



City of Homer

www.cityofhomer-ak.gov

Office of the City Clerk

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Homer, Alaska 99603

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Memorandum

Agenda Changes/Supplemental Packet

TO: MAYOR CASTNER AND HOMER CITY COUNCIL
FROM: MELISSA JACOBSEN, MMC, DEPUTY CITY CLERK
DATE: JANUARY 13, 2020
SUBJECT: AGENDA CHANGES AND SUPPLEMENTAL PACKET

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Mayor's Report

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Ordinance 19-57(S-2), An Ordinance of the City Council of Homer, Alaska, Transferring Necessary Funding to Properly Close Projects Citywide in the 2019 Fiscal Year (General Fund, Water/Sewer Fund and Port & Harbor Fund). Mayor.

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Resolution 20-007(S), A Resolution of the City Council of Homer, Alaska Opposing the State's Repeal of Alaska Administrative Code 5 AAC 95.310 which would Remove the Prohibition on Personal Watercraft Use in

the Fox River Flats and Kachemak Bay Critical Habitat Areas and Affirming the Deleterious Consequences for Community and Economy if Personal Watercraft are Allowed in Kachemak Bay. Evensen/Aderhold. Page 15

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Resolution 20-008(S), A Resolution of the Homer City Council Designating Homer Spit Amended Lot 31, Known as Seafarer's Memorial, as Green Space and Adopting a Land Management Policy that Preserves Lot 31 for Wildlife and as a Natural Agent for Erosion Mitigation. Evensen/Hansen-Cavasos. Page 72



THE STATE
of **ALASKA**
GOVERNOR MIKE DUNLEAVY

Department of Transportation and
Public Facilities

OFFICE OF THE COMMISSIONER
John MacKinnon, Commissioner

PO Box 112500
Juneau, Alaska 99811-2500
Main: 907.465.3900
dot.alaska.gov

January 6, 2020

The Honorable Ken Castner
Mayor, City of Homer
491 East Pioneer Avenue
Homer, Alaska 99603

Dear Mayor Castner:

Thank you for forwarding a copy of Homer City Council resolution 19-082, in support of the Silvertip Maintenance Station.

The decision to close Silvertip was not made lightly. As you and the City Council are aware, we have about \$750,000 fewer operating dollars than we had the previous fiscal year. The vast majority of that is a budget shortfall due to unrealized revenues from the motor fuel tax. Because we cannot purposely spend into a deficit, we had to make tough choices.

Region-wide, we lost five positions in South Central, and took additional reductions to commodities such as sand, salt and guardrail. The decision to close the station was strategic—we had two other adjacent stations that could cover the area. We were also able to provide 18 hours of continuous coverage—only two fewer hours than we have intermittently covered the area in the past. We can also extend working hours if needed in major storm events. This doesn't mean that our crews will be able to keep up with a heavy, wet snow storm—we've had challenges doing so in the past—so it is possible that we will see a short term closure in the pass for crews to mop up a winter event.

I agree with the sentiments expressed in the City Council's resolution, this is not ideal, and I, nor department staff, like to see any roll back in services. We are operating our maintenance division with \$22 million less than we did six years ago. In the last four years, the department has closed four other maintenance stations and imposed limited operating hours on the Richardson, Dalton and Parks Highways.

We have also sought to do more with less—by investing in better, more reliable equipment, and more efficient chemicals to pre-treat roads for anti-icing instead of after-the-fact deicing. We have pursued these efficiencies in order to make up for reductions of staffing, equipment and commodities. And up until now, we have been successful at insulating the public from feeling the impacts of budget reductions. We will continue to do the best job we can with the resources that we are given. I appreciate the seriousness of the situation and will continue to direct the department to be as efficient as possible.

Sincerely,

A handwritten signature in blue ink, appearing to read "John MacKinnon".

John MacKinnon
Commissioner

"Keep Alaska Moving through service and infrastructure."



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Memorandum

TO: Mayor Castner and Homer City Council
FROM: Councilmember Venuti
DATE: December 23, 2019
SUBJECT: AML Conference Report

I attended the AML conference November 20-22 in Anchorage. I arrived in time to meet and greet people before the opening session. I met new council members from Seward and sat at a table with council members from Gustavus and Sitka. There was an excitement in the room with city officials greeting peers and meeting new members.

The conference began with a greeting from Director, Nils Andreassen who welcomed the group warmly. He mentioned the Triple A leg of AML-awareness, advocacy and action. This was followed by a taping of Governor Dunleavy, who was in Sitka. He shared that he would not be proposing cuts to the fish tax revenue or municipal oil and gas property taxes.

A highlight to me was hearing Mayor Berkowitz speak about his thoughts regarding a municipal dividend. This is in response to the lessening municipal support received from the state. Our working lunch was a presentation led by Merrill Lynch directors that was interesting as we heard of ways to plan ahead for potential volatility in the market.

The Homer councilmembers discussed the many choices for afternoon sessions and decided to each attend a different session. I attended the session led by City Clerks from Wasilla, Fairbanks and Ketchikan which covered the role of the clerks and how to have a successful working relationship with the clerks and appointed officials. It reinforced that Homer is very fortunate to have Melissa Jacobson as the City Clerk. I sat by several councilmembers of smaller communities that were not as fortunate to have a knowledgeable clerk to help with questions and keep the meeting moving smoothly.

I had another meeting obligation, but I was able to attend the beginning of a session about Housing and Homelessness. This was a packed session with a lot of good dialogue. It had an impressive panel consisting of leaders in movements to work on the issue of homelessness and housing. No solid solution but a lot of thoughtful effort to help in this area. Homer does need to have a count of homelessness because without that we can't request funds.

There was a Block Party in the evening. Homer had a great presentation and several wonderful items in an auction.

On Thursday after a breakfast with the entire group of Homer councilmembers, mayor and city manager, I attended a session about Early Childhood Education and Childcare deficit. This included a look at national best practices led by the program manager of the National League of Cities. I can definitely see ways Homer can improve the local level of early childhood education. We all attended the session Strengthening the Manager-Elected Official Relationship which had Katie as a panelist. It was very informative and it made me proud that Katie is our city manager. She held her own in the discussions.

Lunch was sponsored by Alliant Insurance and explained the trends nationally in insurance. Risk management was a key issue, which we can be considering for the future.

I ended my time at the conference with an update of the year- long effort to provide the opportunity to collect on sales tax from on line businesses.

I thought this conference was very worthy of our time. I will be making sure that all councilmembers can attend if they so choose. Homer is hosting the AML Summer Conference in 2022, which I think will be exciting for all participants.

1 CITY OF HOMER
2 HOMER, ALASKA

3 Mayor

4 ORDINANCE 19-57(S-2)
5

6 AN ORDINANCE OF THE CITY COUNCIL OF HOMER, ALASKA,
7 TRANSFERRING NECESSARY FUNDING TO PROPERLY CLOSE
8 PROJECTS CITYWIDE IN THE 2019 FISCAL YEAR (GENERAL FUND,
9 WATER/SEWER FUND AND PORT & HARBOR FUND).
10

11 WHEREAS, The Finance Department has identified capital project accounts that were
12 not closed out despite the projects' completion over the last 19 years; and
13

14 WHEREAS, The Homer City Council was briefed on the status of the projects during the
15 Committee of the Whole on November 25, 2019 and in Memoranda 19-155 **and 20-012**; and
16

17 **WHEREAS, The Homer City Council is exercising its authority to balance and bring**
18 **closure to the projects described and enumerated below; and**
19

20 WHEREAS, ~~Some of these~~ **The** projects were open with a negative or positive balance,
21 which could mean a **an authorized** transfer of funds may never have been recorded, **or** there
22 were coding errors, or the project over or under spent **exceeded** its appropriation; and
23

24 **WHEREAS, All municipal projects are subject to the fiscal restraint of the amount**
25 **appropriated and any expenditure beyond the appropriation must follow the rules of**
26 **public process and City Council authorization; and**
27

28 WHEREAS, In the case of projects that came in under budget and **with the** clear
29 authority on where the funds came from, the open balance was returned to the fund of origin
30 and the project was closed out and documented below in this ordinance; and
31

32 WHEREAS, ~~Twenty three general fund, six water/sewer, and ten port/harbor capital~~
33 ~~projects under \$10,000 have been closed out by the City Manager and are documented below~~
34 ~~in this ordinance; and~~ **Included in this Ordinance are Open projects that were found to have**
35 **existing authorization, but included in this ordinance, and as such properly have been**
36 **administratively closed; and**
37

38 WHEREAS, No new funds have been expended to close out the projects listed below;
39 this ordinance acknowledges a transfer for an expenditure that has already occurred; and
40

41 WHEREAS, Administration is developing systems to prevent projects from being left
42 open through internal measures such as close out meetings, forms, regular reports to the City
43 Manager and an annual report to Council; and
44

45 WHEREAS, The transfers authorized in this ordinance will be booked in the 2019 fiscal
46 year in order to provide the most complete and accurate financial statements possible for the
47 fiscal year; and
48

49 ~~WHEREAS, The Finance Department is still in the process of investigating 20 projects~~
50 ~~with open balances as detailed in Memorandum 19-155 and will include as many projects close~~
51 ~~out recommendations as they are able to work through in the allotted time between meetings~~
52 ~~in a substitute ordinance for second reading.~~
53

54 NOW, THEREFORE, The City of Homer Ordains **That**:

55
56 Section 1. ~~That six~~ **Twelve** General Fund capital projects came in under appropriation
57 totaling ~~\$226,022.09~~ **\$1,553,948.05** and are to be closed per funding transfers detailed as
58 follows:
59

<u>Account</u>	<u>Description</u>	<u>Amount</u>
60 151-0003	Soundview Safety	(\$154,150.64)
61 160-0375	HART Roads	\$154,150.64
62		
63 151-0720	Computer Software Upgrade (Caselle)	(\$26,433.26)
64 100-0099	GF Fund Balance	\$26,433.26
65		
66 151-0726	Hockey Grant	(\$750.15)
67 100-0099	GF Fund Balance	\$750.15
68		
69 151-0727	Mariner Park	(\$22,581.78)
70 156-0385	Parks CARMA	\$22,581.78
71		
72 151-0777	Cruise Ship Enhancements (Dtown Restrooms)	(\$225.00)
73 156-0385	Parks CARMA	\$225.00
74		
75 151-0779	Fishing Lagoon Improvements	(\$21,881.26)
76 151-0776	KPHI Phase I	\$21,881.26
77		
78		
79 160-0375	HART Roads	(\$175,041.93)
80 151-7004	Frisbee CT	\$175,041.93
81		
82 151-0721	Consortium Library	(\$110,436.44)

83	803-0375	Library CARMA	\$110,436.44
84			
85	151-0722	New Library	(\$14,880.74)
86	803-0375	Library CARMA	\$14,880.74
87			
88	151-0723	Library Expansion	(\$40,574.95)
89	803-0375	Library CARMA	\$40,574.95
90			
91	151-0275	Special Fund	(\$924,403.63)
92	100-0100	GF Fund balance	924,403.63
93			
94	<u>Account</u>	<u>Description</u>	<u>Amount</u>
95	151-0728	Animal Shelter	(\$45,227.62)
96	156-0370	Animal Shelter CARMA	\$45,227.62
97			
98	151-7002	Waddell Way	(\$39,241.97)
99	160-0375	HART	\$39,241.97

100

101 Section 2. That fourteen ~~fourteen~~ **Nineteen** General Fund capital projects came in over
 102 appropriation totaling ~~\$113,584.08~~ **\$235,435.95** and are to be closed per funding transfers
 103 detailed as follows:

104

<u>Account</u>	<u>Description</u>	<u>Amount</u>
106 160-0375	HART Roads	(\$386.85)
107 151-0001	Bunnell Street Storm Drain Rehab	\$386.85
108		
109 156-0378	Fire Hall Reserves	(\$925.00)
110 151-0004	Fire Hall Improvements	\$925.00
111		
112 156-0390	Library CARMA	(\$2,149.86)
113 151-0005	Library Backup Generator	\$2,149.86
114		
115 156-0388	Airport CARMA	(\$133.90)
116 151-0388	Old Airport Reserves	\$133.90
117		
118 156-0393	Fire CARMA	(\$4,050.00)
119 151-0719	Live Fire Training Trailer	\$4,050.00
120		
121 165-0375	HART Trails	(\$6,073.84)
122 151-0772	Beluga Slough Trails	\$6,073.84
123		
124 620-0375	Revolving Energy Fund	(\$19,773.00)

125	156-0375	General Fund CARMA	(\$76,347.18)
126	151-0775	City Hall Expansion & Remodel	\$96,120.18
127			
128	175-0375	Natural Gas Line Capital Project Fund	(\$0.05)
129	151-0778	South Peninsula Gas Line	\$0.05
130			
131	156-0369	Seawall CARMA	(\$202.47)
132	151-0788	Seawall Maintenance	\$202.47
133			
134	165-0375	HART Trails	(\$6,930.79)
135	151-0792	Spit Trail Completion	\$6,930.79
136			
137	<u>Account</u>	<u>Description</u>	<u>Amount</u>
138	156-0394	Police CARMA	(\$333.42)
139	151-0795	Homeland Security/Radio	\$333.42
140			
141	100-0375	General Fund CARMA	(\$3,207.63)
142	151-0863	Manley Building Fuel Spill	\$3,207.63
143			
144	100-0100	GF Fund Balance	(\$12,732.09)
145	151-0936	Skyline Fire Station	\$12,732.09
146			
147	156-0394	Police CARMA	(\$111.00)
148	151-7006	FY16 Homeland Security Grant	\$111.00
149			
150	100-0100	GF Fund Balance	(\$89,757.14)
151	151-0735	Jack Gist Park	\$89,757.14
152			
153	100-0100	GF Fund Balance	(\$12,292.55)
154	151-0776	Karen Hornaday Park	\$12,292.55
155			
156	100-0100	GF Fund balance	(\$19,802.18)
157	156-0377	Public Safety Bldg	\$322,588.88
158	156-0376	Police Design	(\$87,271.10)
159	156-0378	Fire Hall Improvements	(\$215,515.60)
160			

Section 3. That four ~~four~~ **Eight** General Fund capital projects were incorrectly categorized in this fund totaling ~~\$517,875.09~~ **\$1,095,615.18** and are to be closed per funding transfers detailed as follows:

165	<u>Account</u>	<u>Description</u>	<u>Amount</u>
166	160-0375	HART Roads	(\$487,048.71)

167	151-0002	General Repaving	\$487,048.71
168			
169	157-0780	Non-Capital ASTEP DUI Enforcement	(\$661.25)
170	151-0780	Capital ASTEP DUI Enforcement Grant	\$661.25
171			
172	157-0781	Non-Capital ASTEP Seatbelt Enforcement	(\$2,843.27)
173	151-0781	Capital ASTEP Seatbelt Enforcement Grant	\$2,843.27
174			
175	<u>Account</u>	<u>Description</u>	<u>Amount</u>
176	100-0100	GF Fund Balance	(\$27,321.86)
177	151-0798	Natural Gas SAD	\$27,321.86
178			
179	151-0779	Fishing Lagoon Improvements	(\$21,881.26)
180	151-0776	KPHI Phase I	\$21,881.26
181			
182	151-0736	Fire Dept Small Grants	\$7,390.40
183	157-0736	Fire Dept Misc grants	(\$7390.40)
184			
185	151-0785	Homeland Security 05 - Fire	\$5,557.91
186	151-0375	Interest Income	(\$5,557.91)
187			
188	173-0375	Seawall Assessments	(\$542,910.52)
189	151-0741	Ocean Dr Bluff Erosion	\$542,910.52
190			

191 ~~Section 4. That two~~ **Five** Water and Sewer capital projects came in under appropriation
 192 totaling ~~\$5,850.59~~ **\$962,478.98** and are to be closed per funding transfers detailed as follows:

194	<u>Account</u>	<u>Description</u>	<u>Amount</u>
195	215-0834	Kach Dr Water Main Phase III	(\$157.52)
196	205-0375	HAWSP	\$157.52
197			
198	215-0836	Old Cast Iron Water Main Rep De	(\$5,693.07)
199	205-0375	HAWSP	\$5,693.07
200			
201	215-0835	Water System Distr/storage	(\$21,077.88)
202	205-0375	HAWSP	\$21,077.88
203			
204	215-0859	East End W/S Expansion	(\$507,994.00)
205	205-0375	HAWSP	\$507,994.00
206			
207	215-0865	Design Water Plant	(\$427,556.51)
208	205-0375	HAWSP	\$427,556.51

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Section 5. ~~That~~ Eight Water and Sewer capital projects came over appropriation totaling \$95,713.97 and are to be closed per funding transfers detailed as follows:

<u>Account</u>	<u>Description</u>	<u>Amount</u>
256-0379	Sewer Reserves	(\$1,894.29)
215-0001	Lillian Walli	\$1,894.29
<u>Account</u>	<u>Description</u>	<u>Amount</u>
256-0379	Sewer Reserves	(\$295.36)
215-0002	Kach Dr III Sewer	\$295.36
256-0378	Water Reserves	(\$18,147.83)
215-0003	Kach Dr III Water	\$18,147.83
205-0375	HAWSP	(\$53,785.71)
215-0815	Bartlett/Hohe Reconstruction	\$53,785.71
256-0379	Sewer Reserves	(\$120.00)
215-0826	Kach Dr Phase I Sewer	\$120.00
205-0375	HAWSP	(\$15,276.00)
215-0829	East End Road PVC Pipe Replacement	\$15,276.00
205-0375	HAWSP	(\$5,199.78)
215-0837	Shellfish Ave/South Slope Water Main	\$5,199.78
256-0378	Water Reserves	(\$995.00)
215-0866	Electric Turbine/Hydro	\$995.00

Section 6. ~~That~~ Two Water and Sewer capital projects had an incorrect rebalancing journal entry of \$20,299.16 and are to be closed per funding transfers detailed as follows:

<u>Account</u>	<u>Description</u>	<u>Amount</u>
215-0832	Sanitary Sewer Rehab	(\$20,299.16)
215-0833	Pressure Reducing Valve	\$20,299.16

Section 7. ~~That four~~ **Five** Port and Harbor capital projects came in under appropriation totaling ~~\$26,795.49~~ **\$156,018.58** and are to be closed per funding transfers detailed as follows:

<u>Account</u>	<u>Description</u>	<u>Amount</u>
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251	415-0380	Old Port Reserves	(\$2,394.99)
252	456-0380	Port Reserves	\$2,394.99
253			
254	415-0923	Security Gates & Video Surveillance DWD	(\$2,501.00)
255	456-0380	Port Reserves	\$2,501.00
256			
257	415-0924	DWD Expansion Phase I	(\$17,910.50)
258	456-0380	Port Reserves	\$17,910.50
259	<u>Account</u>	<u>Description</u>	<u>Amount</u>
260	415-0928	Harbor Trails to DWD & Coal Point	(\$3,989.00)
261	456-0380	Port Reserves	\$3,989.00
262			
263	415-0931	Harbor Restrooms/Shelter/Etc	(\$129,223.09)
264	456-0380	Port Reserves	\$129,223.09
265			

266 Section 8. That six **Nine** Port and Harbor capital projects came in over appropriation
 267 totaling ~~\$110,306.57~~ **\$1,744,948.06** and are to be closed per funding transfers detailed as
 268 follows:

270	<u>Account</u>	<u>Description</u>	<u>Amount</u>
271	456-0380	Port Reserves	(\$155.00)
272	415-0926	Cruise Ship Dock & Passenger Facility	\$155.00
273			
274	456-0380	Port Reserves	(\$160.20)
275	415-0932	Anhydrous Ammonia HAZWOPER Training	\$160.20
276			
277	456-0380	Port Reserves	(\$74.44)
278	415-0934	Homer Load & Launch Ramp	\$74.44
279			
280	456-0380	Port Reserves	(\$108,068.29)
281	415-0935	P&H Building (Harbormasters Office)	\$108,068.29
282			
283	<u>Account</u>	<u>Description</u>	<u>Amount</u>
284	456-0380	Port Reserves	(\$1,401.38)
285	415-0938	Fishing Lagoon Fish Cleaning	\$1,401.38
286			
287	456-0380	Port Reserves	(\$447.26)
288	415-0940	Homeland Security FY15 Generator Grant	\$447.26
289			
290	456-0380	Port Reserves	(\$864.88)
291	415-0380	DWD Expansion Improvements	\$864.88
292			

293	456-0380	Port Reserves	(\$51,823.14)
294	415-0910	Damages reimbursements	\$51,823.14
295			
296	456-0380	Port Reserves	(\$1,581,953.47)
297	415-0920	Small Boat Harbor Floats	\$1,581,953.47

298
299 Section 9. ~~That~~ One Port and Harbor capital project did not properly have expenditures
300 totaling \$25,504.23 booked to it and should be closed per funding transfers detailed as follows:

301	<u>Account</u>	<u>Description</u>	<u>Amount</u>
302	456-0380	Port Reserves	(\$25,504.23)
303	415-0929	DWD Fender Repairs	\$25,504.23

304
305 Section 10. ~~That~~ One capital project came in under appropriation totaling \$95,230
306 that effects General Fund, Port and Harbor, Water, and Sewer and is to be closed per
307 funding transfers detailed as follows:

309	<u>Account</u>	<u>Description</u>	<u>Amount</u>
310	151-0718	Homer Energy Audits	(\$95,230)
311	620-0375	Revolving Energy Fund	\$48,440.25
312	256-0378	Water Reserves	\$25,540.93
313	256-0379	Sewer Reserves	\$1,052.31
314	456-0380	Port Reserves	\$20,196.51

315
316
317 Section 2. This is a budget amendment ordinance, is not permanent in nature, and shall
318 not be codified.

319
320 ENACTED BY THE CITY COUNCIL OF HOMER, ALASKA, this ___ day of _____, 2019.

321
322
323 CITY OF HOMER

324
325
326 _____
327 KEN CASTNER, MAYOR

328 ATTEST:

329
330
331 _____
332 MELISSA JACOBSEN, MMC, CITY CLERK

333
334 YES:

335 NO:
336 ABSTAIN:
337 ABSENT:
338
339 First Reading:
340 Public Hearing:
341 Second Reading:
342 Effective Date:
343
344
345 Reviewed and approved as to form:
346
347 _____
348 Katie Koester, City Manager
349
350 Date: _____

Michael Gatti, City Attorney

Date: _____

1 **CITY OF HOMER**
2 **HOMER, ALASKA**

3 Evensen /Aderhold

4 **RESOLUTION 20-007(S)**
5

6 A RESOLUTION OF THE CITY COUNCIL OF HOMER, ALASKA
7 URGING THE STATE OF ALASKA TO RETAIN THE BAN ON
8 PERSONAL WATERCRAFT IN THE KACHEMAK BAY AND FOX RIVER
9 FLATS CRITICAL HABITAT AREAS UNDER 5 AAC 95.310 UNTIL THE
10 DEPARTMENT OF FISH & GAME PROVIDES RESPONSES TO THE
11 CITY'S PREVIOUS CONCERNS, AN ANALYSIS DETAILING THE
12 CITY'S POTENTIAL LEGAL LIABILITY EXPOSURE, AND ADEQUATE
13 FUNDING FOR THE CITY TO ADOPT AND ENFORCE NEW RULES IF
14 5 AAC 95.310 IS REPEALED
15

16 WHEREAS, The Homer Spit and Kachemak Bay provide important recreational and
17 economic opportunities for local residents and attract tens of thousands of visitors each year
18 who support a broad range of local businesses and jobs; and
19

20 WHEREAS, The Alaska Department of Fish & Game (ADFG) opened a thirty (30) day
21 notice period on December 5, 2019, to repeal 5 AAC 95.310, state code that was adopted with
22 strong community support in 2001 as one protection measure for the Kachemak Bay and Fox
23 River Flats Critical Habitat Areas; and
24

25 WHEREAS, On December 16, 2019, the Homer City Council passed Resolution 19-091(A),
26 calling on ADFG to 1) provide scientific and technical information supporting its proposed rule
27 change in a timely manner so the City of Homer and local residents can better understand and
28 comment on the issues presented; 2) extend the comment period to ninety (90) days to allow
29 local residents sufficient time to comment meaningfully on the proposed rule change; and 3)
30 provide an explanation why this rule change should not be considered as part of the ongoing
31 revision process for Management Plans of Kachemak Bay and Fox River Flats Critical Habitat
32 Areas; and
33

34 WHEREAS, On December 16, 2019, the ADFG issued a supplemental notice extending
35 the public comment deadline for fifteen (15) days, until January 21, 2020; and
36

37 WHEREAS, Despite Homer City Council Resolution 19-091(A), to date, the State of
38 Alaska has provided no explanation or rationale for the proposed rule change to the City of
39 Homer or the general public, and has not explained why this policy change should not occur
40 under the management plan revision process; and
41

42 WHEREAS, ADFG adopted the current Management Plan for Kachemak Bay Critical
43 Habitat Area in 1993; and

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WHEREAS, In 1999 the Homer City Council adopted Resolution 99-111, stating that “extensive research from around the country demonstrates that personal watercraft pose threats to waterfowl, seabirds, shorebirds, marine mammals, other wildlife, and their habitat; cause excessive noise and water pollution; create increased accident rates and user conflicts; and could have a negative impact on Homer’s visitor industry;” and

WHEREAS, Over the past several years City of Homer staff have worked as part of a large stakeholder group with ADFG on the revision process of Kachemak Bay Critical Habitat Area Management Plan; since 2016 the City has participated in at least twenty (20) stakeholder meetings, spending significant time and City resources; and

WHEREAS, Rule changes affecting the Kachemak Bay Critical Habitat Area should be included in the management plan revision process, where they can be fully vetted by City of Homer staff and other stakeholders; and

WHEREAS, Personal watercraft (PWC) can be launched from local beaches and boat ramps owned by the City of Homer, and the City of Homer may be forced to adopt new rules to manage the launch and operation of PWCs in City-owned lands and waters; and

WHEREAS, Design and intended use of PWC are inherently different from skiffs and other boats, and a PWC’s ability to achieve high speeds, jump waves, and navigate extremely shallow waters in and around beaches, tidelands, and waters owned by the City of Homer presents new and unknown liability concerns; and

WHEREAS, Because ADFG has performed no analysis of the potential effects of PWCs on municipalities located within and adjacent to the Kachemak Bay Critical Habitat Area, the City of Homer has no ability to assess the liabilities and costs of rule implementation and enforcement if 5 AAC 95.310 is repealed, resulting in an unfunded mandate from the State of Alaska; and

WHEREAS, Over 99% of Alaskan waters are open to PWC use and Alaskans and tourists alike have ample access to Kachemak Bay, one of the most heavily used waterways in the State, through the use of private and commercial vessels.

NOW, THEREFORE, BE IT RESOLVED that the City Council of Homer, Alaska urges the State of Alaska to retain the ban on personal watercraft in the Kachemak Bay and Fox River Flats Critical Habitat areas under 5 AAC 95.310 until the Department of Fish & Game:

1. Provides adequate responses to Homer City Council Resolution 19-091(A);
2. Provides an analysis detailing the City of Homer’s potential legal liability exposure if 5 AAC 95.310 is repealed; and

MEMORANDUM

Department of Fish and Game

333 Raspberry Road
Anchorage, Alaska 99518-1599

To: David Rogers, Director, Division of Habitat
Bruce Dale, Director, Division of Wildlife Conservation

From: Tammy Massie, Habitat Biologist, Division of Habitat *TMM*
Joe Meehan, Lands & Refuges Program Coordinator, Division of Wildlife Conservation *JM*

Date: May 9, 2017

Subject: Personal Watercraft Regulations, Kachemak Bay Critical Habitat Area

In 2001, after extensive public and agency outreach and review, the department adopted regulations to prohibit the use of personal watercraft (PWC) in Kachemak Bay and Fox River Flats Critical Habitat Areas (5 AAC 95.310). Since that time, there have been several requests from PWC advocates (individuals and organizations) to review the regulation and consider revising or rescinding it.

Background: During the 2016 public scoping period for the revision of the Kachemak Bay and Fox River Flats CHA Management Plan, a primary topic of public input was whether or not to retain the prohibition on PWCs, even though these regulations were not intended to be part of the management plan revision. The following table summarizes those comments as well as those received during the original regulation adoption period.

Comment period	For PWC ban	Against PWC ban
December 1999 to February 2000	292 (+12 organizations)	86 (+2 organizations)
September 2000 to October 2000	1,474 (+76 business owners petition)	361
2000 (Referenced in other public comments, but not direct comments)	1,692 Moratorium on PWC petition	1,269 Pro-access petition
September to November 2016	133	78

Table 1. Summary of readily available counts of public comments from ADF&G public comment periods pertaining to PWC use in Kachemak Bay CHA.

During the original regulation adoption period (1999-2001), 85 published sources of literature were reviewed including scientific and popular publications; federal, state and local agency management documents and staff reports; publications and reports from private organizations; and statement and testimony from biological and physical scientists and resource managers. These citations were summarized and provided to the public and department managers during the regulation adoption process (Enclosure 1).

Since the original 2000 literature review, there has been considerable new research on the potential impacts of PWCs to protected areas. An annotated bibliography containing approximately 140 articles not reviewed in the 2000 literature review was recently compiled, reviewed and summarized (Enclosure 2). The topics addressed in this bibliography include effects of PWC and other recreational boating impacts on marine mammals, birds, fish, and other organisms; ecological and water quality impacts; PWC noise; user group conflicts and other management and legal implications. Much of the information available from this literature review does not precisely match the conditions of Kachemak Bay or Fox River Flats CHAs in that it is not specific to northern latitude marine waters with a wide range of biological and human uses. However, several generalizations can be drawn from the literature as a whole and they may assist department leadership on how to approach PWC regulation in Kachemak Bay and Fox River Flats CHAs. (Enclosure 3)

Recommendation: Based on the updated literature review, most of the concerns that led to the adoption of the PWC prohibition in Kachemak Bay and Fox River Flats CHAs in 2001 continue to be valid today. Improvements in technology have addressed the pollution from 2-stroke engines that were one of the primary environmental concerns with PWC during the original 2000 literature review. However, the nature of PWC traffic, especially the capability to execute rapid changes in speed and direction in nearshore shallow waters, continues to have a high potential to impact habitats, marine organisms, wildlife, and other traditional user groups and those cannot be easily mitigated.

The current available information indicates that significant, specialized research into impacts of PWC on marine organisms in nearshore tidal areas, disturbance to overwintering waterbirds, disturbance to marine mammals, and managing user conflicts and compliance would have to be completed before the regulatory ban on PWC in Kachemak Bay and Fox River Flats CHAs should be relaxed. In addition to research necessary to identify potential buffer zones, any partial opening (such as for a transit corridor) of Kachemak Bay and Fox River Flats CHAs to personal watercraft would require considerable investment of department and Alaska Wildlife Trooper staff time for education and enforcement.

In summary, based on our review of information available since the PWC prohibition was adopted in 2001, we feel there is no new information that would warrant rescinding the prohibition, and in fact the newer information highlights most of the concerns identified when the prohibition was adopted. A draft of this memo was circulated to affected staff in all department divisions (DWC, HAB, CF, SF) and this recommendation was widely supported.

Please let us know if you have any questions or need additional details.

cc: Al Ott
Ginny Litchfield
Maria Gladziszewski
Jeff Selinger
Sue Goodglick
Mark Fink
Megan Marie
Tony Kavalok
Howard Golden
Jason Herreman
Jason Schamber

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Water Quality Impacts	The effects of powerboat emissions on the water quality of Loch Lomond.	Bannan, M. 1999. The effects of powerboat emissions on the water quality of Loch Lomond. Ph.D. Dissertation, Glasgow University, Scotland.	Hydrocarbon analysis of exhaust-polluted water	exhaust	unspecified	no	yes	yes	no	This study shows that hydrocarbon pollution from a relatively small number of inefficient powered recreational craft using a Scottish lake poses a potential environmental threat to water chemistry and zooplankton communities.
Water Quality Impacts	Stirring up trouble: Resuspension of bottom sediments by recreational watercraft.	Beachler, M.M., and D.F. Hill. 2003. Stirring up trouble: Resuspension of bottom sediments by recreational watercraft. Conference: 21st International Symposium of the North-American-Lake-Management-Society, Madison, Wisconsin, Nov 7-9, 2001. Lake and Reservoir Management 19(1):15-25.	Experimental and theoretical study of the hydrodynamic impacts of recreational watercraft in shallow waterbodies	turbulent prop or jet wash	unspecified	yes	yes	yes	no	Through a combination of field experimentation and mathematical modelling, this study illustrates the mechanism of bottom stirring by recreational watercraft (inboard, outboard, and jet propulsion). A relationship for boat speed and maximum bed velocity for several different depths was modelled. Also noted that PWC with their exceptionally shallow drafts has increased traffic in regions of water bodies which have historically seen little boating.
Water Quality Impacts	The direct physical, chemical and biotic impacts on Australian coastal waters due to recreational boating.	Burgin, S., and N. Hardiman. 2011. The direct physical, chemical and biotic impacts on Australian coastal waters due to recreational boating. Biodiversity and Conservation 20(4): 683-701.	Recreational impacts on of boats on aquatic ecosystems	physical, chemical, biotic	unspecified	no	yes	no	yes	Physical impacts: disturbance due to movement of craft in shallow water (turbulence), effects of anchoring/drag, and noise/interference/collision with wildlife. Chemical impacts: pollution from fuels and oils, defouling treatments, and human waste. Biotic impacts: introduction and spreading of non-native species. Impacts of recreational boating can be lessened with the support of governments to guide, engage, and educate the boating fraternity.
Water Quality Impacts	MTBE in southern California water.	Dale, M.S., B. Koch, and R.W. Losee, RW. 2000. MTBE in southern California water. Journal of the American Water Works Association 92(8):42-51.	Water quality monitoring of California reservoirs that allow recreational boating	MTBE	humans	no	yes	yes	no	Methyl tertiary butyl ether (MTBE) is a common fuel oxygenate used in motor vehicle fuels to control emissions and boost octane. MTBE has been identified as a surface water contaminant, and major contributions of MTBE are from two-stroke engine watercraft. Precipitation and runoff seemed to be minimal contributors of MTBE to the reservoirs evaluated in this study.
Water Quality Impacts	Potential impacts of emissions from outboard motors on the aquatic environment: A literature review.	Depee, C. 2007. Potential impacts of emissions from outboard motors on the aquatic environment: A literature review. NIWA Project ELF07201/Client Report HAM2007-026. Prepared for West Coast Regional Council. National Institute of Water & Atmospheric Research Ltd., New Zealand.	Boat derived contaminants on water quality (environmental toxicity and drinking water criteria)	sub-surface exhaust emissions	unspecified eggs/larvae	yes	yes	yes	no	Normal levels of motorized recreational boating activity does not have a significant impact on water quality with respect to toxicity. The main contaminants of concern are BTEX compounds, PAHS, and the fuel additive MTBE. These can negatively impact plankton productions and the environmental microlayer where eggs accumulate and larvae feed. Also noted: PWC release disproportionately large amounts of fuel emissions into the water in shallow waters that otherwise would not be disturbed by other forms of boating.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Water Quality Impacts	Physical and chemical characteristics of Knowles, Forgotten, and Moqui Canyons, and effects of recreational use on water quality, Lake Powell, Arizona and Utah.	Hart, R.J., H.E. Taylor, R.C. Antweiler, G.G. Fisk, and G.M. Anderson. 2004. Physical and chemical characteristics of Knowles, Forgotten, and Moqui Canyons, and effects of recreational use on water quality, Lake Powell, Arizona and Utah. Scientific Investigations Report. 2004-5120. U.S. Geological Survey.	Results of a 2-year water sampling program at site on Lake Powell before and after the high-use season	volatile organic compounds (VOCs), wastewater, byproducts of fuel-based contaminants	unspecified	yes	yes	yes	no	Concentrations of many chemical contaminants were higher during the high-use period than during the low-use period. Report illustrates specific temporal and spatial water-quality deterioration caused by visitor use.
Water Quality Impacts	VOC loading from marine engines to a multiple-use lake.	Heald, P.C., S.G.R. Schladow, and B.C.Allen. 2005. VOC loading from marine engines to a multiple-use lake. Lake and Reservoir Management 21(1):30-38.	A boating survey to quantify daily MTBE and BTEX loading from recreational boating on N. Cal multi-use lakes	VOCs	unspecified	yes	yes	yes	no	MTBEs have greater resistance to microbial degradation and persist in the waters longer than BTEX compounds. Study makes clear that aside from eliminating gasoline-fueled engines and MTBE in gasoline, phasing out the use of older technology 2-stroke engines is the single most effective means of controlling MTBE and BTEX inputs to lake and reservoirs.
Water Quality Impacts	Polycyclic aromatic hydrocarbon (PAH) ecotoxicology in marine ecosystems.	Hylland, K. 2006. Polycyclic aromatic hydrocarbon (PAH) ecotoxicology in marine ecosystems. Journal of Toxicology and Environmental Health-Part A-Current Issues 69(1-2):109-123	Carcinogenic effects of PAH on marine organisms	PAH	molluscs, flatfish, perch	no	yes	no	yes	PAH inputs to the marine environment derived from incineration processes (pyrogenic) and from fossil fuels (petrogenic). This report primarily focuses on pyrogenic effect from the smelter industry and offshore activities in Norway. Also noted: The exhaust from outboard engines used with leisure vessels may contribute sufficient PAHs to induce adverse effects in some coastal areas (Tjarnlund et al 1996).
Water Quality Impacts	Health & environmental assessment of MTBE: Report to the Governor and Legislature of the State of California as sponsored by SB 521.	Keller, A., J. Froines, and C. Koshland. 1998. Health & environmental assessment of MTBE: Report to the Governor and Legislature of the State of California as sponsored by SB 521. Volume 1: Summary & Recommendations. University of California, Santa Barbara	Reformulated gasoline air quality benefits vs human health and ecological effects of MTBE	MTBE	humans	no	yes	yes	no	RFG is intended to reduce engine pollutant formation and air toxic emissions. Added gasoline oxygenates promote more efficient combustions by converting carbon monoxide to carbon dioxide. Improvements in newer engines also significantly reduce emissions of air pollutants, and MTBE and other oxygenates were found to have no significant effect on exhaust emissions from these newer vehicles. Report recommends phasing out MTBE over several years to allow refiners to develop and produce non-oxygenated RFG.
Water Quality Impacts	Underwater emissions from a two-stroke outboard engine: a comparison between an EAL and an equivalent mineral lubricant.	Kelly, C.A., G.A. Ayoko, and R.J. Brown. 2005. Underwater emissions from a two-stroke outboard engine: a comparison between an EAL and an equivalent mineral lubricant. Materials & Design 26(7):609-617.	Characterizing and quantifying pollutants in water column from 2-stroke engine	PAHs and VOCs	unspecified	no	yes	yes	yes	Emission rates of PAHs and VOCs were determined for 2-stroke engine when using a mineral and equivalent environmentally adapted lubricant (EAL). Results show little difference in emissions rates of pollutants with either lubricants in salt and fresh water.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Water Quality Impacts	Gasoline-related compounds in Lakes Mead and Mohave, Nevada,	Lico, M.S, and B.T.Johnson. 2007. Gasoline-related compounds in Lakes Mead and Mohave, Nevada, 2004-06. Scientific Investigations Report 2007-5144. U.S. Geological Survey	Sampling of lake waters to determine distribution of man-made organic compounds related to use of gasoline powered engines	PAHs, MTBE, VOCs (BTEX)	unspecified	no	yes	yes	no	Every site sampled detected compounds contained in raw gasoline (BTEX) and those produced by combustion of gasoline (PAH). MTBE was detected in 2004, although concentrations decreased most likely due to the removal of MTBE from gasoline purchased in California. Evidence indicates that motorized watercraft are the principal source of BTEX and PAH in lakes.
Water Quality Impacts	Assessing environmental impacts of two-stroke outboard motor lubricants using tank testing and simple dispersion model.	Loberto, A.R., R.J. Brown, and C.A. Kelly. 2003. Assessing environmental impacts of two-stroke outboard motor lubricants using tank testing and simple dispersion model. Pages 3-12 in: 2nd International Conference on Tribology in Environmental Design, Bournemouth Univ., Poole, England, Sept 8-10, 2003.	Experimentally investigate the spread of emissions by the boat wake and its propeller	exhaust	unspecified	yes	yes	yes	yes	Mixing action of the propeller is extensive resulting in relatively low concentrations of the emitted pollutants. The propeller of a boat mixes more extensively than that of a jet.
Water Quality Impacts	MTBE and gasoline hydrocarbons in ground water of the United States.	Moran, M.J. J.S. Zogorski, and P.J. Squillace. 2005. MTBE and gasoline hydrocarbons in ground water of the United States. Ground Water 43(4):615-627	The occurrence and distribution of MTBE and gasoline hydrocarbons in national samples of ground water over 10 year period	MTBE	humans	no	yes	yes	no	Although relatively infrequently detected in ground water sampling, the detection frequency of MTBE rivals or surpasses other VOCs that have been produced and used for a much longer period of time. The potential long-term human health effects of low-level concentrations of MTBE in drinking water are not well understood.
Water Quality Impacts	Seasonal increases in polycyclic aromatic hydrocarbons related to two-stroke engine use in a small Alaskan lake.	Rice, S.D., L. Holland, and A. Moles. 2008. Seasonal increases in polycyclic aromatic hydrocarbons related to two-stroke engine use in a small Alaskan lake. Lake and Reservoir Management 24(1):10-17	The role of boating activity on the presence of PAHs through interannual sampling with passive samplers	PAHs	fish	yes	yes	yes	no	Seasonal increases of PAHs coincide with spatial and temporal increases in the use of 2-stroke powered jet skis and skiffs. PAH loads indicate a chronic exposure issue for aquatic residents of lakes and are cause for concern for the long-term water quality needs of fish and wildlife.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Water Quality Impacts	Analysis, occurrence and fate of MTBE in the aquatic environment over the past decade.	Rosell, M., S. Lacorte, and D. Barcelo. 2006. Analysis, occurrence and fate of MTBE in the aquatic environment over the past decade. Trends in Analytical Chemistry [TrAC] 25(10): 1016-1029.	Updated overview of the analytical techniques, environmental occurrence and fate of MTBE in studies over past decade	MTBE	humans, aquatic life	yes	yes	yes	no	Fuel oxygenate MTBE is nearly ubiquitous in the worldwide environment. The use of motorized watercraft was the major contribution as a source of MTBE, whereas neither highway run-off nor precipitation contributed significantly. Restrictions of highly emitting 2-stroke engine types should be considered.
Water Quality Impacts	Concentrations, sources, and fate of the gasoline oxygenate methyl tert-butyl ether (MTBE) in a multiple use lake.	Reuter, J.E., B.C. Allen, and R.C. Richards. 1998. Concentrations, sources, and fate of the gasoline oxygenate methyl tert-butyl ether (MTBE) in a multiple use lake. Environmental Science & Technology 32(23):3666-3672.	MTBE measurements on multi-use lake at 9 individual depths on 16 dates	MTBE	humans	yes	yes	yes	no	Recreational boating was the msot important source of MTBE, neither highway runoff nor precipitation contributed significantly. Peaks of MTBE in early July, minimum occurred in January. Thermal stratification slows MTBE transportation to deeper depths.
Water Quality Impacts	A personal watercraft-based system for coastal ocean mapping.	Webb, B.M. 2012. A personal watercraft-based system for coastal ocean mapping. Journal of Ocean Technology 7(2):48-68	Use of PWC as a platform for coastal mapping			yes	no	no	yes	A novel PWC-based system for coastal ocean mapping has been developed, field-tested, and deployed in Alabama's coastal waters to measure tidal currents, hydrography, and near-surface water characteristics in shallow water.
Water Quality Impacts	Jet ski provides platform for collecting water quality data in bay studies.	Werblow, S., and B. Webb. 2012. Jet ski provides platform for collecting water quality data in bay studies. Sea Technology 53(8):45+.	Use of PWC as a platform for coastal mapping			yes	no	no	yes	Jet ski deployed to measure hydrocarbons and investigate coastal dynamics in coastal waters.
Noise	The effects of noise disturbance from various recreational boating activities common to inland waters on the cardiac physiology of a freshwater fish, the largemouth bass (<i>Micropterus salmoides</i>).	Graham, A.L., and S.J. Cooke. 2008. The effects of noise disturbance from various recreational boating activities common to inland waters on the cardiac physiology of a freshwater fish, the largemouth bass (<i>Micropterus salmoides</i>). Aquatic Conservation-Marine and Freshwater Ecosystems 18(7):1315-1324.	Physiological measurement (cardiac output) of bass under three types of boat noise	boating noise	Largemouth bass	no	yes	yes	no	Cardiac output, an indicator of fish stress, increases in magnitude from exposure to canoes, trolling motors, and combustion engines. Results demonstrate that fish experience sublethal physiological disturbances in response to the noise propagated from recreational boating activities.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Noise	Underwater noise of small personal watercraft (jet skis).	Erbe, C. 2013. Underwater noise of small personal watercraft (jet skis). Journal of the Acoustical Society of America 133(4):EL326-EL330.	PWC noise measurements with underwater acoustic recorders to be used for environmental impact studies	PWC noise		yes	no	no	yes	Although quieter underwater than boats, the sound pressure level might not be a good indicator of the bioacoustic impact on marine fauna.
Noise	Drowning in noise, noise costs of jet skis in America	Komanoff, C. and H. Shaw. 2000. Drowning in noise-Noise costs of jet skis in America. Noise Pollution Clearinghouse. Montpelier, VT.	Report on noise pollution, characterization of noise and report of human perception of monetary cost of PWC noise	PWC noise	humans	yes	no	yes	yes	Biggest difference between noise from PWC and motorboats is that the former continually leave the water, which magnifies noise in two ways. Without the muffling effect of water, the engine noise is typically 15 dBA louder, and the smacking of the craft against the water surface results in a loud "whoop" or series of them. With the rapid maneuvering and frequent speed changes, the impeller has no constant "throughput" and no consistent load on the engine. Consequently, the engine speed rises and falls, resulting in a variable pitch. This constantly changing sound is often perceived as more disturbing than the constant sound of motorboats. Estimates costs of PWC noise in terms of perceived loss of value by nearshore human users.
Legal, Management & Policy	Acadia bans PWCs on lakes.	Daerr, E.G. 1998. Acadia bans PWCs on lakes. National Parks 72(9/10):45	The first legislative ban of PWC in a National Park			yes	no	yes	no	With involvement from NPAC, National Parks and Conservation Association, Acadia National Park in Maine becomes the first national park to legislatively ban PWC from lakes and ponds.
Legal, Management & Policy	The National Park Service's proposed ban: A new approach to personal watercraft use in the national parks.	D'Antuono, K. 2000. The National Park Service's proposed ban: A new approach to personal watercraft use in the national parks. Boston College Environmental Affairs Law Review 27(2):243.	An examination of the legality of NPS ban on PWC use	safety concerns, pollution, noise, habitat disruption, wildlife disturbance	aquatic flora and fauna, water bodies, and humans	yes	yes	yes	yes	NPS invoked its regulatory powers under Organic Act to propose a System-wide ban of PWC, citing safety concerns, adverse environmental impacts, and harming wildlife. The author views that the System-wide ban is both a legal and effective remedy, and that exemptions from the ban should be granted on a limited basis.
Legal, Management & Policy	PWCs banned from towns at Cape Cod.	Dougherty, R. 2002. PWCs banned from towns at Cape Cod. National Parks 76(3/4):16	NPCA successfully lobbies Massachusetts to bans PWCs from waters surrounding four seaside towns			yes	no	no	yes	Ordinance approved by Massachusetts officials banning PWC in four towns surrounding Cape Cod Natinoal Seashore. These local waters are contiguous with federal waters, considered ecologically sensitive.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Legal, Management & Policy	PWCs banned most of park system.	Dougherty, R. 2002. PWCs banned most of park system. National Parks 76(5/6):14.	NPCA highlights PWC usage debate in National Park System			yes	no	yes	yes	Timeline from 1998 - 2002 highlighting ban on PWCs within National Park System. At time of printing PWC is allowed at 16 out of 87 park units, which are conducting environmental assessments for PWC management.
Legal, Management & Policy	The sounds of silence: Trends in the regulation of personal watercraft.	Dudiak, T.A. 2003. The sounds of silence: Trends in the regulation of personal watercraft. Conference: 21st International Symposium of the North-American-Lake-Management-Society, Madison, Wisconsin, Nov 7-9, 2001. Lake and Reservoir Management 19(1):45-54.	An overview of boating regulatory authority with discussion of recent court decisions in PWC regulaton.			yes	no	yes	yes	With the regulatory precedent set by the NPS banning PWC, local and state entities are following the trend that imposes access limitations for recreation that may threaten resources and public safety.
Legal, Management & Policy	Taking PWCs to task.	Jacobs, I.L. 1998. Taking PWCs to task. National Parks 72(3/4):49-50.	Powerbost industry CEO opinion PWC vs. Boats			yes	yes	N/A	N/A	Powersports CEO does not think PWC should be treated the same as boats due to different operating parameters and driver behavior, which diminishes boating experiences and perception of boating community.
Legal, Management & Policy	Managing recreational use on the Yahara Lakes.	Jones, S.A. 2003. Managing recreational use on the Yahara Lakes. Conference: 21st International Symposium of the North-American-Lake-Management-Society, Madison, Wisconsin, Nov 7-9, 2001. Lake and Reservoir Management 19(1):35-44.	Dane County, WI, description and evaluation of growth of lake based recreation and balancing resource use			yes	yes	yes	no	Increase in the multi-use of popular recreational lakes has driven up conflict within user groups. Regulatory and educational practices are used to manage recreational use. An increase in comprehensive data analysis and thorough public input can help management resolve conflict and achieve balanced resource use.
Legal, Management & Policy	PWCs: Out of place in parks.	Katherine, H.M. 1997. PWCs: Out of place in parks. National Parks 71(3/4):17.	A pre-NPS Ban on PWC in parks discussion			yes	no	yes	no	outdated - A plan on zoning a portion of Lake Crescent in Olympic National Park for PWC before NPS ban on PWC in Park System.
Legal, Management & Policy	NPCA demands final PWC rule.	MacKay, K. 1998. NPCA demands final PWC rule. National Parks 72(7/8):18.	Request to issue moratorium on PWC in national parks			yes	no	yes	yes	outdated
Legal, Management & Policy	PWC rule issued by park service.	MacKay, K. 1998. PWC rule issued by park service. National Parks 72(11/12):20.	Report that NPS has released a proposal to regulate PWC in national parks			yes	no	yes	yes	outdated

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Legal, Management & Policy	Jet skis hit bumpy water.	Morgan, K. 1997. Jet skis hit bumpy water. Earth Island Journal 12(4):9.	Report on environmental problems caused by PWC in USA			yes	no	yes	yes	outdated
Legal, Management & Policy	Use of personal watercraft banned.	O'Connell, K.A. 1996. Use of personal watercraft banned. National Parks 70(7/8):25	Report on the decision of officials of the Glacier National Park in Montana for temporary ban on PWC			yes	no	yes	no	outdated
Legal, Management & Policy	Assessment of recreation activity and its application to integrated management and spatial planning for Cork Harbour, Ireland.	O'Mahony, C., J. Gault, and V. Cummins. 2009. Assessment of recreation activity and its application to integrated management and spatial planning for Cork Harbour, Ireland. Marine Policy 33(6):930-937.	A study to create and implement an integrated management strategy for recreation in a coastal setting			yes	yes	no	yes	A collaborative effort for linking scientific research to policy and planning involving participation for marine recreational activities. Data required involves level of use and activities and how users interact with each other and the wider environment.
Legal, Management & Policy	Making waves (cover story).	Whiteman, L. 1997. Making waves (cover story). National Parks 71(7/8):22-25.	An introduction of PWC lead to plans banning them in Park System			yes	no	yes	yes	outdated
Legal, Management & Policy	UK personal watercraft management: A user perspective.	Whitfield, R., and R. Roche. 2007. UK personal watercraft management: A user perspective. Marine Policy 31(4): 564-572.	A study examines the role of PWC clubs in effecting better management of the sport			yes	no	no	yes	Along with statutory framework, PWC Clubs in England are playing an increasingly important role in the management of PWC activity. Membership could be expected to altar behavior through peer education, and with input from coastal managers working with local clubs.
Legal, Management & Policy	Code of Federal Regulation for PWC		Federal code establishing emission standards for PWC at Lake Mead, Mojave, and Powell	air pollution		yes	no	yes	no	36 CFR §7.48 (f)(3) - After December 31, 2012, no one may operate a personal watercraft (PWC) that does not meet the 2006 emission standards set by EPA for the manufacturing of two-stroke engines. A person operating a personal watercraft that meets the EPA 2006 emission standards through the use of direct-injection two-stroke or four-stroke engines, or the equivalent thereof, is not subject to this prohibition and will be allowed to operate.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Legal, Management & Policy	Code of Federal Regulation for PWC		Federal code establishing emission standards for PWC at Lake Powell	air pollution		yes	no	yes	no	36 CFR §7.70 (e)(3) - After December 31, 2012, no one may operate a personal watercraft (PWC) that does not meet the 2006 emission standards set by EPA for the manufacturing of two-stroke engines. A person operating a personal watercraft that meets the EPA 2006 emission standards through the use of direct-injection two-stroke or four-stroke engines, or the equivalent thereof, is not subject to this prohibition and will be allowed to operate.
Legal, Management & Policy	Padre Island National Seashore Personal Watercraft Use-Environmental Assessment	NPS (National Park Service). 2006. Padre Island National Seashore Environmental Assessment. February 1, 2006. NPS, U.S. Department of the Interior, Padre Island National Seashore, Texas.	National Park Service NEPA assessment for regulations to manage or prohibit PWC in Padre Island National Seashore	disturbance from traffic, noise, potential pollution	fish, birds, submerged aquatic vegetation	yes	no	no	yes	Assessment of impacts to National Seashore from 3 alternatives: 1) remain closed to PWC 2) allow limited use of PWC 3) Allow PWC only in boat channel. Identifies projected potential use of PWC and identified adverse negligible to moderate impacts to park resources and users, but does not identify any long term impacts to productivity. Final determination was not to open the area to PWC use.
Injury	Brief report personal watercraft injuries on noncoastal waterways.	Doering, H.B., S.D. Helmer, and J.G. Ward. 2012. Brief report personal watercraft injuries on noncoastal waterways. American Surgeon 78(9):1005-1007.	A retrospective review of PWC trauma registry from 1/1200 to 12/31/2008	PWC	Humans	yes	no	yes	no	In 2009, PWC accounted for 22 percent of all boating accidents in the US, while they only made up 10 percent of the recreational boating fleet. Head injuries were the most common and with appropriate education and increased emphasis on safety mechanisms and equipment, many PWC accidents can be prevented.
Injury	The increasing threat of personal watercraft injuries.	Latch, R, and D.H. Fiser. 2004. The increasing threat of personal watercraft injuries. Clinical Pediatrics 43(4):309-311.	Trend of increasing number and severity of injuries associated with rise of popularity of PWCs	PWC	Humans	yes	no	yes	yes	With the increasing prevalence of PWC use and injury, recommendations to reduce morbidity and mortality including using US Coast Guard approved PFDs, limiting use of PWC to trained adults, and improving recognition of significant PWC injury by medical personnel.
Injury	Human error in recreational boating.	McKnight, A., J. Becker, W. Wayne, and A.J. Pettit. Human error in recreational boating. Accident Analysis and Prevention 39(2):398-405.	Per-boat accident rates and causes from all types of recreational boats	Human error	Humans	yes	yes	yes	yes	PWC have the highest of all per-boat accident rates. Operating too close to other boats and land showing a large number of collisions. Alcohol plays a very small role in PWC accidents.
Injury	Epidemiology of Personal Watercraft Injuries	Gill, R.S., K.A. Whitlock, A.S. Jawanda, S.S. Gill and S. Karmali. 2012. Epidemiology of Personal Watercraft Injuries. Journal of Trauma Treatment 1:112. doi:10.4172/2167-1222.1000112 .	Summary of PWC injuries	PWC	Humans	yes	no	yes	yes	Major causes of PWC related injuries are blunt trauma collisions. However, there is increasing recognition of rare injuries to the perineum and lower abdomen. In order to curb the high accident rates, industry and regulators will heed recommendations for protective safety equipment including helmets and wetsuits bottoms combined with improved operator education.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Injury	Personal Watercraft Steering, Braking, and Testing	Kamen, P. 2010. Personal Watercraft Steering, Braking and Testing. Second Cheasepeake Power Boat Symposium, The Society of Naval Architects and Marine Engineers. https://www.well.com/user/pk/spa/PWC-steering.pdf (accessed April 2017).	Informal summary of braking and steering technology in PWC	technology improvements	Humans	yes	no	n/a	n/a	Description of evolution of off-throttle steering and emergency stopping equipment in PWC from 1955 to 2009, in the context of assessing accidents and improving safety. Early safety problems with PWC resulted in part from operators unable to compensate for long stopping distances and jet-based steering (rather than rudders or props). Various types of modifications to PWC to improve handling are reviewed; computer-aided throttle management for steering and reversing is the most recent and promising, though "boat" based technologies are applicable.
Effects on Other Wildlife	Impact of recreational power boating on two populations of northern map turtles (<i>Graptemys geographica</i>).	Bulte, G., M.-A. Carriere, and G. Blouin-Demers. 2010. Impact of recreational power boating on two populations of northern map turtles (<i>Graptemys geographica</i>). <i>Aquatic Conservation-Marine and Freshwater Ecosystems</i> 20(1):31-38.	Assessing the vulnerability of fresh water turtles to direct effects of boating activities	boat strikes	Northern map turtle	no	yes	yes	no	Recreational power boating is a serious threat to northern map turtles, even under moderate boat traffic. Adult females are at a higher risk of being hit by boats due to differences in habitat use, movement patterns, and basking behavior. Conservation measures such as restricting speed or prohibiting powerboats in critical habitats could reduce injuries and mortality.
Effects on Other Wildlife	Impacts of Human Recreation on Brown Bears (<i>Ursus arctos</i>): A Review and New Management Tool.	Fortin, J.K., K.D. Rode, G.V. Hilderbrand, J. Wilder, S. Farley, C. Jorgensen, and B.G. Marcot. 2016. Impacts of Human Recreation on Brown Bears (<i>Ursus arctos</i>): A Review and New Management Tool. <i>PLOS One</i> 11(1): http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0141983	Potential population-level effects of recreational activities and the tools to aid managers in making decisions about recreational activities in brown bear habitats	anthropogenic recreational activities	Brown bears	no	yes	yes	no	Primary mechanism which brown bears are affected by recreation is via displacement. Most impactful during hyperphagia, when bears dramatically increase their food intake in preparation for hibernation. Decisions that managers make about regulating recreational activities in time and space have important consequences for bear populations.
Effects on Other Wildlife	Measuring the effects of water-based recreation on the spatial ecology of eastern musk turtles.	Laverty, J.F., B. Korol, and J.D. Litzgus. 2016. Measuring the effects of water-based recreation on the spatial ecology of eastern musk turtles. <i>Copeia</i> 104(2):440-447.	Comparison of turtle spatial ecology and health in human impacted and non-impacted sites	water-based recreation	Eastern musk turtles	no	yes	yes	no	Water-based human recreation had minimal effect on the spatial ecology of turtles. No differences in injury and mortality rates were found between impacted and non-impacted sites. Data suggested higher occurrences of mortalities at impacted site, larger sample size required.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Other Wildlife	Recreational boats and turtles: Behavioral mismatches result in high rates of injury.	Lester, L.A., H.W. Avery, and A.S Harrison. 2013. Recreational boats and turtles: Behavioral mismatches result in high rates of injury. PLOS ONE 8(12) http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0082370	Measuring the rate of terrapin injuries due to boat strikes and determining whether terrapins behaviorally respond to boat sounds <i>in situ</i> .	boat strikes	Diamondback terrapins	no	yes	yes	no	Boat injuries were found in 11% of captured terrapins, killed terrapins not included in injury rate. Terrapins do not behaviorally respond to playback recordings of boat engine sounds (possibly because of they are habituated to the sounds produced by boat engines). Conservation measures are needed to protect viability of terrapin populations.
Effects on Other Wildlife	Animal reactions to oncoming vehicles: a conceptual review.	Lima, S.L., B.F. Blackwell, and T.L. DeVault. 2015. Animal reactions to oncoming vehicles: a conceptual review. Biological Reviews 90(1):60-76.	Providing insight into reactions of animals to oncoming vehicles when collisions might be imminent	auto, boat, or aircraft strikes	variety of taxa	no	yes	yes	no	Avoiding a collision requires successful vehicle detections, threat assessment, and evasive behavior; failures can occur at any of these stages. Much behavioral work on animal-vehicle collisions remains to be done across a wide variety of taxa.
Effects on Other Wildlife	Ungulate flight responses to human disturbance: A review and meta-analysis.	Stankowich, T. 2008. Ungulate flight responses to human disturbance: A review and meta-analysis. Biological Conservation 141(9):2159-2173.	Types of disturbance stimuli and ungulates reactions	anthropogenic disturbance	ungulates	no	no	no	no	Environmental factors, and experience with humans and their recreational activities have significant impacts on ungulate behavior. Testable management predictions about flight responses generated from analysis that can enhance wildlife fitness and human experiences.
Effects on Marine Mammals	Behavioural responses of harbour seals to human-induced disturbances.	Andersen, S.M., J. Teilmann, and R. Dietz. 2012. Behavioural responses of harbour seals to human-induced disturbances. Aquatic Conservation-Marine and Freshwater Ecosystems 22(1):113-121.	Experimental disturbances conducted on seal reserve in Denmark	boats / pedestrians	Harbor seal	no	yes	no	yes	Harbor seals respond to approaching boats at a significantly greater distance compared with pedestrians.
Effects on Marine Mammals	Harbor seal behavioral response to boaters at Bair Island Refuge.	Fox, K. S. 2008. Harbor seal behavioral response to boaters at Bair Island Refuge. M.S. Thesis, San Jose State University.	Documentation of seal and boat interaction in San Francisco Bay	boats	Harbor seal	no	yes	no	yes	Harbor seals demonstrate habituation to current boater traffic passing haul-out site, although a correlation was found between multiple boat events and lower total seal numbers at haul-out.
Effects on Marine Mammals	Evaluation of Boater Compliance with Manatee Speed Zones along the Gulf Coast of Florida.	Gorzelany J.F. 2004. Evaluation of Boater Compliance with Manatee Speed Zones along the Gulf Coast of Florida. Coastal Management 32:215-226.	Manatee speed zone compliance surveys in presence and absence of law enforcement	boats	Florida manatee	yes	yes	no	yes	Relative proportion of compliant boaters decreased with decreasing vessel size with lowest proportion of compliance observed among PWC. Overall compliance increases with presence of law enforcement.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Marine Mammals	Long-term observations of a harbor seal haul-out site in a protected cove in Casco Bay, Gulf of Maine.	Harris, D. E., B. Lelli, and S. Gupta. Long-term observations of a harbor seal haul-out site in a protected cove in Casco Bay, Gulf of Maine. <i>Northeastern Naturalist</i> 10(2):141-148.	Seal haul-out trends over four year period	boats	Harbor seal	no	yes	no	yes	Observations of seals on molting ledges show an obvious 12-month periodicity corresponding to yearly cycles in seal behavior. The number seals at a haul-out site can vary greatly within a year and from year to year. Decreasing trend in fraction of days each month that seals were present probably not caused by increased boat activity during summer months.
Effects on Marine Mammals	Bottlenose dolphins increase breathing synchrony in response to boat traffic.	Hastie, G.D., B. Wilson, and L.H. Tufft, L.H. 2003. Bottlenose dolphins increase breathing synchrony in response to boat traffic. <i>Marine Mammal Science</i> 19(1):74-84.	Behavioral changes of dolphins in presence of boats, short term escape responses	boats	Bottlenose dolphin	no	yes	no	yes	Synchronous breathing patterns of bottlenose dolphin increase in the presence of boat traffic; such short-term behavioral responses by dolphins may potentially accumulate to produce longer-term consequences for both individuals and whole population.
Effects on Marine Mammals	Geostatistical analyses of interactions between killer whales (Orcinus orca) and recreational whale-watching boats.	Jelinski, D.E., C.C. Krueger, and D.A. Duffus. 2011. Geostatistical analyses of interactions between killer whales (Orcinus orca) and recreational whale-watching boats. <i>Applied Geography</i> 22(4):393-411.	Geographic information system (GIS) analysis of recreational boats and killer whales, reserve boundary violations	boats	Killer whales	no	yes	no	yes	Reserve violations are high among all user groups, vessel behavior is associated with vessel size and method of propulsion, resulting in short-term changes in killer whale movement. This study supports recommendations of Erbe (2002) for killer whale-watching, based on acoustic analysis, where vessels should be turned off and approach no closer than 50m to avoid hearing loss and change of behavior. Cruising speed of about 10km/hr when within a few hundred meters.
Effects on Marine Mammals	Combined physiological and behavioral observations to assess the influence of vessel encounters on harbor seals in glacial fjords of southeast Alaska.	Karpovich, S.A., J.P. Skinner, J.E. Mondragon, and G.M. Blundell. 2015. Combined physiological and behavioral observations to assess the influence of vessel encounters on harbor seals in glacial fjords of southeast Alaska. <i>Journal of Experimental Marine Biology and Ecology</i> 473: 110-120.	Heart rate recorder attached to harbor seals for physiological response to incidental traffic and experimental disturbances	boats	Harbor seal	no	yes	no	yes	From monitoring heart rates in seals, disturbances from boats can cause direct energetic costs to harbor seals and has implications associated with the conservation of marine mammal populations that inhabit areas with vessel traffic.
Effects on Marine Mammals	Haul-out disturbance on harbor seals (Phoca vitulina) on glacial ice in Tracy Arm, Alaska.	Mathews, E.A., L.A. Jemison, G.W. Pendleton, K.M. Blejwas, K.E. Hood, and K.L. Raum-Suryan. 2016. Haul-out disturbance on harbor seals (Phoca vitulina) on glacial ice in Tracy Arm, Alaska. <i>National Marine Fisheries Service Fishery Bulletin</i> 114(2): 186-2002.	Randomized observations to determine frequency at which seals entered water in presence and absence of vessels	boats	Harbor seal	no	yes	no	yes	Odds of seal entering water due to presence of vessel over 2 times as high as baseline, undisturbed rate. 3.7 times as high when vessel within 100m. Tour and power vessels were the most common types of vessels, but seals were most sensitive to cruise ships and kayaks.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Marine Mammals	Immediate response of Atlantic bottlenose dolphins to high-speed personal watercraft in the Mississippi Sound.	Miller, L.J., M. Solangi, and S.A. Kuczaj, II. 2008. Immediate response of Atlantic bottlenose dolphins to high-speed personal watercraft in the Mississippi Sound. Journal of the Marine Biological Association of the United Kingdom 88(6):1139-1143.	Opportunistic surveys of PWC and dolphins conducted over two years from research vessel	PWC	Bottlenose dolphin	yes	no	no	yes	Passing of high speed PWC significantly increased dolphin dive duration, group cohesion, and breathing synchrony. 47% of the encounters of dolphin group's had changes in behavior within one minute of PWC interaction, including increase in travelling behavior and decrease in feeding behavior.
Effects on Marine Mammals	Haul-out selection by pacific harbor seals (Phoca Vitulina Richardii): Isolation and Perceived Predation Risk.	Nordstrom, C.A. 2002. Haul-out selection by pacific harbor seals (Phoca Vitulina Richardii): Isolation and Perceived Predation Risk. Marine Mammal Science 18(1): 194-205.	Predator avoidance behavior of terrestrial predators	terrestrial predators	Harbor seal	no	no	no	yes	Harbor seals select isolated sites to reduce exposure to terrestrial carnivores.
Effects on Marine Mammals	Short-term effects of boat traffic on bottlenose dolphins, Tursiops truncatus, in Sarasota Bay, Florida.	Nowacek, S.M., R.S. Wells, and A.R. Solow. 2001. Short-term effects of boat traffic on bottlenose dolphins, Tursiops truncatus, in Sarasota Bay, Florida. Marine Mammal Science 17(4):673-688.	Specific behavioral response assessment of individual dolphins to boat traffic	boats	Bottlenose dolphin	yes	yes	no	yes	Dolphins had longer interbreath intervals (IBI) during boat approaches compared to control periods (no boats within 100m). They also decreased interanimal distance, changed heading, and increased swimming speed in response to approaching vessels compared to control periods. Changes in behavior were more likely to occur in response to a PWC than to an outboard at slow and fast speeds. PWC are not acoustically detectable at the same distances as are other types of watercraft (Evans et al 1992) and lack of predictability translates into greater disturbance and possibly danger potential.
Effects on Marine Mammals	Manatee behavioral response to approaching boats.	Rycyk, A. 2013. Manatee behavioral response to approaching boats. Ph.D. Dissertation, Florida State University.	DTAG and GPS tagging of manatees mapped along with boat traffic in SE Florida	boats	Florida manatee	no	yes	no	yes	Evaluation of the type and range of manatee behavioral response to approaching boats. Manatee behavior during boat passes is influenced by boat distance and speed, manatee behavior, and environmental factors. Behavioral changes specifically influenced by sound level and its rise rate.
Effects on Marine Mammals	Variability in reactions of Pacific harbor seals, Phoca vitulina richardsi, to disturbance.	Suryan, R.M. and J.T. Harvey. 1999. Variability in reactions of Pacific harbor seals, Phoca vitulina richardsi, to disturbance. Fishery Bulletin 97(2): 332-339	Quantifying the variability in response to disturbance among individuals and locations	boats	Harbor seal	no	yes	no	yes	Distance at which powerboats caused harassment ranged from 28 to 260 meters. Boating regulations near harbor seal haul-out sites should address speed and approach angle of vessel in addition to distance from animals. Boats that traveled slowly, parallel to the haul-out site, and made no abrupt move or changes in speed caused minimal disturbance.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Marine Mammals	California sea lion (<i>Zalophus californianus</i>) and Steller sea lion (<i>Eumetopias jubatus</i>) interactions with vessels in Pacific Rim National Park Reserve: Implications for marine mammal viewing management.	Szanişzlo, W.R. 1999. California sea lion (<i>Zalophus californianus</i>) and Steller sea lion (<i>Eumetopias jubatus</i>) interactions with vessels in Pacific Rim National Park Reserve: Implications for marine mammal viewing management. M.S. Thesis, University of Victoria, (Canada).	Determining kind and level of behavioural response of sea lions to vessel activity to evaluate effectiveness of Park Guidelines in preventing sea lion disturbance	boats, aircraft, terrestrial	California and Steller sea lion	yes	yes	no	yes	Disturbance to sea lions is minimal when following the prescribed distances and speed restrictions. PWC elicited a major disturbance response by sea lions. Personal Watercraft are not appropriate for viewing sea lions.
Effects on Marine Mammals	Harbor seal vigilance decreased over time since haul out.	Terhune, J.M. and S.W. Brillant. 1996. Harbor seal vigilance decreased over time since haul out. <i>Animal Behavior</i> 51: 757-763.	High level of viligance support an anti-predator function of harbour seal gropuing on haul-out sites	human disturbance	Harbor seal	no	yes	no	yes	Initial scanning time of newly hauled-out harbor seals during the first 3 min after haul out decreased as group size increased. The scanning times of individual seals significantly decreased over time since haul out.
Effects on Marine Mammals	Influences of boat traffic and noise on behaviors and vocalizations of bottlenose dolphins (<i>Tursiops truncatus</i>) in the Indian River Lagoon, Florida.	Williams, C.R. 2009. Influences of boat traffic and noise on behaviors and vocalizations of bottlenose dolphins (<i>Tursiops truncatus</i>) in the Indian River Lagoon, Florida. Ph.D. Dissertation, Florida Institute of Technology.	Hydrophone arrays used to measure vessel noise and dolphin vocalization. Dolphin behaviors observed before, during and after boats passed	boats	Bottlenose dolphin	yes	yes	no	yes	Dolphins are significantly reacting to boats at greater distances (mean of 185 m) than suggested by the MMPA and the general 50 m approach distance should be extended to mitigate the current levels of anthropogenic disturbances specific to Sebastian inlet.
Effects on Marine Mammals	Human and boat interactions with common bottlenose dolphins (<i>Tursiops truncatus</i>) in the waterways around Savannah, Georgia.	Wu, C. 2013. Human and boat interactions with common bottlenose dolphins (<i>Tursiops truncatus</i>) in the waterways around Savannah, Georgia. M.S. Thesis, Savannah State University, Georgia.	Surveys conducted to gauge observations and attitudes of recreational and commercial boater - dolphin interactions	boats	Bottlenose dolphin	no	yes	yes	yes	Recreational boaters and commercial fisherman contribute to the high occurance of human-dolphin interactions in the Savannah GA area by conditioning the animals through illegal feeding. Regulatory measures are already in place but enforcement is lacking. Education programs recommended to improve knowledge within user-groups.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Marine Mammals	Effects of Vessels on Harbor Seals In Glacier Bay National Park.	Young, C., Gende, S.M., and J.T. Harvey. 2012. Effects of Vessels on Harbor Seals In Glacier Bay National Park. <i>Tourism in Marine Environments</i> 10(1-2):5-20	Evaluation of effectiveness of harbor seal-related vessel regulations in Glacier Bay National Park	boats	Harbor seal	no	yes	no	yes	Vessel regulations might be variably effective due to biological irrelevance, noncompliance, or environmental factors. Marine protected area (MPA) regulations should be evaluated to ensure achievement of conservation objectives.
Effects on Fish	Impoverishment of YOY-fish assemblages by intense commercial navigation in a large Lowland river.	Huckstorf, V., W.-C. Lewin, and T. Mehner. 2011. Impoverishment of YOY-fish assemblages by intense commercial navigation in a large Lowland river. <i>River Research and Applications</i> 27(10):1253-1263.	Comparison of young of years fish assemblages in 3 river stretches with varying levels of boat traffic	navigation-induced physical forces (waves/wakes, return currents, shoreline dewatering)	perch and roach primarily, 12 other species	no	yes	yes	no	YOY fish assemblage structure changed along the boat traffic intensity gradient, with both species number and total fish density reduced in the highest traffic intensity reach (6-41 boat passes/day). Intensive commercial navigation impoverished the fish assemblage in width-restricted waterways. Fish species using littoral areas as nursery habitat will have lower recruitment in with high boat traffic. 9Correlative study, minimal corrections for pollution/ behavioral reponses.)
Effects on Fish	Effects of outboard motor emissions on early development of the killifish <i>Oryzias latipes</i> .	Koehler, M.E., and J.T. Hardy. 1999. Effects of outboard motor emissions on early development of the killifish <i>Oryzias latipes</i> . <i>Northwest Science</i> 73(4):277-282.	Laboratory based experiment exposure fish embryos to two-stroke outboard motor emissions to document impacts on larval development.	motor emissions, PAHs	killifish	no	yes	yes	no	Larvae exposed to increasing concentrations of outboard motor exhaust during development displayed slower development, increased incidence of larval abnormalities (abnormal hearts, spines, eyes; absence of swim bladders and spleens) and higher mortality rates at higher concentrations. Gas chromatography determined concentrations of 4 PAHs in the water samples. These concentrations were used to estimate boat use hours on various sizes of lakes to reach lethal concentrations and concluded that heavy use on small lakes might reach that threshold.
Effects on Fish	Documented and potential biological impacts of recreational fishing: Insights for management and conservation.	Lewin, W.-C., R. Arlinghaus, and T. Mehner. 2006. Documented and potential biological impacts of recreational fishing: Insights for management and conservation. <i>Reviews in Fisheries Science</i> 14(4):305-367	recreational fish harvest	N/a						not relevant

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Fish	Physiological changes in prickly sculpin (<i>Cottus asper</i>) inhabiting a lake used by jet-propelled watercraft.	Moles, A., and G.D. Marty. 2005. Physiological changes in prickly sculpin (<i>Cottus asper</i>) inhabiting a lake used by jet-propelled watercraft. <i>Bulletin of Environmental Contamination and Toxicology</i> 74(6): 1151-1158.	Effects of PWC on sculpin bodu condition in lakes with heavy PWC use vs. boat/aircraft use vs. minimal motorized use	PAHs in fuel/exhaust	prickly sculpin	yes	no	yes	no	Prickly sculpin in Auke Lake are undergoing physiological changes (lower condition factor, lower gastrointestinal indices, lower lymphocytes, more microscopic lesions associated with toxicity, and prevalence of different parasites) that have not been observed in sculpin from other lakes that are not as heavily used by motorized watercraft. The suspected source of the physiological changes is the chronic input of polycyclic aromatic hydrocarbons (PAH's) in the summer from PWC use in the lake. The authors suggested that at the time of the study, the Auke Lake watershed was experiencing a decline in the number of returning salmon and there was concern that the quality of fish rearing habitat was declining due to human activities, with release of PAH's from PWC's at the top of the list.
Effects on Fish	Influence of motorboat use on thermal refuges and implications to salmonid physiology in the lower Rogue river, Oregon.	Reid, I.S. 2007. Influence of motorboat use on thermal refuges and implications to salmonid physiology in the lower Rogue river, Oregon. <i>North American Journal of Fisheries Management</i> 27(4):1162-1173.	Motorboat wake impact on thermal refugia, and consequently on salmonid physiology	thermal habitat disruption, startle responses	salmonids	no	yes	yes	no	Thermal imaging, temperature monitors, behavioral observations, and bioenergetics models were used to evaluate the effects of boat traffic on fish in thermal refugia in a riverine setting. Small sample number (10 boat passes) did not find significant changes in water temperature from boat passes/wakes. Startle responses from juvenile Chinook salmon were not observed when boat was +3m away. Bioenergetics models indicated minimal negligible impact physiologically.
Effects on Fish	Boating and navigation activities influence the recruitment of fish in a Baltic Sea archipelago area.	Sandstrom, A., B.K. Eriksson, and P. Karas. 2005. Boating and navigation activities influence the recruitment of fish in a Baltic Sea archipelago area. <i>Ambio</i> 34(2):125-130.	Year of the year abundance sampling for three species to compare boat routes, marinas, and control areas.	boat traffic and dredging for navigation	Perch, pike and white bleak	no	yes	no	yes	Comparison of YOY abundance for multiple species in different coastal areas with boat traffic/dredging concludes that species with high preference for submerged vegetation were negatively influenced by boating and navigation activities and that species with low preference were positively influenced.
Effects on Fish	The effects of hydrocarbon pollution from a two-stroke outboard engine on the feeding behaviour of <i>Lythrypnus dalli</i> (Perciformes : Gobidae).	Shulman, P., and C.M. Pomory. 2000. The effects of hydrocarbon pollution from a two-stroke outboard engine on the feeding behaviour of <i>Lythrypnus dalli</i> (Perciformes : Gobidae). <i>Marine and Freshwater Behaviour and Physiology</i> 33(3):213-220.	Laboratory comparison of effects of different concentrations of two-stroke boat exhaust in water on gobie feeding behavior.	hydrocarbon pollution	<i>Lythrypnus dalli</i>	no	yes	no	yes	Gobie feeding time periods were increased in the presence of sub-lethal amounts of two-stroke engine exhaust in water. Indicates that presence of exhaust required more effort to successfully gain food. Although statistically significant differences were only found at the highest pollution concentration of the trial amounts, behavior changes were noted for lower amounts.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Fish	Impacts of recreational motorboats on fishes: A review.	Whitfield, A. K., and A. Becker. 2014. Impacts of recreational motorboats on fishes: A review. <i>Marine Pollution Bulletin</i> 83(1):24-31	synthesis of direct and indirect impacts of a wide range recreation boats on several species of fish	direct strikes, behavioral response to boat passage, noise, heavy metals, fuel and boat byproducts, invasive species introductions, indirect habitat components (infra-structure, other biota, waterbody size)	various	no	yes	yes	yes	Recreation boat traffic does have impacts on fish, though actual impacts can vary by species and fish size, especially in terms of behavioral responses. Fuel, fuel byproducts, and anti-fouling treatments are detrimental, particularly in small/low flushing systems, but regulatory restrictions on pollution are making these less serious. Inadequate research exists on pelagic fish eggs and larvae. Aquatic invasives (carried on boats) appear to currently be the greatest potential threat to aquatic ecosystems.
Effects on Birds	Bulrush Mediation Effects on Wave Action: Implications for Over-water Nesting Birds	Allen, J.H., G.L. Nuechterlein, and D. Buitron. 2008. Bulrush mediation effects on wave action: implications for over-water nesting birds. <i>Waterbirds</i> 31(3):411-416.	Natural and boat wake wave attenuation by vegetation, nest survival	wake	bulrushes, grebes	no	yes	yes	no	Study of emergent vegetation in shallow freshwater areas used by over water nesting birds. Increased density of stems relative to location of floating nests can attenuate both natural waves and boat wakes impacts on nests, creating better nesting habitat. Higher density vegetation reduces wave heights, and nests are less likely to sink.
Effects on Birds	Effect of human activities on bearded vulture behaviour and breeding success in the French Pyrenees.	Arroyo, B., and M. Razin. 2006. Effect of human activities on bearded vulture behaviour and breeding success in the French Pyrenees. <i>Biological Conservation</i> 128(2):276-284	Relationship between types of activities and distance to the nest with probability of nesting failure	anthropogenic activities, noise	bearded vulture	no	no	no	no	Human activities have a direct effect on vulture behavior, increasing the likelihood that nest areas would be unattended. An increased probability of nest failure occurred in those areas where disturbance was most frequent. The types of activities with strongest effects were very noisy activities and hunting. Conservation measures based on these results may minimize detrimental effects of human activities on vultures.
Effects on Birds	The impact of recreational boat traffic on marbled murrelets (<i>Brachyramphus mamoratus</i>).	Bellefleur, D., P. Lee, and R.A. Ronconi. 2009. The impact of recreational boat traffic on marbled murrelets (<i>Brachyramphus mamoratus</i>). <i>Journal of Environmental Management</i> 90(1):531-538.	Flushing reactions of marbled murrelets within vicinity of small boat traffic	boat traffic	marbled murrelets	no	yes	no	yes	Study shows that age, boat speed, and boat density significantly affected flushing response. Faster boats caused a greater proportion of birds to flush, at further distances. Management actions include speed limits, set back distances, and exclusion of boat traffic.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Birds	Modelling the responses of wildlife to human disturbance: An evaluation of alternative management scenarios for black-crowned night-herons.	Bennett, V.J., E. Fernandez-Juricic, and P.A. Zollner. 2011. Modelling the responses of wildlife to human disturbance: An evaluation of alternative management scenarios for black-crowned night-herons. <i>Ecological Modelling</i> 222(15):2770-2779.	Application of SODA (Simulation of Disturbance Activities) a spatially explicit individual-based model to example case study	human activities, noise	black-crowned night-herons	no	no	yes	no	SODA is a non-species specific spatially explicit individual-based model for exploring the effects of spatial and temporal patterns of anthropogenic disturbance on wildlife. Using a classification and regression tree (CART) procedure to analyse simulation output, authors explored the dynamics of multiple strategies in concert. Simulation modelling helps to evaluate complex circumstances that would be difficult to replicate and test empirically.
Effects on Birds	Jet skis jolt loons.	Bower, J. 1997. Jet skis jolt loons. <i>Audubon</i> 99(5):14.	Loon disturbances from increasing presence of PWC, nest damage	wakes, noise, blocking nest access	common loon	yes	no	yes	no	Report on the growing number of loon/PWC encounters on Michigan lakes. A call for a comprehensive study on the impact of PWC on loon populations.
Effects on Birds	Effects of motorized boat passes on the time budgets of New Zealand dabchick, (<i>Polyocephalus rufopectus</i>).	Bright, A., G.R. Reynolds, and J. Innes. 2003. Effects of motorized boat passes on the time budgets of New Zealand dabchick, <i>Polyocephalus rufopectus</i> . <i>Wildlife Research</i> 30(3):237-244.	Experiments conducted to examine effects of boat passes of different speeds and frequencies on behavior	wakes, noise	New Zealand dabchick	no	yes	yes	no	Boat passes change short-term behavior of dabchicks, becoming more pronounced as the number of boat passes increases. These behavioral changes may increase daily energy expenditure and reduce time available for feeding. There was no effect on boat speed (5 vs 10 knots) on the behavior of birds. The birds also demonstrated habituation to boat traffic in high-use recreational sites.
Effects on Birds	Correlations between human-made structures, boat-pass frequency and the number of New Zealand dabchicks (<i>Polyocephalus rufopectus</i>) on the Rotorua Lakes, New Zealand.	Bright, A., J.R. Waas, and J. Innes. 2004. Correlations between human-made structures, boat-pass frequency and the number of New Zealand dabchicks (<i>Polyocephalus rufopectus</i>) on the Rotorua Lakes, New Zealand. <i>New Zealand Journal of Ecology</i> 28(1):137-142.	Effect that human-made structures and human activities may have on the numbers and distribution of dabchick pairs, chicks and nests	structures, wakes, noise	New Zealand dabchick	no	yes	yes	no	Human-made structures and boating activities do not have a significant negative effect on the numbers and distribution of dabchicks on Rotorua lakes. However, little is currently known about dabchick life history or population dynamics, so findings need to be interpreted conservatively.
Effects on Birds	Effects of human activity on bald eagle distribution on the northern Chesapeake Bay.	Buehler, D.A., T.J. Mersmann, and J.D. Fraser. 1991. Effects of human activity on bald eagle distribution on the northern Chesapeake Bay. <i>Journal of Wildlife Management</i> 55(2):282-290	Bald eagle distribution within potential habitat identified by radio-tags	human activities	bald eagles	no	yes	yes	no	Eagle use of the shoreline was inversely related to building density and directly related to the development set-back distances. Few eagles used shoreline segments with boats and pedestrians nearby.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Birds	Personal watercraft and boats: Coastal conflicts with common terns.	Burger, J. 2003. Personal watercraft and boats: Coastal conflicts with common terns. Conference: 21st International Symposium of the North-American-Lake-Management-Society, Madison, Wisconsin, Nov 7-9, 2001. Lake and Reservoir Management 19(1):26-34.	Observation of common tern behavior and reproductive success in response to motorboats and PWCs	wakes, noise	common terns	yes	yes	no	yes	Prior to study, reproductive success of terns had declined to zero. Terns respond with significantly more upflights to PWCs that raced by and circled the island, than to motor boats that travelled slowly and remained in the channel. Education, public meetings, increased signage, enforcement, and designated zones for PWCs resulted in the greatest increase in reproductive success.
Effects on Birds	Effect of approaching boats on nesting black skimmers: Using response distances to establish protective buffer zones.	Burger, J., M. Gochfeld, and C.D. Jenkins. 2010. Effect of approaching boats on nesting black skimmers: Using response distances to establish protective buffer zones. Journal of Wildlife Management 74(1):102-108.	Determining set-back distances based on timing of first responses to approaching boats, timing of initial flight, and time to return after disturbance	small boats	black skimmers	yes	yes	no	yes	The skimmer reproductive stage had the greatest effect on all responses, followed by direction of approach, number of adults present at colony, and number of nests. The distance at which skimmers first flew when a boat approached decreased from the pre-egg laying period to hatching, and then increased slightly later in the season. Recommendation for managers to use a set-back distance > 118 meters from the perimeter of the colony, which is the 95% percentile of the distance that skimmers first flew in response to approaching boats.
Effects on Birds	Recreational activities affecting the habitat use by birds in Pampa's wetlands, Argentina: Implications for waterbird conservation.	Cardoni, D.A., M. Favero, and J.P. Isacch. 2008. Recreational activities affecting the habitat use by birds in Pampa's wetlands, Argentina: Implications for waterbird conservation. Biological Conservation 141(3): 797-806.	Bird surveys performed in areas of high disturbance due to recreation (weekends) and without (weekdays)	terrestrial anthropogenic	waders, grebes	no	no	yes	no	Some species (waders) were more affected by human presence than others (grebes). Changes in the waterbird grouping and structure in relation to the presence of people on the shoreline was detected. The buffer area defined by the current Reserve management strategy is working properly.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Birds	A review of human disturbance effects on nesting colonial waterbirds.	Carney, K.M., and W.J. Sydeman. 1999. A review of human disturbance effects on nesting colonial waterbirds. <i>Waterbirds</i> . 22(1):68-79.	Developing general guidelines for ecotourism and other forms of human visitation through literature review	anthropogenic disturbances	various	no	yes	yes	yes	A summary of reviewed articles, based on taxonomy, examining investigator, ecotourist, recreator, watercraft, and aircraft activity effects on physiology, reproductive behavior, reproductive success, and population trends of waterbirds. Goals of paper are to identify species/taxa most vulnerable to human disturbance, the times at which disturbance is most likely to cause adverse impacts, and precautions that can be taken to minimize adverse effects. Though most studies found significant negative effects, taking careful measures minimized impact on some species. Waterbirds are especially vulnerable to human activities because their size, animated behavior, and physical beauty tend to attract humans.
Effects on Birds	Response: Disturbance, habituation, and management of waterbird colonies.	Carney, K.M., and W.J. Sydeman. 2000. Response: Disturbance, habituation, and management of waterbird colonies. <i>Waterbirds</i> . 23(2):333-334	Response to criticism of literature review of human disturbance and colonial waterbirds	anthropogenic disturbances	various	no	yes	yes	yes	Although Nisbet (2000) highlights several differences between his conclusions and Carney (1999), perspectives are more often in common than in conflict. Agree that future studies should rigorously address how visitor activities affect waterbird colonies.
Effects on Birds	Set-back distances to protect nesting and roosting seabirds off Vancouver Island from boat disturbance.	Chatwin, T.A., R. Joy, and A.E. Burger. 2013. Set-back distances to protect nesting and roosting seabirds off Vancouver Island from boat disturbance. <i>Waterbirds</i> 36(1):43-52.	Developing rules with scientifically based guidelines for birdwatching from boats	boats	cormorants, oystercatchers, gulls, and guillemots, ducks	no	yes	no	yes	This study examines the effects of species sensitivity, vessel type, habituation and season on agitation distance. A general set-back guideline of 40 m was recommended to protect most nest and roost sites while allowing viewers to appreciate seabirds. Set-backs could be adjusted to protect locally sensitive sites or species.
Effects on Birds	Persistence and abundance of the western grebe (<i>Aechmophorus occidentalis</i>) in Alberta.	Erickson, M.E. 2010. Persistence and abundance of the western grebe (<i>Aechmophorus occidentalis</i>) in Alberta. M.S. Thesis, University of Alberta, Canada.	emergent vegetation, human developments, and prey availability affect grebe population	habitat loss, anthropogenic disturbances	western grebe	yes	yes	yes	no	Recreational activity can be a serious stressor to grebes, with the wakes from watercraft swamping nests and forcing adults to abandon their eggs. Recommends that shoreline vegetation be protected for the success of breeding grebes, and human activity around colonies should be kept to a minimum to curb further grebe decline.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Birds	Alert distance as an alternative measure of bird tolerance to human disturbance: implications for park design.	Fernandez-Juricic, E., M.D. Jimenez, and E. Lucas. 2001. Alert distance as an alternative measure of bird tolerance to human disturbance: implications for park design. Environmental Conservation 28(3):263-269.	Adapting alert distance from waterbirds to pedestrian approaches of four bird species in wooded parks	anthropogenic disturbances	sparrow, blackbird, woodpigeon, magpie	no	no	no	no	Alert distances varied among species, with large species being less tolerant of human disturbance than small ones. Alert distance appears to be a more conservative indicator of tolerance than flight distances, because it includes a buffer zone in which birds may adapt their reaction to the behavior of visitors. Minimum approaching distances can be estimated from alert distances, and implemented to reduce human-wildlife conflicts.
Effects on Birds	Sensitivity of wildlife to spatial patterns of recreationist behavior: A critical assessment of minimum approaching distances and buffer areas for grassland birds.	Fernandez-Juricic, E., M.P. Venier, and D. Renison. 2005. Sensitivity of wildlife to spatial patterns of recreationist behavior: A critical assessment of minimum approaching distances and buffer areas for grassland birds. Biological Conservation 125(2):225-235.	Assesses the effects of tangential and direct approaches on birds and evaluates methods to estimate buffer areas	anthropogenic disturbances	finch, cindclodes, miner, meadowlark, lapwing	no	no	no	no	Study finds that four out of the five species showed greater flight initiation distance response to tangential rather than direct approaches, and that the minimum approach distance and buffer area estimates for these species varied significantly. Estimations based on alert distances may be too simplistic.
Effects on Birds	Responses of nestling black-crowned night herons (Nycticorax nycticorax) to aquatic and terrestrial recreational activities: a manipulative study.	Fernandez-Juricic, E., P.A. Zollner, and C. LeBlang. 2007. Responses of nestling black-crowned night herons (Nycticorax nycticorax) to aquatic and terrestrial recreational activities: a manipulative study. Waterbirds 30(4):554-565.	Assesses the effects of the presence and frequency of canoe and pedestrian disturbance on multiple behavioral responses of heron nestlings in Chicago	pedestrians, paddlers	black-crowned night-herons	no	no	yes	no	Both pedestrian and canoers initiated behavioral responses of nestlings (scanning, freezing, sleeping, and walking). The recommendation of the authors is to restrict boating activities during the initial part of the breeding season to minimize nest abandonment. Pedestrians should be managed in such a way as to increase the distance between pathways and nests. A 50 m buffer zone around the colony is recommended based on the responses obtained from the colony.
Effects on Birds	Determining impacts on least tern (Sternula antillarum) breeding colonies along a gradient of human disturbance.	Fournet, B. 2015. Determining impacts on least tern (Sternula antillarum) breeding colonies along a gradient of human disturbance. M.S. Thesis, University of Charleston, South Carolina.	Observation of tern nests to assess the amount human disturbance and follow up surveys with pedestrians	pedestrians, dogs, crows	least tern	no	no	no	no	Terns showed a significant response to crows and people with dogs compared to people without dogs. Surveys showed that beachgoers did value beach-nesting birds and thought that protecting nesting birds is important, but lack the knowledge necessary to assess their own negative impacts.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Birds	Effects of motorized tourboats on the behavior of nonbreeding American flamingos in Yucatan, Mexico.	Galicia, E., and G.A. Baldassarre. 1997. Effects of motorized tourboats on the behavior of nonbreeding American flamingos in Yucatan, Mexico. Conservation Biology 11(5):1159-1165.	Flamingo disturbance observations from interactions with sanctuary tourboats	tourboats	American flamingos	no	yes	no	yes	Tourboats reduced feeding time and increased alert behavior of flamingoes in the Celestun Estuary. Conservation efforts should focus on education of tour boat operators to reduce disturbance of flamingoes.
Effects on Birds	Effects of watercraft on bald eagles nesting in Voyageurs National Park, Minnesota.	Grubb, T.G., W.L. Robinson, and W.W. Bowerman. 2002. Effects of watercraft on bald eagles nesting in Voyageurs National Park, Minnesota. Wildlife Society Bulletin 30(1):156-161.	Assessment of the potential impact of watercraft on nesting bald eagles through quantification of behavioral responses	boats	bald eagles	yes	yes	yes	no	Observation of 9 active nests over a one year period yielded a response (alert posture or flying) frequency of 4.7% when watercraft passed within 800m of these nests. Authors used CART to explore and quantify conditions leading to bald eagle response, despite the species' low overall response rate. The model indicated that distance was the most critical component of any potential watercraft disturbance, with responses decreasing at increasing distances. Unknown effects on prey delivery rates, adult nest attendance, physiological stress, site tenacity and long-term productivity warrant further study.
Effects on Birds	AvianBuffer: An interactive tool for characterising and managing wildlife fear responses.	Guay, P.-J.; W.F.D. van Dongen, F.D. Wouter, and R.W. Robinson. 2016. AvianBuffer: An interactive tool for characterising and managing wildlife fear responses. Ambio 45(7):841-851	Describes software that models alert distances of birds with various disturbances	anthropogenic disturbances	unspecified	no	no	no	no	Users can input bird species and determine an alert distance above which the species is predicted to not flee humans. Authors feel that this tool will be of interest to conservation managers, pest managers, policy makers, land-use planners, educators, animal welfare proponents, and wildlife ecologists.
Effects on Birds	Responses of wintering grassland raptors to human disturbance.	Holmes, T.L., R.L. Knight, and L. Stegall. 1993. Responses of wintering grassland raptors to human disturbance. Wildlife Society Bulletin 21(4):461-468.	Measurement of flushing responses and flush distance of 6 species of raptors exposed to walking and vehicle disturbances	pedestrians, vehicles	american kestrel, merlin, prairie falcon, rough-legged hawk, ferruginous hawk, golden eagle	no	no	no	no	Raptor response to disturbance varies among species and between populations, therefore management plans should be tailored to each species, habitat, and season. Buffer zones for wintering raptors could be effective if placed around sensitive foraging areas. Walking disturbances resulted in more flushes than vehicle disturbances for all species except prairie falcons.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Birds	Database of bird flight initiation distances to assist in estimating effects from human disturbance and delineating buffer areas	Livezey, K.B., E. Fernandez-Juricic, D.T. Blumstein, A.F. Livezey, and B. Kent. 2016. Database of bird flight initiation distances to assist in estimating effects from human disturbance and delineating buffer areas. Journal of Fish and Wildlife Management 7(1):181-191.	Database records various species of birds sensitivity to humans and their activities	pedestrian, watercraft, aircraft	various threatened and/or endangered bird species Anseriformes, Charadriiformes, Ciconiiformes, Falconiformes	no	yes	yes	yes	This database distinguishes between nesting and nonnesting situations. The database includes numbers for non-motorized and motorized watercraft along with the respective alert distances (distances at which birds exposed to an approaching human activity exhibit alert behavior), flight initiation distances (distances at which birds exposed to an approaching human activity initiate escape behavior), and minimum approach distances (distances at which humans should be separated from wildlife).
Effects on Birds	A systematic review of the effects of recreational activities on nesting birds of prey.	Martinez-Abraín, A., D. Oro, J. Jimenez, G. Stewart, and A. Pullin. 2010. A systematic review of the effects of recreational activities on nesting birds of prey. Basic and Applied Ecology 11(4):312-319.	Literature review dealing with human recreational effects on nesting-site occupancy and breeding performance of diurnal and nocturnal raptor species	terrestrial anthropogenic	various raptors	no	no	no	no	Authors summarize that there is insufficient information to quantitatively meta-analyze this topic. The only situation appropriate to analysis was the influence on nest location of a number of anthropic structures, specifically the distance of nests to the closest paved roads. Big raptors nesting in trees exhibited great displacement distances from nests to roads than big raptors nesting in cliffs.
Effects on Birds	Oh, not those jet-ski things again!	Milius, S. 1998. Oh, not those jet-ski things again! Science News 154(7):107.	Observations of PWC disrupting breeding colonies of birds along coastal waterways	PWC	terns	yes	no	no	yes	Author reports that PWC disturb nesting terns even more than motorboats, noting that birds react most dramatically early in the breeding season. Recommends that PWC not be allowed within 100 meters of nesting colonies.
Effects on Birds	The effects of human disturbance on common loon and red-necked grebe breeding success in southcentral Alaska.	Mills, Tamara K. 2004. The effects of human disturbance on common loon and red-necked grebe breeding success in southcentral Alaska. M.S. Thesis, University of Alaska Anchorage.	Decade long observation on Mat-Su lakes of watercraft/human development and loons/grebes	watercraft, habitat loss	common loon, red-necked grebe	yes	yes	yes	no	Temporal and spatial changes in loon and grebe populations studied by comparing lake use from 1987 to 1999, utilizing canoe and aerial surveys. Lake occupancy for all species declined and shifted spatially, while productivity remained stable for loons.
Effects on Birds	The effect of human disturbance and flock composition on the flight distances of waterfowl species.	Mori, Y., N.S. Sodhi, S. Kawanishi, and S. Yamagishi. 2001. The effect of human disturbance and flock composition on the flight distances of waterfowl species. Journal of Ethology 19(2):115-119.	Waterfowl response to human disturbance and the factors that influence their behavior	small boat	11 waterfowl species	no	yes	yes	no	Flight distance seemed to be affected by usage of water area: flight distances tended to be longer for waterfowl species that use a water area for foraging than for those that use it primarily for resting. The behavior of actively foraging species may be more affected by human disturbances than that of resting species.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Birds	Disturbance, habituation, and management of waterbird colonies – Commentary.	Nisbet, I.C.T. 2000. Disturbance, habituation, and management of waterbird colonies – Commentary. <i>Waterbirds</i> 23(2):312-332.	Critique of studies of effects of human disturbance on breeding colonial waterbirds, review of Carney (1999)	anthropogenic disturbances	terns, gulls, herons	no	yes	yes	yes	Author argues that many studies do not withstand critical scientific scrutiny, overstating the adverse effects of human disturbance. Also that there is little scientifically acceptable evidence that human disturbance causes substantial harm to terns, gulls, or herons. Recommends that controlled, deliberate disturbance, resulting in habituation, can be used as a management tool.
Effects on Birds	Using the risk-disturbance hypothesis to assess the relative effects of human disturbance and predation risk on foraging American oystercatchers.	Peters, K.A., and D.L. Otis. 2005. Using the risk-disturbance hypothesis to assess the relative effects of human disturbance and predation risk on foraging American oystercatchers. <i>Condor</i> 107(3):716-725.	Examination of how natural predation risk factors interact with human-disturbance stimuli	predation, boats	American oystercatcher	no	yes	no	yes	The risk-disturbance hypothesis asserts that animals perceive human disturbance similar to nonlethal predation stimuli. Observation of animals show relationship between vigilance behavior, predator density, and boat activity. Findings show some support for risk-disturbance hypothesis.
Effects on Birds	Wading bird response to recreational boat traffic: Does flushing translate into avoidance?	Peters, K.A., and D.L. Otis. 2006. Wading bird response to recreational boat traffic: Does flushing translate into avoidance? <i>Wildlife Society Bulletin</i> 34(5):1383-1391.	Examination the association between flushing and local site use among wading birds in tidal creeks	boats	herons, egrets	no	yes	yes	yes	Patterns of response varied among species, and there was no clear relationship between flushing and site use. Flush rates may not adequately reflect the species sensitivity to human disturbance and should only be used as a management guide in conjunction with other indices such as spatial distribution.
Effects on Birds	Recommendations for protecting raptors from human disturbance: A review.	Richardson, C.T., and C.K. Miller. 1997. Recommendations for protecting raptors from human disturbance: A review. <i>Wildlife Society Bulletin</i> 25(3):634-638.	Guidelines for assessing spatial and temporal buffer zones for a variety of raptors	anthropogenic disturbances	raptors	no	no	no	no	Human activities are known to impact raptors by: physically harming or killing eggs, young or adults; altering habitats; by disrupting normal behavior. To be effective buffer zones should be based on empirical evidence of wildlife responses to disturbances.
Effects on Birds	Buffer-zone distances to protect foraging and loafing waterbirds from disturbance by personal watercraft and outboard-powered boats.	Rodgers, J.A., and S.T. Schwikert. 2002. Buffer-zone distances to protect foraging and loafing waterbirds from disturbance by personal watercraft and outboard-powered boats. <i>Conservation Biology</i> 16(1): 216-224.	Observation of flush distances of 23 species of birds to direct approach of PWC and motorboats	motorized watercraft	Pelecaniformes, Ciconiiformes, Falconiformes, Charadriiformes	yes	yes	yes	no	Authors detected considerable variation in flush distances among individuals within the same species and among species in response to both types of vessels. Eleven species showed no significant difference in flush distance between the rapid (30-40km/h) direct approach of PWC and outboard-powered vessels. Seven species were approached only with PWC, not motorboats. Data suggests that a single buffer-zone distance can be developed for both PWC and outboard-powered vessels. Specific buffer zone distances given for individual species to minimize their disturbance at sites in Florida are given in report.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Birds	Buffer zone distances to protect foraging and loafing waterbirds from disturbance by airboats in Florida.	Rodgers, J.A., and S.T. Schwikert. 2003. Buffer zone distances to protect foraging and loafing waterbirds from disturbance by airboats in Florida. <i>Waterbirds</i> 26(4):437-443.	Observation of flush distances of 13 species of birds to different levels of airboat activity on lakes	airboat noise	Pelecaniformes, Ciconiiformes, Falconiformes	no	yes	yes	no	Authors detected considerable variation in flush distances among individuals within the same species and significant differences among species in response to an airboat. Larger species generally exhibited greater average flush distances. A comparison of flush distances with fast moving motorboat and an airboat indicated that all species exhibit a greater flush distances to the approach of an airboat. Recommended buffer zones given for each bird species.
Effects on Birds	Set-back distances to protect nesting bird colonies from human disturbance in Florida.	Rodgers, J.A., and H.T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. <i>Conservation Biology</i> 9(1):89-99.	Observations of 15 species of colonial waterbirds exposed to three types of anthropogenic disturbances to elicit set-back distances	pedestrians, canoes, motorboats	Pelecaniformes, Ciconiiformes, Pelecaniformes	no	yes	yes	yes	Authors define set-back distance as a minimum distance of nonintrusion by humans measured from the perimeter of a colony that will preclude disturbances to nesting birds. Their recommended set-back distances was estimated using an empirical formula as a function of observed flushing distances. This distance of 100 meters for wading bird colonies and 180 meters for mixed tern/skimmer colonies are believed to be adequate to effectively buffer the studied sites from human disturbances caused by approach of pedestrians and motor boats.
Effects on Birds	Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida.	Rodgers, J.A., and H.T. Smith. 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. <i>Wildlife Society Bulletin</i> 25(1):139-145.	Observations of 16 species of colonial waterbirds exposed to four types of anthropogenic disturbances to determine buffer zones	pedestrians, ATVs, canoes, motorboats	Pelecaniformes, Ciconiiformes, Pelecaniformes, Charadriiformes	no	yes	yes	yes	Based on an empirical formula based on the mean plus 1.6495 standard deviations of the observed flushing distances plus 40 meters (buffer distance = $\exp [\mu + 1.6495\sigma] + 40m$), a buffer of about 100 meters should minimize disturbance to most species of waterbirds studied in Florida.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Birds	Management options to reduce boat disturbance on foraging black guillemots (<i>Cepphus grylle</i>) in the Bay of Fundy.	Ronconi, R.A., and C.C. St Clair. 2002. Management options to reduce boat disturbance on foraging black guillemots (<i>Cepphus grylle</i>) in the Bay of Fundy. <i>Biological Conservation</i> 108(3):265-271.	Observations of flushing behavior in relationship between boat characteristics, guillemot behavior, and environmental conditions	motorboats	black guillemots	no	yes	no	yes	The distance guillemots foraged from shore and the size, speed, and approach distance of boats were important factors predicting flushing probability. Flushing probability was greatest with fast boats and closer approach distances. Boat size was also a significant factor predicting flushing events, but the direction of the effect was inconsistent. Small boats were more likely to flush birds than medium-sized boats, but small boats were not significantly different from large boats. Small boats generally traveled faster than medium and large boats, and had closer approach distances to guillemots than medium or large boats, likely because small boats often approached the shoreline more closely. In sum, small boats travelling fast and close to shore were more disruptive to the guillemots. Report recommends a set-back distance of 600 meters from shore with a speed limit of 25 km/hr to minimize guillemot flushing.
Effects on Birds	Effects of human activity on behavior of breeding American Oystercatchers, Cumberland Island National Seashore, Georgia, USA.	Sabine, J.B., III, J. Meyers, J.M., and C.T. Moore. 2008. Effects of human activity on behavior of breeding American Oystercatchers, Cumberland Island National Seashore, Georgia, USA. <i>Waterbirds</i> 31(1):70-82.	Frequency of occurrence of behaviors relative to different disturbances of American oystercatchers during one year breeding season	pedestrians, vehicles, motorboats	American oystercatchers	no	yes	no	yes	Data indicates that tide, temperature, intraspecific encounters, and human activity influenced oystercatcher behavior, such that reproductive success may have been affected negatively. Ground-nesting birds are more likely to leave their nests when disturbances come from pedestrians rather than vehicles. Managers should minimize pedestrian activity near nests during incubation. During brood rearing, protection from pedestrian activities should be increased, and vehicular activity should be minimized at current levels or less.
Effects on Birds	Effects of recreational activity on wintering bald eagles.	Stalmaster, M.V., and J.L. Kaiser. 1998. Effects of recreational activity on wintering bald eagles. <i>Wildlife Monographs</i> 137(1-46).	Assessment of how recreationists affected eagle numbers, distribution, activity, and feeding on chum salmon	pedestrians, non motorized boats, motorboats	bald eagles	no	yes	yes	no	Based on flushing responses and flushing distances, foot traffic was most disturbing to eagles, fishing boats were intermediate in effect, and eagle-viewing boats were least disturbing. However, boat traffic, especially motorboats, disturbed a greater portion of the eagle population than foot traffic. Recommendations to prohibit recreational activity during the first 5 hours of daylight within 400m of eagles in order to minimize disturbance of feeding behavior.
Effects on Birds	Responses of bald eagles to human activity during the summer in interior Alaska.	Steidl, R.J., and R.G. Anthony. 1996. Responses of bald eagles to human activity during the summer in interior Alaska. <i>Ecological Applications</i> 6(2):482-491.	Observations of flush response rate and flush distance to recreational boating along narrow river	non motorized boats	bald eagles	no	yes	yes	no	In contrast to flush response, flush distance was strongly associated with age and was greatest for adults, least for juveniles, and intermediate for subadults. Breeding adults were much less likely to flush than nonbreeding adults, and flushed at lesser distances. Author recommends that along narrow wilderness rivers, the impacts of human activity on Bald Eagle populations be regulated with temporal, rather than spatial, restrictions.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Birds	Experimental effects of human activity on breeding Bald Eagles.	Steidl, R.J., and R.G. Anthony. 2000. Experimental effects of human activity on breeding Bald Eagles. Ecological Applications 10(1):258-268.	Observations of breeding eagles in the presence of human campers at a distance of 100 and 500 m	terrestrial anthropogenic	bald eagles	no	no	no	no	With humans near nests, adult eagles decreased the time they preened, slept, maintained nests, and fed themselves and their nestlings, and increased the time they brooded nestlings. In contrast nest attendance did not change with humans near nests, however, the time adults were absent from the nest area increased with humans near nests. Throughout the 24 hour treatment, eagle responses to nearby humans diminished, suggesting habituation. Human activity near nests caused clear and consistent changes in behaviors of breeding eagles, suggesting tha frequent human activities near nests could adversely affect reproductive success.
Effects on Birds	National bald eagle management guidelines.	U.S. Fish and Wildlife Service. 2007. National bald eagle management guidelines. FWS. https://www.fws.gov/northeast/pafo/pdf/NationalBaldEagleManagementGuidelines.pdf	Federal recommendations for land management practices to benefit bald eagles		bald eagles	yes	yes	yes	yes	Guidelines are intended to: (1) Publicize the provisions of the Eagle Act that continue to protect bald eagles, (2) Advise landowners, land managers, and the general public of the potential for various human activities to disturb bald eagles, and (3) Encourage additional nonbinding land management practices that benefit bald eagles. For PWC: (1) do not operate PWC and (2) avoid concentrations of noisy vessels except where eagles have demonstrated tolerance for such activity. During breeding season, buffer is 330 feet from nest.
Effects on Birds	Disturbance to a foraging seabird by sea-based tourism: Implications for reserve management in marine protected areas.	Velando, A., and I. Munilla. 2011. Disturbance to a foraging seabird by sea-based tourism: Implications for reserve management in marine protected areas. Biological Conservation 144(3):1167-1174.	Evaluation of the best managing options to mitigate the impact of tourism on European shags in MPAs	tourboats	European shag	no	yes	no	yes	Boat disturbance elicited a characteristic avoidance behavior that resulted in a substantial reduction in foraging activity as levels of boat use increased. Management strategies to minimize disturbance to foraging seabirds may depend on the spatial overlap between sea-based recreational activites and foraging seabirds and the spatial variation in marine habitat quality for seabirds.
Effects on Birds	Responses of incubating hooded plovers (<i>Thinornis rubricollis</i>) to disturbance.	Weston, M.A., and M.A. Elgar. 2007. Responses of incubating hooded plovers (<i>Thinornis rubricollis</i>) to disturbance. Journal of Coastal Research 23(3):569-576.	Observations of breeding plovers and disturbances, placing recreational disturbance in context with natural disturbances	terrestrial anthropogenic predators, dogs	hooded plovers	no	no	no	yes	Human disturbance is more frequent than natural disturbances, and humans decrease nest attendance substantially and more than any other source of disturbances.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Effects on Birds	Bald eagle response to boating activity in northcentral Florida.	Wood, P.B. 1999. Bald eagle response to boating activity in northcentral Florida. Journal of Raptor Research 33(2):97-101.	Observations of effects of weekend and weekday boating activity on bald eagles on Florida lakes	motorboats	bald eagles	no	yes	yes	no	Boating activity reduced the number of eagles using the shoreline on only one of the three lakes studied, did not influence flush distance, and increased the distance perched from the shoreline by 3 meters. There was no evidence that recreational boating activity negatively affected eagle use of these lakes. The minimal flush distances and the lack of measurable effects on eagle behavior and activity patterns suggested that many of these birds may have become habituated to boating disturbance, although they still show some avoidance behavior.
Eco-logical or Environmental Impacts	Physical impacts of wind and boat traffic on Clear Lake, Iowa, USA.	Anthony, J.L., and J.A. Downing. 2003. Physical impacts of wind and boat traffic on Clear Lake, Iowa, USA. Conference: 21st International Symposium of the North-American-Lake-Management-Society, Madison, Wisconsin, Nov 7-9, 2001. Lake and Reservoir Management 19(1):1-14.	Evaluation of potential roles of both wind and recreational boat traffic in the resuspension of sediments in a shallow lake	wind, motorboats	fish, macrophytes	no	yes	yes	no	Intensive monitoring over a wind-event showed that the total phosphorus concentrations can increase by 100% over a daily period and ammonia concentrations increase to levels near to those toxic to fish at the peak of winds. Heavy boat traffic appears to exacerbate wind-induced resuspension and may slow the resettlement of resuspended sediments. Benthic resuspension may contribute to the suppression of fish and macrophyte communities.
Eco-logical or Environmental Impacts	The effects of motorized watercraft on aquatic ecosystems.	Asplund, T.R. 2000. The effects of motorized watercraft on aquatic ecosystems. PUBL-SS-948-00. Wisconsin Dept. of Natural Resources, Madison. PUBL-SS-948-00. PUBL-SS-948-00. http://dnr.wi.gov/topic/ShorelandZoning/documents/201301041052.pdf	All encompassing report covering water clarity, water quality, shoreline erosion, aquatic plants, fish, wildlife, and PWCs	anthropogenic	macrophytes, fish, aquatic wildlife	yes	yes	yes	no	Specifically discusses PWC studies on: 1)Noise - PWCs tended to have more variable sound levels at distances of 300 feet or more, 2)Disturbance to wildlife - The proximity of watercraft and either the fast movement or noise of those operating at high speeds were the most disturbing attributes, and tended to be those associated with PWCs, 3)Emissions - The actual amount of fuel discharged is a function of speed, tuning, size of engine and other other factors, 4)Physical impacts - Some resuspension of fine sediments was documented during tests with frequent stops, starts, and turns in a confined area. Greatest potential for sediment disturbance comes when boats travel at intermediate speeds, between no-wake and planing.
Eco-logical or Environmental Impacts	The ecological impacts and management of recreational boating.	Asplund, T. 2003. The ecological impacts and management of recreational boating. Conference: 21st International Symposium of the North-American-Lake-Management-Society, Madison, Wisconsin, Nov 7-9, 2001. Lake and Reservoir Management 19(1): III-IV.	Perspective of recreational boating from water resource manager	motorboats	terns	yes	yes	yes	yes	Recreational boating impacts the aquatic environment through a variety of mechanisms, including emissions and exhaust, propeller contact, turbulence from propulsions systems, waves produced by movement, and noise. Sediment resuspension, water pollution, disturbance of fish and wildlife, destruction of aquatic plants, and shoreline erosion have all been identified and documented as ecological concerns of recreational boating.
Eco-logical or Environmental Impacts	Biological impacts of boating at Kawau Island, north-eastern New Zealand.	ackhurst, M.K., and R.G. Cole. 2000. Biological impacts of boating at Kawau Island, north-eastern New Zealand. Journal of Environmental Management 60(3):239-251.	Sampling of the benthic fauna to detect disturbances from recreational boat anchoring	anchors	bivalve Atrina zelandica	no	yes	no	yes	Experimental anchoring of differing intensities damaged Atrina, which were then attacked by whelks and starfish. Anchoring scars persisted for up to 3 months, but had diminished in area and depth after 1 month. As intense anchoring is localised in a few bays over a short time, and macrobenthos can recover over the remainder of the year, benthic impacts are unlikely to require management at present.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Eco-logical or Environmental Impacts	The impact of tourism and personal leisure transport on coastal environments: A review.	Davenport, J., and J.L. Davenport. 2006. The impact of tourism and personal leisure transport on coastal environments: A review. <i>Estuarine Coastal and Shelf Science</i> 67 (1-2):280-292.	Effects of various aspects of mass tourism and related transport infrastructure on coastal ecosystem	mass tourism	variety of taxa	yes	yes	no	yes	Comprehensive literature review of recreational transport and tourism on coastal environment, considers PWC particularly worrying with it being highly polluting, very rapid, and extremely noisy. PWCs were never evaluated for environmental impact before widespread promotion in the marketplace, nor have they been subject to the same pollution regulations that control existing technology (e.g. motorcycles and cars).
Eco-logical or Environmental Impacts	Federal lands: agencies need to assess the impact of personal watercraft and snowmobile use.	Estes, B. 2001. Federal lands: agencies need to assess the impact of personal watercraft and snowmobile use. Pages 176-180 in: Harmon, D., ed. <i>Crossing Boundaries in Park Management: Proceedings of the 11th George-Wright-Society Biennial Conference on Research and Resource Management in Parks and on Public Lands</i> , Denver, CO, April 16-20, 2001	Review of PWC and snowmobiles on lands managed by four federal agencies (BLM, USFWS, NPS, and USFS)	PWC	ospreys	yes	no	yes	yes	Highlights differing regulations between management agencies. NPS and USFWS generally disallow recreational use of these vehicles unless it can be demonstrated that no harm would be likely to results to the unit's resources and environment. In contrast, the USFS and BLM generally allow their use unless the unit manager clearly demonstrates potential harm. Extent of use and prohibitions by agency and vehicle type is tabulated. Also noted: researchers at Great White Heron National Wildlife Refuge in the Florida Keys observed that disturbances by PWC contributed to poor reproductive success of nesting ospreys.
Eco-logical or Environmental Impacts	Relationships of human disturbance, bird communities, and plant communities along the land-water interface of a large reservoir.	Francl, K.E. and G.D. Schnell. 2002. Relationships of human disturbance, bird communities, and plant communities along the land-water interface of a large reservoir. <i>Environmental Monitoring and Assessment</i> 73(1):67-93.	Measurements of human activity, plant surveys, and bird surveys were performed at 40 paired transects (one with human disturbance, one without)	pedestrians, land vehicles, watercraft, RVs	91 species of birds, plants	no	yes	yes	no	Study suggests that bird-species composition is regulated more by human activity than by plant-community composition. Also, in studied area, bird communities are a better choice than plant communities to index the effect of human disturbance. To maintain regional diversity of both birds and plants, undisturbed areas should be maintained around reservoirs.
Eco-logical or Environmental Impacts	Human-caused disturbance stimuli as a form of predation risk.	Frid, A., and L. Dill. 2002. Human-caused disturbance stimuli as a form of predation risk. <i>Conservation Ecology</i> 6(1): Article #11.	Further development of risk-disturbance hypothesis, why disturbance stimuli should be analogous to predation risk.	pedestrians, land vehicles, watercraft, bicycles	birds, mammals	no	yes	yes	yes	Prey have evolved antipredator responses to generalized threatening stimuli, such as loud noises and rapidly approaching objects. Literature provides examples of stimuli ranging from the dramatic, low flying helicopter to the quiet wildlife phtographer, and animals responses are likely to follow the same economic principles used by prey encountering predators. Authors also use a predation risk framework to explore four less studied areas: mate acquisition, parental investment, population dynamics, and interactions at the community level.
Eco-logical or Environmental Impacts	Current status of marine leisure activities in Japan.	Gotoh, H., M. Takenwa, and Y. Maeno. 2008. Current status of marine leisure activities in Japan. <i>WIT Transactions on Ecology and the Environment</i> 115:23-33.	Surveys on the utilization of beaches for beach users in Japan			yes	no	no	yes	Recently, various types of marine sports have increased in popularity. It is important to develop a common system of etiquette and safety to facilitate the coexistence of swimmers and marine sports participants. Monitoring of marine sport safety by lifeguards and other rescue personnel is necessary to avoid conflicts with fisherman.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Eco-logical or Environmental Impacts	Two strokes and you're out.	Long, R. 1997. Two strokes and you're out. Earth Island Journal 12(2):11	Examination of EPA to regulate emissions from 2-stroke engines	exhaust	fish, marine invertebrates, plankton, algae	yes	no	yes	yes	An overview of Bluewater Networks legal challenge against the EPA in US Court of Appeals. This environmental group believes that EPA has issued faulty regulations, that allow US to become polluted by personal watercraft and motorboats. Bluewater network is embarking on an education program that will encourage boaters to use only four-stroke motors for their outboards and PWCs.
Eco-logical or Environmental Impacts	A review and synthesis of recreation ecology research findings on visitor impacts to wilderness and protected natural areas.	Marion, J.L., Y.F. Leung, H. Eagleston, and K. Burroughs. 2016. A review and synthesis of recreation ecology research findings on visitor impacts to wilderness and protected natural areas. Journal of Forestry 114(3):352-362.	Literature review with a focus on visitor impacts on vegetation, soil, wildlife, and water resources	anthropogenic	unspecified	no	yes	yes	yes	This article synthesized recreation ecology research intended for enhancing understanding of recreation impacts while advancing the practice of visitor impact management. The results suggest that advances in recreation ecology have gone further with vegetation and soil, than with water quality. Research on wildlife impacts have gained momentum in recent years.
Eco-logical or Environmental Impacts	Boat wakes as a cause of riverbank erosion: a case study from the Waikato River, New Zealand.	McConchie, J.A., and I.E.J. Toleman. 2003. Boat wakes as a cause of riverbank erosion: a case study from the Waikato River, New Zealand. Journal of Hydrology 42 (2):163-179	Measurements of the wave train and suspended-sediment concentration generated by three different types of power crafts	boat wakes		yes	yes	yes	no	The effectiveness of boat wake as an erosive agent depends on : the resistance of the bed and banks where the waves impact (controlled by sediment, vegetation, water level, and profile), the conditions under which the waves were generated (water depth; channel width; vessel size, displacement, and speed; the distance from vessel to shore; and the frequency of vessel traffic), and the characteristics of the resulting waves (wave energy and frequency of wave impacts). Vessel-generated waves, because of their greater amplitude, are more erosive than wind-generated waves in riverine environments.
Conflicts	Factors contributing to conflicts and user satisfaction at Lake Gaston: Examining conflict between personal watercraft users and anglers.	Beal, D.M. 2011. Factors contributing to conflicts and user satisfaction at Lake Gaston: Examining conflict between personal watercraft users and anglers. M.S. Thesis, East Carolina University.	Determining with surveys if conflict exists between two user groups	n/a	n/a	yes	no	yes	no	Anglers experienced higher degrees of conflict attributed to PWC users. Anglers assessments of conflict attributed to PWC users were lower for those anglers who had experience in PWC use. Managerial recommendations include developing 'no wake' zones near shore with markers and signage, lake safety education, lake patrols, and penalties.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Conflicts	Multiuse coastal commons: Personal watercraft, conflicts, and resolutions.	Burger, J. 2001. Multiuse coastal commons: Personal watercraft, conflicts, and resolutions. Pages 195-215 in: Burger, J., E. Ostrom, and R.B. Norgaard, eds. Conference: Symposium on Protecting the Commons - A Framework for Resource Management in the Americas Location: Piscataway, NJ, June 1998.	Delineating common issues in the coastal zone of NJ, describing conflicts of PWCs with other coastal resources, and places PWC use within a commons framework	PWC	migratory birds	yes	no	no	yes	While future equitable use of water surfaces by the various users in Barnegat Bay, NJ is not ensured, this case study clearly indicates that it is possible to achieve action when all relevant parties are included and protections of a particular common-pool resource (migratory birds) is essential. The present study provides an example in which the users are diverse, yet they still arrived at a common solution.
Conflicts	Conflict resolution in coastal waters: the case of personal watercraft.	Burger, J., and L. Leonard. 2000. Conflict resolution in coastal waters: the case of personal watercraft. Marine Policy 24(1):61-67	Using the case study on breeding terns and PWC disturbances, examination of how to resolve conflicts between different user groups	PWC	common terns	yes	no	no	yes	This example illustrates several principles that are relevant to establishing marine policy in other communities: 1) action was promulgated at the local level, 2) discussions included all the relevant users of the water surface, 3) discussions were open to everyone, regardless of their direct interest, 4) discussions were not dominated by either state biologists or state police, 5) no extreme measures were suggested that eliminated PWCs from Barnegat Bay generally, and 6) actions occurred only after everyone was involved in the process. Although the educational and enforcement campaign did not eliminate the problem, they reduced the disturbance to the birds in 1998 and 1999, allowing increased reproductive success, representing a successful co-management program.
Conflicts	Resources and estuarine health: Perceptions of elected officials and recreational fishers.	Burger, J., J. Sanchez, and M. McMahon, M. 1999. Resources and estuarine health: Perceptions of elected officials and recreational fishers. Journal of Toxicology and Environmental Health-Part A 58(4):245-260.	Understanding the perception of multiple user groups in addressing environmental problems in coastal systems	anthropogenic	aquatic organisms, birds	yes	yes	yes	yes	For effective management of coastal environments, and the development of wise public policy, it is essential to understand the relationship between the perceptions of the public and those of the officials charged with managing the coasts, as well as those of the managers themselves. Between fisherman and public, there were significant differences in their relative rating of the severity of environmental problems. PWC ranked as the most severe problem for both fisherman and public officials.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Conflicts	Incorporating recreational users into marine protected area planning: A study of recreational boating in British Columbia, Canada.	Gray, D.L., R.R. Canessa, and R. Rollins. 2010. Incorporating recreational users into marine protected area planning: A study of recreational boating in British Columbia, Canada. Environmental Management 46(2):167-180.	Surveys of recreational boaters in order to achieve social and biological objectives		n/a	yes	yes	no	yes	Results show variability in boater setting preferences. Several marine activities emerged as sources of perceived conflict for boaters, including personal watercraft, commercial whale watching vessels, and shellfish aquaculture. Analysis shows that while some of these issues may be addressed through zoning, others are better addressed through education and communication.
Conflicts	Spatial characterization of marine recreational boating: Exploring the use of an on-the-water questionnaire for a case study in the Pacific Northwest.	Gray, D.L., R.R. Canessa, C. Keller, and C. Peter. 2011. Spatial characterization of marine recreational boating: Exploring the use of an on-the-water questionnaire for a case study in the Pacific Northwest. Marine Policy 35(3):286-298	Study that uses an on-the-water-questionnaire to map recreational boating distribution/density in a complex, multi-use marine setting, applying to ArcGIS	anthropogenic	n/a	no	yes	no	yes	Marine spatial planning requires a variety of information on human use of the marine environment. This research has partially addressed a notable information gap gathering an extremely rich baseline dataset for recreational boating and developing a repeatable methodology for future studies. Data can be used by agencies for marine and coastal planning.
Conflicts	Jet Ski riders circle the wagons.	raker, D. 2002. Jet Ski riders circle the wagons. High Country News 34(20):5.	Article documenting National Park Service ban of PWC on Lake Powell	anthropogenic	n/a	yes	no	yes	no	National Park Service has issued a moratorium on personal watercraft use at Lake Powell and seven other Western national recreation areas on November 6, 2002. This ban will be until the NPS completes an environmental review of the machines' impacts.
Conflicts	Planning for conflict resolution: Jet-ski use on the Northumberland coast.	oe, M. and J.F. Benson. 2001. Planning for conflict resolution: Jet-ski use on the Northumberland coast. Coastal Management 29(1):19-39.	Study to develop a strategy for water-based recreation, development of management proposals for use of PWC		n/a	yes	no	no	yes	Aim of study was to reconcile the disparate nature of the recreation and conservation interests through production of strategic framework that would act as a mechanism under which conflicts could be identified and resolved. Looking to issue locally relevant proposals to deal with PWC in ecologically sensitive and aesthetically important coastal landscapes.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Conflicts	Are marine reserves and non-consumptive activities compatible? A global analysis of marine reserve regulations.	Thurstan, R.H., J.P. Hawkins, and L. Neves. 2012. Are marine reserves and non-consumptive activities compatible? A global analysis of marine reserve regulations. Marine Policy 36(5):1096-1104.	Examination of potential impacts of 16 non-consumptive activities and how they might compromise the conservation efforts of marine reserves.	anthropogenic	n/a	yes	yes	no	yes	The risk analysis suggests that motor boating and activities which include or require it have a high potential to negatively impact wildlife and habitats if inadequately managed. Some activities traditionally considered benign have the potential to damage marine reserves yet are commonly allowed with little or no regulation. If marine reserves are to provide the strong protection they are intended to provide, all activities need careful management considerations.
Conflicts	A comparison of recreation conflict factors for different water-based recreation activities.	Wang, C.P., and C.P. Dawson. 2000. A comparison of recreation conflict factors for different water-based recreation activities. Pages 121-130 in: Northeastern Recreation Research Symposium, Bolton Landing, N.Y., Apr 2-4, 2000. U.S. Forest Service, Northeastern Forest Experimental Station, General Technical Report 276.	Survey taken about recreational conflict problems sampling from landowners and those who registered watercraft in New York State		n/a	yes	yes	yes	no	Results showed that the eight groups are common in structure but not in the value of the conflict factors. Study results also showed a series of asymmetrical conflicts in which landowners were interfered with by both personal watercraft users and motorboaters, motorboaters were affected by personal watercraft users but not landowners, and personal watercraft users were not affected by either one.
Conflicts	Recreation conflict along New York's Great Lakes coast.	Wang, C.P., and C.P. Dawson. 2005. Recreation conflict along New York's Great Lakes coast. Coastal Management 33 (3):297-314.	Using goal interference theory to survey and examine recreation conflict among motorboat users, PWC users, and riparian landowners		n/a	yes	yes	yes	no	Goal interference theory can be seen as a general model that contains four dimensions for explaining recreation conflict, but not every dimension is significant in predicting various conflicts. Not all dimensions (activity style, resource specificity, mode of experience, and lifestyle tolerance) apply in every situation, but they should each be considered as conflict is assessed in coastal recreation planning and management.
Conflicts	Recreation conflict of participants in different mode of water-based activities and their adoption choice.	Wu, C., C.-P. Wang, and H.-H. Liu. 2009. Recreation conflict of participants in different mode of water-based activities and their adoption choice. Advances in Hospitality and Leisure 5:69-87.	Exploring water-based recreationists' perception on recreation conflict as well as their use of coping mechanisms			yes	yes	no	yes	Among all three groups (motorized, nonmotorized, and dual participants), less conflict was reported for nonmotorized participants than motorized participants. Moreover, the data also suggest that coping mechanisms are widely employed in outdoor recreation. The level of recreationists' skill, knowledge, and commitment may slightly influence their willingness to adopt coping mechanisms.

Topic	Title	Full citation	Long topic	Impact mechanism	Species	yes/no				Summary statement
						PWC specific	General boating	Fresh water	Salt water	
Conflicts	Kayaking playground or nature preserve? Whitewater boating conflicts in yellowstone national park	Yochim, M.J. 2005. Kayaking playground or nature preserve? Whitewater boating conflicts in Yellowstone National Park. Montana-The magazine of western history 55(1):52-64.	NPS balancing it's duties to conserve the park while determining what forms of recreation are appropriate	kayaks	nesting birds	no	no	no	no	A history of boating in the Yellowstone area, and current decision by the NPS to not allow whitewater kayaking. Discussion of park managers guiding principals of resources, science, values, tradition, human psychology, and society's laws and how that effects decisions on the role recreation plays in natinal parks. These guiding principles imply a vision of nature in which visitors are humbled by nature and its processes through observation and reflection.

From: bdenoble@alaska.net
To: [Department Clerk](#)
Subject: City Council Resolution re opposition to lifting jet ski ban
Date: Monday, January 13, 2020 11:15:03 AM

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Dear Madam/Mssr. Clerk:

Although I live in Eagle River and have no vote, I do visit Homer regularly and want to voice support of this resolution against the lifting of the jet ski ban. I fear jet skis will harm and disrupt the wildlife in the critical habitat area and increase boating safety issues. Please approve the resolution!!

Brad De Noble
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P.O. Box 2994

Homer AK 99603

January 12, 2020

Re: **RESOLUTION 20-007** A RESOLUTION OF THE CITY COUNCIL OF HOMER, ALASKA OPPOSING THE STATE'S REPEAL OF ALASKA ADMIN CODE 5 AAC 95.310 WHICH WOULD REMOVE THE PROHIBITION ON PERSONAL WATERCRAFT USE IN THE FOX RIVER FLATS AND KACHEMAK BAY CRITICAL HABITAT AREAS AND AFFIRMING THE DELETERIOUS CONSEQUENCES FOR COMMUNITY AND ECONOMY IF PERSONAL WATERCRAFT ARE ALLOWED IN KACHEMAK BAY.

Dear Council Members:

I strongly support retention of the existing Personal Watercraft ban in Kachemak Bay, and I urge the Homer City Council to pass Resolution 20-007. The City of Homer has strong reasons to support this resolution supporting the retention of the PWC ban in Kachemak Bay.

There are economic, quality of life, habitat and wildlife protection, natural quiet, and many other reasons to pass this resolution. The notion that jet skis are like other boats and used like other boats does not fit the way these boats are marketed and used all over the world. Check into this website that helps a potential PWC buyer figure out which thrill craft to purchase: <https://www.boattrader.com/resources/jetskis-guide/> This gives one a bit of insight on what Kachemak Bay will be in for if the we become a mecca for jet skis. The jet ski scene at Big Lake in the summer is just a taste of what we may see down here.

Since 2001, Kachemak Bay and Fox River Flats Critical Habitat areas (CHA) have had a ban on the use of Personal Watercraft (PWC) AKA jet ski. Kachemak Bay has a world-renowned reputation for its quiet beauty and rich marine resources. Kachemak Bay is part of a tiny 1% of coastal Alaska that is currently PWC free due in part to strong community support to keep it that way. I have talked to many visitors over the years about their experiences in our area. I always ask folks what they think about the fact that the Bay is "jet ski free." All responded that it is wonderful and that it is part of the reason they come here. I have even heard the comment, "I come here so I can remember what my local beach used to be like before jet skis took it over."

Homer has truly built an economy based on the splendor of the Bay's scenery and its rich marine life. That we do not have any of these thrill craft racing around in the Bay makes a tremendous difference to the quality of the experience that we as residents and visitors alike share. No matter how much better the 4-stroke engine is, the fact still remains these craft are marketed as thrill machines that can go 65 plus miles per hour. Many who ride them love going full throttle in circles jumping wakes, and it is that type of use the majority of us see as incompatible with the designation of the Bay as a CHA and highly disruptive to our quality of life here.

During the original efforts to enact the ban in 2001, many concerns about noise were raised by coastal property owners because of the way PWC are operated, often in circles near shore. High speed PWC jumping wakes can make a lot of annoying noise that unlike noise from boats

transporting passengers, may stay in one area for a long period of time. This type of noise is extremely annoying to people as well as very disturbing to wildlife. Many of us live here because our local soundscape is relatively intact and not overrun by noisy human behaviors.

So many of us live here for the quiet that we currently have, and it is so essential to our quality of life here and how we experience Kachemak Bay, the potential loss of quiet along our beaches in the Homer area would be devastating to our community. I know that in many other places where personal watercraft have free reign, there are contentious problems between those on the beaching wanting to enjoy their quiet recreation and the PWC riders circling, wave jumping, and operating at high rates of speed. Conflict also arises when these craft access popular beaches where people are recreating. Kachemak Bay's nearshore soundscape is remarkably quiet. Most boats are way out on the Bay so their low-pitched motors transiting to a distant location does not bother beach users. PWC have the potential to destroy the nearshore quiet enjoyed by beach users and coastal residents. Kachemak Bay has a wide reputation as "a Bay of quiet beauty." We do not want to lose this valuable natural resource.

PWC have very shallow drafts, so they are able to go into much shallower areas than outboard skiffs, and these shallow areas tend to be highly sensitive habitat for many marine birds and mammals. High speed craft in shallow areas can produce wakes that destroy habitat. This is well documented in the scientific literature ADF&G staff scientists examined in support of the ban on PWC. Because of their high speeds, and the nature of how people use them, there is a higher potential for injury to marine mammals like seals, otters, dolphins, and whales here in the Bay, as well as harassment of marine mammals. Even when crossing the Bay in a small skiff in choppy offshore seas traveling at much lower speeds, it is difficult sometimes to see marine mammals and avoid them. At 65 mph more injuries, most likely deadly, will happen to marine life.

To state that there are no problems with personal watercraft given the problems so many areas in the Lower 48 struggle with is to turn a blind eye to the reality of how these high-speed, highly maneuverable, shallow-drafted watercraft are frequently used. It also disregards the difference between that usage and that of a boat transporting people to view wildlife, to fish, or just drop people off on a beach. We have businesses, such as water taxis and lodges, around the Bay that depend on the rich marine resources, the scenery, the wildlife viewing and photography opportunities, and the quiet recreation of hiking and kayaking to make a living. Many vital feeding, nesting, and resting areas for seabirds, waterfowl, sea otters, seals, and much more are at risk of disturbance if PWC have free access in the CHA.

It is because of the rich bird life and marine resources that Kachemak Bay has so many special designations recognizing its importance and the need to protect this area. In 1995, the World Bank identified Kachemak Bay as a significant, important marine area worthy of inclusion in their proposed system of Marine Protected Areas. In 1999, Kachemak Bay National Estuarine Research Reserve (KBNERR) was established, one of 28 in the nation. This happened because of the widespread support of the community in learning more about our Bay. In 2016, Kachemak Bay became part of the Western Hemisphere Shorebird Reserve Network, unanimously approved by the governing council. This expansion of 231,000 acres, adding the Bay to the original WHSRN designation of 1995, comes with a designation of "International Importance." While these designations do not come with any regulatory authority, it certainly demonstrates

the significance of this ecosystem and why it is vital to protect it to the fullest extent possible. The PWC ban certainly is an important part of this protection.

Proponents of removing the ban are trying to cast this as simply an access issue. The PWC ban does not restrict people from accessing the Bay. It does restrict the type of craft used for access in order to protect critical habitat which benefits all Alaskans' enjoyment and use of Kachemak Bay. Just as many areas have closed areas for non-motorized uses or for certain types of vehicles, a ban on certain craft that have the potential to create as many problems as PWC do is not at all an unreasonable restriction. In fact, it is incredibly reasonable, especially as 99% of Alaska's waters are open to PWC.

A ban on PWC does not deny anyone access as there are many other ways to go out on the water. It also protects the safety of other users like sea kayakers, mariculture farmers, and commercial fishermen. The May 9, 2017 Memorandum from the ADF&G Division of Wildlife Conservation to the Director of the Division of Habitat concluded, "In summary, based on our review of information available since the PWC prohibition was adopted in 2001, we feel there is no new information that would warrant rescinding the prohibition, and in fact the newer information highlights most of the concerns identified when the prohibition was adopted."

I would further add that another major reason the ban was originally enacted was that enforcement of closed areas or travel corridors would not only be difficult to enforce, it would be very expensive. Given today's budgetary crisis, it is disingenuous on the part of the Governor to attach no fiscal note to removing the ban. If the ban were overturned, very likely there would be no money to enforce violations caused by PWC operators. In fact, given the narrowness of the Homer harbor entrance and the turbulent waters off the end of the Spit and the high speeds at which many PWC travel, I would be very concerned for the safety of all marine operators rounding the Spit and other narrow channels like the entrance to Halibut Cove Lagoon, if the PWC ban were lifted. Completely lifting the ban without consideration for the need to have areas closed to protect wildlife, speed restrictions for safety, and a restricted zone nearshore would be irresponsible.

Furthermore, the process being used to overturn the ban is very poor public policy. This issue should be discussed within the Critical Habitat Management Plan process that involves all the stakeholders and area residents. With nearly all of Alaska's huge coastline open to personal watercraft, critical habitat areas that are specially set aside for habitat and wildlife should remain protected from the use of this type of watercraft which are notorious throughout the Lower 48 and in other countries for the inappropriate and damaging ways they are used.

The short 30-day comment period during the holidays was not conducive to public participation. The less-than-generous additional 15-day extension is disingenuous. Many folks will have barely even returned from the holidays Outside or recovered from the exhausting holiday season before the comment period ends. There is no emergency on this issue! While the CHA management plan process is the appropriate venue for exploring regulatory changes in the CHA, at the very least a 90-day comment period would allow a fuller and more reasonable opportunity for regional stakeholder participation.

It has been 18 years since this ban was enacted. As a result, the Bay has grown in its reputation as a great place to visit, in part because of the integrity of its Wilderness values and because it

does not allow PWC. Providing this experience to visitors is central to our economy. Two special interest groups have been working for years with the PWC industry to overturn this ban despite the fact that they have nearly 99% of all coastal waters to take their PWC. In fairness, there should be some coastal areas that do not allow PWC. The critical habitat areas and our quality of life are at stake, as is the quality of the experience for everyone who visits here. Don't let the Bay become like all the other areas in the Lower 48 that are overrun with these thrill craft. I support retaining this ban on PWC in Kachemak Bay and Fox River Flats Critical Habitat areas, and I trust and hope the Council will pass **RESOLUTION 20-007** supporting the retention of the PWC ban.

Sincerely,

Nina Faust

From: [Rich Amy Fetterhoff](#)
To: [Department Clerk](#)
Subject: Speak for yourself, not me
Date: Sunday, January 12, 2020 2:31:33 PM

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Dear Homer City Council members:

I have read Resolution 20-007 and I am disgusted at the audacity of the language used in it. This resolution does not speak for me, a resident of Homer since 1991. Please remember what City Council's job is--to make sensible governing decisions for the good of the whole community, not throw around personal-opinion-laden resolutions that do not corporately represent our whole community (remember the attempt to make Homer a sanctuary city?). Learn from the past, Council! If you personally have opinion on the matter of personal watercraft use in Kachemak Bay, I suggest you submit your own comments via the public comment portal by January 21. For your convenience, here is the information for you...

You may submit written questions relevant to the proposed action to Rick Green at rick.green@alaska.gov or 333 Raspberry Rd., Anchorage, AK 99518-1565. The questions must be received at least 10 days before the end of the public comment period. The Alaska Department of Fish and Game may aggregate its response to substantially similar questions and make the questions and responses available on the Alaska Online Public Notice System.

--

*Rich & Amy
Pioneer Inn - PO Box 1430
244 W. Pioneer Ave.
Homer, Alaska 99603
(907) 235-5670*

*Your privacy is taken seriously, and we do not share any of it with anyone-
- ever.*

From: [Dotti Harness-Foster](#)
To: [Department Clerk](#)
Subject: Support Res. 20-007 to City Council
Date: Monday, January 13, 2020 8:48:50 AM

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Hi Melissa, Renee and Rachel,
Please forward my comments to the City Council:

I urge you to support Res. 20-007 which opposes the State's effort to repeal the prohibition of personal watercraft in Kachemak Bay.

Kachemak Bay was designated as a Critical Habitat Area in the 1990's to preserve our natural resource. Numerous businesses rely on the serene environment which attracts thousands of visitors each year. Please help to protect Kachemak Bay by supporting Res. 20-007.

Dotti Harness-Foster, M.Ed., GCFP
Feldenkrais Practitioner
459 Klondike Ave. #1, Homer, AK 99603
907-299-6789
www.insightfulbodymoves.com

From: [mako haggerty](#)
To: [Department Clerk](#)
Subject: Jet skis
Date: Sunday, January 12, 2020 2:18:42 PM

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I oppose the lifting of the ban on Personal Water Craft (PWC)
They violate everything we have worked to protect here on Kachemak Bay
Imagine a pair of jet skis spinning donuts in Chinapoot Bay
'nuf said
Mako Haggerty

From: [Seaside Adventure](#)
To: [Department Clerk](#)
Subject: Jet Ski info to distribute to council members
Date: Thursday, January 09, 2020 5:24:48 PM

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Please distribute this information to the City Council and the Mayor. Thank you so much! We respectfully ask the Homer City Council to speak out against the repeal of the Jet Ski ban in Kachemak Bay and Fox River Flats. As you know, Kachemak Bay is the only marine habitat in Alaska that is closed to PWCs, and therefore the only sanctuary protected from intrusive thrill craft. All other Alaskan marine waters are open to PWCs (jet ski type speed machines that are designed to go 60 to 70 miles an hour and cannot be compared to boats). Our wildlife deserves the protection it has been granted by numerous government entities, and the thousands of people using the bay for fishing, kayaking, beach combing and hiking deserve this one place to find the quiet nature experience we all seek here. Here is a link that represents the Jet Ski philosophy, and gives an idea of what we, and all of Kachemak Bay had suffered before the ban. <https://www.boattrader.com/resources/jetskis-guide/>

- **The ADF&G focus and mission** has always been - Quote: “To protect, maintain, and improve the fish, game, and aquatic plant resources of the state, and manage their use and development in the best interest of the economy and the well-being of the people of the state, consistent with the sustained yield principle”.
- Every aspect of this mission statement stands against the planned repeal of the Jet Ski/PWC use in the Critical Habitat of Kachemak Bay. It is especially disturbing to learn about your position that you place little weight on the importance of public input, while holding the responsibility for that process.
- Also going against the repeal are the ADF&G Guiding Principles:
 - Improve public accessibility to, and encourage active involvement by the public in, the department’s decision-making processes.
 - Build a working environment based on mutual trust and respect between the department and the public, and among department staff.
 - Maintain the highest standards of scientific integrity and provide the most accurate and current information possible
- And Goal: Increase public knowledge and confidence that wild populations of fish and wildlife are responsibly managed.

Since Rick Green and Commissioner Lang have both stated on numerous occasions that they already support the repeal of the ban, and place “little weight on the importance of public input”, which shows a worrisome attitude, so we cc our comments also to ben.stevens@alaska.gov, Representative.Louise.Stutes@akleg.gov, Representative.Sarah.Vance@akleg.gov, Senator.Gary.Stevens@akleg.gov

Thank you so much!

Rick and Dorla

A Seaside Adventure, LLC

Rick and Dorla Harness
907-235-6672
seasideadventure@earthlink.net
www.seasideadventure.com
PO Box 3066 Homer AK 99603

From: [Seaside Adventure](#)
To: [Department Clerk](#)
Subject: Please pass these Jet Ski comments on to council members and the mayor
Date: Monday, January 13, 2020 8:19:12 AM

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Jet Ski (PWC) ban in Kachemak Bay viewed from a business perspective

My wife and I have been operating a small eco-tour business in Little Tutka Bay for over 30 years, and I also used to guide fishing charters. I am a life-long Alaskan in my 60s, and have been exploring Kachemak Bay since the 1950s. Before the ban was put in place in 2001, I had a number of disturbing and even outright threatening encounters with jet skis (PWCs)

- For example: When fishing in Tutka Bay, a teenager on a jet ski came and run doughnuts around us for the longest time, and my fisherman guests said to his wife “how far have we come, and how much money have we spent to get away from those things?”
- In another incident my kayak guests marveled at watching hauled out seals, a grooming sea-otter and a perching eagle all at the same time, when jet skis came out of nowhere at high speed, doing their thrill craft maneuvers, which immediately scared away the animals, ruining the moment for the visitors as well disrupting the wildlife.
- Another time two jet skis came screaming around the point of the channel that separates our cove from the back lagoon at high speed, coming straight at me and my guests in our kayaks. The jet skis were barely able to veer off onto the beach and miss us. I could go on and on, but you get the picture.

I never experienced anything like that with any other types of boats in all my life (you will not find a 16' boat capable of running 60 to 70 mph near the shore with a supercharged 300 hp engine like a bullet)

The only argument of the Jet Ski lobby is the right to access. Yes - everyone should have access to all public lands and waters. Currently every person does have numerous means of access to Kachemak Bay, but it is impossible to allow every mode of access for every place. There are restrictions on where you can use drones, guns, Atv's, cars, etc. and there are good reasons for those restrictions. Kachemak Bay is the only marine water body closed to Jet Ski type thrill craft in all of Alaska, and there is a long list of scientifically proven reasons for that, which have been thoroughly researched for years, and documented by all scientists involved. The scientists have revisited the issue several times, and each time they unanimously concluded that the ban should stay in place, because none of the scientific reasons have changed.

The jet ski ban is existential for Homer and its businesses who promote their brand as a destination with a focus on the ecology of the bay. The pristine, quiet natural allure of Kachemak Bay is Homer's greatest and primary asset.

Take a look at the Homer Visitor Guide! Every single page promotes Homer's wealth of the bay's wildlife, peacefulness and tranquility it offers to the many

current user groups.

Wide-reaching marketing research has established time and again that the main trends in tourism focus on destinations that promote and take pride in preserving untouched, pristine natural sites. Travelers have a hunger for wild places that have become so hard to find anymore. Kachemak Bay has been recognized by state, national and international agencies and organizations as a rare area of unusual biodiversity and pristine natural habitat, as proven by the designation as a Critical Habitat Area, National Estuarine Research Reserve, internationally designated critical migration site of the Western Hemisphere Shorebird Reserve Network, and State Park and Wilderness Area. There are not many places like this left on our planet, whereas countless destinations worldwide cater to those who crave motorized thrill experiences.

Some say we are loving our bay to death, and over time more and more people have been using the bay as a selling point for their businesses, and as a destination to get away from the noise and hustle of modern life. **However - even with the expanded number of users, so far all are able to co-exist, because they all tag into the quiet sports of fishing, kayaking, kite surfing, beach combing, hiking etc.** The service businesses of Homer are also tied into these uses, and cater to visitors who come to experience the special quiet magic of Kachemak Bay and its abundant wildlife, and the service industry also caters to the residents who operate those businesses, and those who live here because of Kachemak Bay's natural beauty.

Fisherman, Artists, B&Bs, hotels, restaurants, marine services, transportation businesses, boat tour operators, kayak tour guides, retailers, and others all make a living because of the bay, whether directly or indirectly. To keep intact the magnetic attraction that allures residents and visitors alike to Homer, we must be good stewards of the precious place millions of people envy us for. Just think for a minute about how many people on our entire planet can say that they live in such a vital, rich, intact, natural habitat, that is easy for us to take for granted? Kachemak Bay is not just a body of water to run around on, but a living nature preserve providing us with opportunities to watch wildlife and harvest wild food. Ocean warming and acidification already poses threats, we can't afford to add more.

We have talked to many business owners, none of which wanted the ban lifted. They know that they can only get hurt in the long term by allowing these destructive, obnoxious thrillcraft that go 60 to 70 miles an hour on the bay, and no kayak, boat or marine mammal can avoid jet skis. <https://www.foxnews.com/us/danger-on-the-high-skis-fatalities-bring-renewed-calls-for-personal-watercraft-safety> These machines are designed to operate in close proximity to the shore at extreme speed, much faster than any small boat that would maneuver those waters. Whales, sea otters, seals, seabirds have not evolved to get out of the way of a speed craft like a Jet Ski, fragile inter-tidal zones with their vulnerable creatures and plants would be threatened, fish runs that travel close to the beaches would be disrupted. Jet ski type PWCs are at best a nuisance, but most likely a threat to birds, marine mammals, kelp beds, fish runs, set net sites and humans. Another complication is that there is no funding nor any plan to manage, let alone regulate jet skis if the ban would be repealed.

I'll close with a quote from PWC advertisers www.boattrader.com: *"If you're looking to buy a personal watercraft (PWC) – chances are you're a bit of an adrenaline junky with a need for speed, drawn to the thrill of zooming over the water at high velocity. That, or your children have convinced you to purchase one because they've decided they can't live without it!"*

You can find additional information here: <https://inletkeeper.org/2019/12/09/make-time-to-protect-the-natural-values-of-kachemak-bay-comments-due-jan-6/>

From an economic (as well as scientific and ethical) perspective, Kachemak Bay must remain protected from PWC thrill craft use! Jet ski users have 99% of Alaskan waters available to them. We must continue to preserve this one and only remaining sanctuary in Alaska that has been set aside, where people and animals can find quiet and peaceful refuge!

Respectfully,
Rick and Dorla Harness

A Seaside Adventure, LLC
Rick and Dorla Harness
907-235-6672
seasideadventure@earthlink.net
www.seasideadventure.com
PO Box 3066 Homer AK 99603

From: [Trish Herrmann](#)
To: [Department Clerk](#)
Subject: resolution 20-007 support
Date: Sunday, January 12, 2020 9:27:21 PM

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Hello,

Please send this message to all council members, mayor and include in the packet:

I am writing a letter in support of the resolution 20-007 supporting the jet-ski ban retention that will be brought up at city council tomorrow.

I am a naturalist here in Homer and strongly believe that the prohibition of personal watercraft use here in this Kachemak bay critical habitat area and Fox River Flats is vital for the long term sustenance of our home and land/waters.

In this time when so many choices are being made with no regard for the protection and advocacy of our land and waters, I believe it is our job to do so.

Thank you so much for listening and advocating for our community, lands, waters, and future generations.

Sincerely,

Trish Herrmann

From: [Florence Larson](#)
To: [Department Clerk](#)
Subject: Jet skies
Date: Sunday, January 12, 2020 8:51:09 PM

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To: Mayor Ken Castner and all members of Homer City Council:

Please retain the ban of Jetskis from Kachemak Bay! It has been in effect for 18 years and established due to the critical habitat of the bay. That fact has not changed. In fact, the ban may be more needed now than before due to decrease of species.

I'm sure the noise, speed of and reckless nature of some drivers has been discussed thoroughly. That said economically this bay and what it offers has become a huge benefit to Homer. In the future, this will grow. People love Homer and treat it as a destination. Why would we change what already works? There are numerous waters where Jetskis can exercise that sport.

Let's keep Kachemak Bay magnificent!! The natural water and beauty will remain for generations if we exercise restraint.

Thank you for your consideration and service.

Warmly,
Flo Larson

From: [Joanie Martinez](#)
To: [Department Clerk](#)
Subject: Don't lift the ban on jet skis in Kachemak Bay!
Date: Monday, January 13, 2020 8:41:36 AM

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As a concerned citizen of Alaska and Homer, I'm writing to voice my disapproval of lifting the jet ski ban in Kachemak Bay!

This area will suffer much increased noise, water, land and air pollution if jet skis are allowed in Kachemak Bay! The impact on the sensitive Fox River drainage area could be devastating! This area is notable for its wildlife and fish populations along with its serene beauty and peace, and all of this would be negatively impacted if jet skis are allowed to go racing about throughout the bay. I know that if I were a tourist I would be severely turned off to see this happen to this uniquely beautiful area!

PLEASE DO NOT LIFT THE BAN ON JET SKIS IN KACHEMAK BAY!!!!!!

Sincerely,

Joanie Martinez
58745 Meadow Rim Rd
Homer, Alaska 99603

PLEASE INCLUDE THIS LETTER IN THE COUNCIL PACKET

From: [Crisi Matthews](#)
To: [Melissa Jacobsen](#)
Subject: Fwd: Personal Watercraft on Kachemak Bay
Date: Sunday, January 12, 2020 10:16:23 AM

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For Council Consideration. Thank you.

From: Crisi Matthews <shop@homershores.com>

Date: January 12, 2020 at 10:13:52 AM AKST
To: rick.green@alaska.gov
Subject: **Personal Watercraft on Kachemak Bay**

I'm writing this letter in support of all personal watercraft on Kachemak bay. We own an acre of property on the spit fronting Kachemak Bay and I believe personal use watercraft currently in use such as Paddleboards and kayaks should be expanded to include motorized watercraft. There is a great market for it in terms of summer activity in business enterprise but in addition I believe it would help in some circumstances to better the quality of life. We have seen Great deal of erosion in front of our property which has created an artificial Sandbar. Last summer alone we had two swimmers (now that the temperatures are warm enough to enter the bay for swimming) come close to drowning because they dropped off the sandbar and didn't realize there was an undertow that started to take them out to sea. Multiple people re-entered the water to help them causing more danger in my mind if they were not strong swimmers. That being said if there was a motorized watercraft nearby it could have been used in such a condition to assist. While I realize it could also increase the potential for accidents on the water, I can see that the advantage of having them could outweigh that risk. As a waterfront resident and user of motorized large vessels non-motorized kayaks and paddle boards I feel there is enough space on the water to be shared.

Respectfully delivered on the go!
Crisi Matthews

From: [Jenny](#)
To: [Department Clerk](#)
Subject: Resolution 20-007
Date: Monday, January 13, 2020 8:19:09 AM

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Madam Clerk, please forward to City Council or include on the meeting packet, whichever works with the short notice!

Dear Homer City Council Members,

I do not live within city limits, but I am an owner of a business within the city. I support this resolution as I think a change in Personal Watercraft regulations should be weighed and studied carefully if it is going to happen, not be hurried through to appease a special interest group who has influence with the governor. The environmental health of Kachemak Bay and its flora and fauna is the keystone of the economic life for our community. Please pass this resolution showing concern for our environment.

Thank you for your time,

Jennifer Stroyeck
65240 Diamond Ridge Rd.
Homer, AK 99603

From: [Jeanne](#)
To: [Department Clerk](#)
Subject: for Council distribution
Date: Sunday, January 12, 2020 5:40:59 PM

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I support Resolution 20-007 and appreciate the strong language. Thank you for being part of the community forum for this discussion. I would suggest considering a couple changes. Lines 48-51 are repeated at lines 53-56. The use of the word "slyly" in line 20 made me chuckle but it presumes intent and while I believe it is entirely possible and probable, it may not be the best choice unless adding something like "it would appear to be". And it does appear to be. Many years ago my husband and I built a home on a lake near Seward. In the four years prior to occupying the house, the area was quiet: quiet residents, quiet sports. Someone started using PWC and would do circles on the lake just off our dock. Summer quiet was gone. When we later moved for a job opportunity, the jet skis were the major factor determining whether to sell the house or keep it. We sold.

As a resident species, I object to PWC in Kachemak Bay.

Jeanne Walker
Kachemak City

44 WHEREAS, Supra-tidal beach berms at Seafarer’s Memorial have been identified as
45 critical environment for migratory and resident shorebirds, and provides wildlife habitat (e.g.,
46 for marine mammals) near the geographical center of Kachemak Bay, which is unique
47 regionally; and
48

49 WHEREAS, Through data collection and ongoing bird counts, this region of the Spit has
50 been identified by Cornell University’s Ornithology Lab as an International Birding Hot Spot
51 location; and
52

53 WHEREAS, Wild bird migration, feeding, and nesting in and around Homer are
54 important economic bases for the City; their presence attracts visitors nationally and
55 internationally; their financial impact is broad and realized via nature or eco-tourism in general
56 as well as special events (such as the annual Shorebird Festival); and
57

58 WHEREAS, The Greater beach of Seafarer’s Memorial is a crucial foundation
59 geologically that provides *coastal sand supply*; its ample sand, pebble and gravel components
60 directly preserve the Homer Spit “system” as a whole and, through natural marine processes,
61 mitigate erosion along easternmost beaches of the Spit including the terminus.
62

63 NOW, THEREFORE, BE IT RESOLVED that the Homer City Council hereby designates
64 Homer Spit Amended Lot 31 as green space, but requires no specific signage.
65

66 BE IT FURTHER RESOLVED, that any part of the property that is not developed as of the
67 passage of this resolution shall be maintained in perpetuity as green space and open to the
68 public, free from buildings, parking, camping, hardscaping of any kind, earthmoving of any
69 kind beyond regular parking space maintenance strictly limited spatially to present 45 parking
70 spaces.
71

72 BE IT FURTHER RESOLVED that any new trail development is limited to the public beach
73 access dedicated in through the Land and Water Conservation Fund Grant # 02-00430 and
74 defined as the northwestern twenty feet of Lot 31, Homer Spit Amended; being a strip of land
75 twenty feet wide, immediately adjacent and parallel to the northwest property line, and also
76 being immediately adjacent to Lot 27; containing 3,595 square feet, more or less.
77

78 PASSED AND ADOPTED by the Homer City Council this 13th day of January, 2020.
79

80 CITY OF HOMER

81
82
83 _____
KEN CASTNER, MAYOR

84 ATTEST:
85

86 _____
87 MELISSA JACOBSEN, MMC, CITY CLERK
88
89
90 Fiscal information: N/A