minutes). These counts will need to be conducted during the coho run from August 20 through the end of October of each year. The amount of sampling necessary is undetermined but could be up to 4-5 days a week during the pilot year and less frequently in subsequent years. Once statistically sound species apportionment ratios are determined they will be applied to the fish count data from the DIDSON.

Mitigations:

Impacts to migrating fish and wilderness character will be minimized by allowing continuous fish passage and preventing unnatural aggregation. Impacts to visitor experience will be mitigated by siting the installation well above most angling effort, minimizing installation footprint, and site maintenance and data retrieval visits, camouflaging equipment, utilizing hand tools for installation and removal, and using clean, quiet fuel cell technology for a power source. Equipment will be installed and operated from June 1 through October 31 each season and removed each fall and winter for 4 seasons. When possible the site will be accessed as nearly as possible from the Bartlett River, minimizing terrestrial impacts. This will be done using non-motorized vessels.

All personnel will be trained in Leave No Trace techniques, efforts will be made to avoid enlarging the existing wildlife trail leading to the site. Campsite and installation sites will be completely rehabilitated upon completion of the project.

Effects:

Wilderness Character

Untrammelled

The installation of a DIDSON Sonar unit does diminish the untrammelled quality for this portion of the river in wilderness by restricting (but not stopping) the natural passage of fish. The physical sampling required for species apportionment will also impact the untrammelled nature of the salmon run. Normally, impacts to a single species would be captured in the “natural quality”, but Salmon are a keystone species within Glacier Bay’s ecosystems, and should a population fail due to overfishing, then the other species that depend on the salmon’s lifecycle would also be impacted. Without accurate escapement numbers, it is unknown whether the current (or anticipated) fishing pressure on the salmon runs in the Bartlett River is having an adverse ecological impact on these populations. If the information gathered is reliable and accurate enough to assist with the long-term preservation of native fish populations in the Bartlett River there could be a benefit to the untrammelled quality of wilderness character.

Undeveloped

Installations such as this are prohibited by the Wilderness Act, section 4(c) unless they are the minimum necessary for the preservation of wilderness character:

*(c) Except as specifically provided for in this Act, and subject to existing private rights, there shall be no commercial enterprise and no permanent road within any wilderness area designated by this Act and, **except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act** (including measures required in emergencies involving the health and safety of persons within the area), **there shall be** no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and **no structure or installation** within any such area.*

The DIDSON sonar installation will impact the undeveloped nature of Glacier Bay’s wilderness for the 4 year duration of the project.

Natural

There will be adverse effects to wildlife due to direct disturbance during installation, operation, and removal of the DIDSON unit. These disturbances would be short-lived and insignificant. There would be an impact to the natural condition of the area due to informal trailing and expansion of existing wildlife trails due to the frequent visits required to install, maintain and remove the DIDSON unit.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation

Visitor experience could be diminished if this wilderness river’s salmon populations are reduced due to overharvesting. There could be an insignificant impact to the visitor experience due to the presence of NPS personnel along the river and at the installation site. Though the upstream areas above the Glory Hole are rarely visited, those rare visitors in those areas have a much higher expectation for solitude. An unlikely encounter with a NPS crew would therefore have a magnified impact on these visitors. Visitors typically access the Bartlett River through the park frontcountry zone on one trail. Visitors would expect to see some evidence of human use. During these months angler visitation is high and social trailing and vegetation trampling is probably expected and accepted. This alternative is expected to create a negative impact for approximately 3 months of each calendar year the installation is in place and would be mitigated by notifying local residents in Gustavus and park visitors in Bartlett Cove of the expected dates, nature, and duration of the disturbance.

Other unique components that reflect the character of this wilderness

Symbolic Values

Salmon are a keystone species and as such have tremendous symbolic value. They represent intact ecosystems, wildness and abundance. Should overfishing result in the degradation of the Bartlett River salmon runs, many people will view this as a symbolic blow to the wildness of Glacier Bay and the abundance of Alaska’s rivers and forests. However, the placement of the DIDSON installation in the relatively development free wilderness of Glacier Bay and the impacts that installation will have on free-

flowing water and wild salmon runs also causes an impact (albeit temporary) to the symbolic value of wild free flowing salmon.

Heritage and Cultural Resources

No effect

Maintaining Traditional Skills

Hand tools will be used to install equipment and to clear instream woody debris. Non-motorized vessels will be used as much as possible to access the site.

Special Provisions

Not applicable

Economics and Timing Constraints

The cost breakout for implementing this alternative are as follows:

Item	Qty	DIDSON	
		Cost (\$)	4 y Total (\$)
Personnel			
GS-05 biotech (\$ 1,229/PP)	NA	0	0
GS-07 biotech (11 PP@1,522/PP)	8 PP	12,176	48,704
GS-09 biologist (11 PP@2,800/PP)	8 PP	22,400	89,600
GS-12 biologist (6 PP@4,620x/PP)	4 PP	18,480	73,920
WG-7 Maint Worker (\$25/h)	200 h	<u>5,000</u>	<u>5,000</u>
<i>Subtotal</i>		58,056	217,224
Supplies & Equipment			
Fish fencing/ weir panels	60' Al fencing	21,500	21,500
DIDSON package		93,300	93,300
field equipment, repairs & supplies	yearly	<u>10,300</u>	<u>41,200</u>
<i>Subtotal</i>		<i>125,100</i>	<i>156,000</i>
Total		183,156	373,224

Additional Wilderness-specific Comparison Criteria

Not applicable

Safety of Visitors, Personnel, and Contractors

There would be no known direct safety hazards to visitors during the project. Personnel would be at some risk for slips, trips and falls due to terrain, and bear encounters when spawning salmon are present. There are also hypothermia and water related hazards associated with installing the anchors and DIDSON sonar unit within the Bartlett River channel. As the spawning run progresses bears are more and more likely to stay close to the river. At the same time the frequent presence of NPS personnel increases the chance that a bear is disturbed while feeding or that bears become tolerant or habituated to human presence. These bears may pose a heightened risk to the public as well as survey personnel.

Alternative C – Floating Board Weir

Description:

The most accurate method for assessing salmonid escapement in the Bartlett River, because of typical turbid water clarity, is a floating board weir. The weir would be located at a key location on the river and would operate from August to October for 4 years. From November through July each year the weir itself would be removed and stored on site, however, the cable, iron channel rails, and duckbill anchors set into the riverbed cannot be removed each year. The structure would be assembled initially at Bartlett Cove, disassembled and re-assembled on site to minimize time present in wilderness, personnel presence and noise, disturbance to wildlife and visitors, and use of power tools. Materials would be brought up river before or after the wilderness water motor vessel restriction is in place, personnel would boat up river or hike in on the Bartlett River Trail. The weir would require 24 hour monitoring to ensure proper function including fish enumeration and release. A field camp would also be required to house staff on site. This camp would consist of up to 3 tents, a kitchen area placed 100 yards from the sleeping area, and would be situated in resilient vegetation. The camp could be moved every week to reduce long-term site impacts.

Capturing all salmon returning up the Bartlett River would provide the most accurate population estimate of all methods and allow selective identification of all coho in the system. Data on non-target species could also be recorded. The margin of error would be lowest of all the alternatives provided weir integrity could be maintained during flood events.

Mitigations:

Impacts to visitor experience will be mitigated by siting the installation well above most angling effort, minimizing installation footprint and site maintenance and data retrieval visits, camouflaging equipment, and minimizing the use of motorized tools by utilizing hand tools whenever possible for installation and removal. Equipment will be installed and operated from June 1 through October 31 each season and removed each fall and winter for 4 seasons. When possible the site will be accessed as nearly as possible from the Bartlett River, minimizing terrestrial impacts. This will be done using non-motorized vessels.

All personnel will be trained in Leave No Trace techniques, efforts will be made to avoid enlarging the existing wildlife trail leading to the site. Campsite and installation sites will be completely rehabilitated upon completion of the project.

Effects:

Wilderness Character

Untrammelled

This alternative would have the most significant effect on the untrammelled quality of the Bartlett River system. The weir will restrict fish passage including non-target species. Fish held by the weir may attract fish eating birds and mammals including bears, making them more vulnerable to predation and injury.

Physical effects include disturbance or alternation of the riverbed, release of sediment during installation and site preparation, some alteration of the current, and capture of floating debris. During rain events in September and October the weir could wash out or be blocked by enough debris that it tears free and damages the riverbank and bottom. All of the rail and cable can be removed at the end of the project, however one or more of the duckbill anchors may not be retrievable from the riverbed.

Undeveloped

Installations such as this are prohibited by the Wilderness Act, section 4(c) unless they are the minimum necessary for the preservation of wilderness character:

*(c) Except as specifically provided for in this Act, and subject to existing private rights, there shall be no commercial enterprise and no permanent road within any wilderness area designated by this Act and, **except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act** (including measures*

required in emergencies involving the health and safety of persons within the area), **there shall be** no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and **no structure or installation** within any such area.

This installation will impact the undeveloped nature of Glacier Bay's wilderness for the 4 year duration of the project.

Natural

The weir will require one or more daily visits to maintain or repair the weir and 24 hour surveillance to process fish for over 4 months each year for 4 years. The adverse effects to wildlife will be due to noise and human presence on site during construction and during daily weir operations.

The adverse effects to fish include stress of capture and handling, potential complications from tagging and mortality by predators due to aggregation and containment. Actual mortality would be very low. The impacts to wildlife will be due to direct disturbance during counts and travel to/from the weir. Wildlife attracted to spawning salmon including black and brown bear, bald eagle, river otter, harbor seal, coyote, and wolverine could be present at the same times surveys take place. Some bears may become habituated to human activity increasing the chance they cause continuing problems to anglers or visitors around Bartlett Cove. Other wildlife normally present in riverine and riparian habitats including waterfowl, gulls, moose, passerine birds, smaller mustelids, and small mammals could be disturbed each time survey personnel arrive or depart. Waterbirds and possibly fish eating mammals could become trapped in the structure.

Human presence and noise would directly disturb wildlife during fish counts and weir installation. Some visitors may use informal trails created by NPS personnel, expanding the trail tread, vegetation and soil damage.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation

There would be a high impact to the visitor experience during weir construction due to the visual discontinuity and social encounters, and a continued visual presence while the weir is in operation. The weir requires continuous human presence with a significant seasonal camp while the weir is in operation. Visitors may need to travel up or downstream to avoid views of the weir and activity of survey personnel. Anglers may lose opportunity on this section of the river if they are prohibited from fishing for some distance above and below the weir. When the weir is operating, salmon would not be available to anglers or other visitors above the structure until survey personnel release them. Some visitors will feel the river is no longer wild and natural because of the weir and its control of natural fish passage, diminishing their wilderness experience. It could become a target for vandalism due to the remote location. This can be mitigated somewhat with an announcement and signs explaining the purpose for the weir.

Other unique components that reflect the character of this wilderness

Symbolic Values

Salmon are a keystone species and as such have tremendous symbolic value. They represent intact ecosystems, wildness and abundance. Should overfishing result in the degradation of the Bartlett River salmon runs, many people will view this as a symbolic blow to the wildness of Glacier Bay and the abundance of Alaska's rivers and forests. However, the placement of the weir in the relatively development free wilderness of Glacier Bay and the impacts that weir will have on free-flowing water and wild salmon runs also causes a significant impact (albeit temporary) to the symbolic value of wild free flowing salmon.

Heritage and Cultural Resources

No effect

Maintaining Traditional Skills

Hand tools will be used to install equipment and to clear instream woody debris. Non-motorized vessels will be used as much as possible to access the site.

Special Provisions

Not applicable

Economics and Timing Constraints

The cost breakout for implementing this alternative are as follows:

Item	Qty	Resistance Bd Weir	
		Annual Cost (\$)	Total (\$)
Personnel			
GS-05 biotech (\$ 1,229/PP)	11 PP/y	13,519	54,076
GS-07 biotech (11 PP@1,522/PP)	11 PP/y	16,742	66,968
GS-09 biologist (11 PP@2,800/PP)	11 PP/y	30,800	123,200
GS-12 biologist (6 PP@4,620x/PP)	6 PP/y	27,720	110,880
WG-7 Maint Worker (\$25/h)	300 h	<u>7,500</u>	<u>7,500</u>
<i>Subtotal</i>		96,281	362,624
Supplies & Equipment			
Fish fencing/ weir panels	70' FB weir	30,000	30,000
DIDSON package	NA	0	
field equipment, repairs & supplies	yearly	<u>10,300</u>	<u>41,200</u>
<i>Subtotal</i>		40,300	71,200
Total		136,581	433,824

Additional Wilderness-specific Comparison Criteria

Not applicable

Safety of Visitors, Personnel, and Contractors

There would be few safety hazards to visitors during the project. There is a slight chance that a visitor may climb onto the weir, injure themselves or fall into the river. Personnel would be at some risk for slips, trips, falls, and hypothermia from a fall into the river during weir assembly and maintenance, and bear encounters when spawning salmon are present. As the spawning run progresses bears are more and more likely to stay close to the river. At the same time the daily presence of survey personnel increases the chance that a bear is disturbed while feeding or that bears become tolerant or habituated to human presence. This poses a heightened risk to the bears, to the public and to survey personnel.

Comparison of Alternatives

	Alternative A No Action	Alternative B DIDSON Sonar	Alternative C Weir
Untrammelled	-+	++	--+
Undeveloped	+	-	-
Natural	+-	+-	-+
Solitude or Primitive Recreation	+-	-+	-+
Unique components	+-	+-	+-
WILDERNESS CHARACTER	---/++++	--/++++	-----/++++

	Alternative A No Action	Alternative B DIDSON Sonar	Alternative C Weir
Heritage & Cultural Resources	NE	NE	NE
Maintaining Traditional Skills	NE	++	++
Special Provisions	NA	NA	NA
Economics & Timing	NE	-	--
Additional Wilderness Criteria	NA	NA	NA
OTHER CRITERIA SUMMARY		-/++	--/++

	Alternative A No Action	Alternative B DIDSON Sonar	Alternative C Weir
SAFETY (PUBLIC AND WORKERS)	++	-	-

Step 2 Decision: What is the Minimum Activity?

The standard that must be met for the proposed action is contained in the National Park Service Reference Manual for the administration of Wilderness (RM 41) which states the following:

*Research and monitoring devices (e.g., video cameras, data loggers, meteorological stations) may be installed and operated in wilderness if: (1) the desired information is **essential for the administration and preservation of wilderness** and cannot be obtained from a location outside of wilderness without significant loss of precision and applicability, and (2) the proposed device is the minimum requirement necessary to accomplish the research objective safely.*

Alternative B, installation of DIDSON Sonar for counting Coho and Sockeye escapement on the Bartlett River, is the preferred alternative. The DIDSON technology greatly reduces estimation error associated with visual survey methods attempted in 2007 and offers lower levels of impact than a floating board weir (Alternative C).

This action meets the minimum requirements for administration of Wilderness for the following reasons:

- Using accurate, precise and reliable methods for enumerating migrating salmon is critical for making management decisions. Data derived from this project will serve to accurately and reliably assess the number of coho and sockeye within the Bartlett River system, providing park and state officials the baseline data necessary to make and justify management decisions.
- The salmon stocks in question reside in a river entirely within designated wilderness.
- Impacts to wilderness experience, while significant to the occasional wilderness explorer who will encounter the installation, are localized and temporary.

Mitigation

Impacts to migrating fish and wilderness character will be minimized by allowing continuous fish passage by the DIDSON installation and only temporary and preventing unnatural aggregation. Impacts to visitor experience will be mitigated by siting the installation well above most angling effort, minimizing installation footprint and site maintenance and data retrieval visits, camouflaging equipment, utilizing hand tools for installation and removal, and using clean, quiet fuel cell technology for a power source. Equipment will be installed and operated from June 1 through October 31 each season and removed each fall and winter for 4 seasons.

All personnel will be trained in Leave No Trace techniques, efforts will be made to avoid enlarging the existing wildlife trail leading to the site. Campsite and installation sites will be completely rehabilitated upon completion of the project.

Monitoring and Reporting

The installation site shall be assessed at the beginning and end of each season until termination of the special use permit to document site impacts. All equipment associated with the installation shall be removed at the end of the project period. Trail and site impacts will be rehabilitated. This project must meet all conditions of the special use permit.

Wilderness Act Section 4(c) uses approved in this alternative:

- | | |
|---|---|
| <input type="checkbox"/> mechanical transport | <input type="checkbox"/> landing of aircraft |
| <input type="checkbox"/> motorized equipment | <input type="checkbox"/> temporary road |
| <input type="checkbox"/> motor vehicles | <input checked="" type="checkbox"/> structure or installation |
| <input type="checkbox"/> motorboats | |

Approvals	Signature	Name	Position	Date
Prepared by:				
Recommended:				
Approved by:				

Appendix A

Citations:

Alaska Department of Fish and Game Sonar Program: <http://www.sf.adfg.state.ak.us/SonarProgram>

Cousens N.B.F., Thomas G.A., Swann C.G., Healey M.C. *A review of salmon-escapement estimation techniques. Canadian Technical Report of Fisheries and Aquatic Sciences 1982;1108. 122 pp.*

Holmes J.A., G. Cronkite, H. Enzenhofer, T. Mulligan. *Accuracy and precision of fish-count data from a "dual-frequency identification sonar" (DIDSON) imaging system. ICES Journal of Marine Science. 2006; V65: 543-555*

Murdoch C., and Soiseth, *2007 Bartlett River Fieldwork Summary, 2007; 34pp.*

Appendix B

Table 1. Comparison of various salmonid escapement estimation methods. As reviewed in Cousens et al. (1982). The summary Ranking is from most (1) to least (7) favorable (in terms of accuracy) methods.

Method	Assessment type	Pros	Cons	Accuracy	Ranking
Foot Count	Relative, peak escapement	Relatively simple, inexpensive	Access, Visibility concerns, Surveyor experience	30-50% of fence counts; 10-15% under ideal conditions	7
Snorkel/Float	Relative, peak escapement	Relatively simple, inexpensive, good for coho, minimizes double counting	Access, Visibility concerns,	Within 5% of indexed tower counts	5
Aerial Count	Relative, peak escapement	Improved visibility,	Safety (≤ 500 ft.); Moderate expense; Visibility concerns	20-30% of true pops. Least accurate of SE AK mthds	6
Photo Methods	Relative, peak escapement	Permanent record; Reduces accuracy concerns	Used with visual mthds (i.e. foot or tower counts)	Somewhat higher than visual mthd used	To accompany visual methods
Tower Count	Absolute,	Effective for large runs, less cost than M-R but similar accuracy	Visibility concerns, Spp. ID concerns;	15-30% of true pop; 5-10% under ideal conditions	3
Fence Count (Weir)	Absolute	High accuracy, Sex/ morph. info easily obtained	Most expensive, freshets effects	Reference Standard	1
Mark-Recap.	Absolute	High accuracy,	Capture difficulty, Assumptions often violated, Moderate expense	Often overestimates due to tag losses; 3-41% of true pop. w/ avg. @ 25-30%	2
Index streams	Relative	Cost effective, reduced time, stratified mthd	Visibility concerns; Reliability depends on base yr accuracy; requires many yrs data	Similar to visual methods used	Variant using other (typically visual) methods
Side scan sonar	Absolute	Fairly high accuracy; Excellent for bank oriented spp in large rivers	Requires considerable investment, field power, periodic calibration & adjustment; Spp ID	Within 5-10% of true estimates	4