



# INVESTIGATOR'S ANNUAL REPORT

United States Department of the Interior

National Park Service

All or some of the information you provide may become available to the public.

OMB # (1024-0236)  
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Form No. (10-226)

<b>Reporting Year:</b> 2007	<b>Park:</b> Glacier Bay NP & PRES	<b>Select the type of permit this report addresses:</b> Scientific Study	
<b>Principal Investigator:</b> John Hudson		<b>Office Phone:</b> 9077902227	
<b>Mailing Address:</b> 16445 Point Lena Loop Road Juneau, AK 99801 Juneau, AK 99801 USA		<b>Office Fax:</b>	
		<b>Office Email:</b> jhudson@gci.net	
<b>Additional investigator or key field assistants(first name, last name, office phone, office email)</b>			
<b>Name:</b> Sonia Nagorski	<b>Phone:</b> 907 796 6580	<b>Email:</b> sonia.nagorski@uas.alaska.edu	
<b>Name:</b> Eran Hood	<b>Phone:</b>	<b>Email:</b>	
<b>Name:</b> John DeWild	<b>Phone:</b>	<b>Email:</b>	
<b>Name:</b> Daniel Engstrom	<b>Phone:</b> 651-433-5953 ext. 11	<b>Email:</b> dre@umn.edu	
<b>Name:</b> Nick Schlosstein	<b>Phone:</b> 907 9531117	<b>Email:</b> nickschlosstein@gmail.com	

<b>Study Title (maximum 300 characters):</b> Scale and distribution of global pollutants (mercury and POPs)in Southeast Alaska Network park watersheds			
<b>Park-assigned Study or Activity #:</b> GLBA-00111	<b>Park-assigned Permit #:</b> GLBA-2007-SCI-0012	<b>Permit Start Date:</b> Jun 15, 2007	<b>Permit Expiration Date:</b> Mar 31, 2008
<b>Scientific Study Starting Date:</b> Jun 15, 2007		<b>Estimated Scientific Study Ending Date:</b> Mar 31, 2008	
<b>For either a Scientific Study or a Science Education Activity, the status is:</b> Continuing		<b>For a Scientific Study that is completed, please check each of the following that applies:</b>	
		<input type="checkbox"/> A final report has been provided to the park or will be provided to the park within the next two years	
		<input type="checkbox"/> Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park	
		<input type="checkbox"/> All collected and retained specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
<b>Activity Type:</b> Research			
<b>Subject/Discipline:</b> Contaminants / Hazardous Materials			

<b>Purpose of Scientific Study or Science Education Activity during the reporting year (maximum 4000 characters):</b> The main goal of this project is to conduct a contaminants survey in freshwater fish, benthic macroinvertebrates (BMI), streambed sediments, and stream water in a variety of watersheds in Glacier Bay National Park and Preserve (GLBA). The harmful effects of mercury (Hg) and persistent organic pollutants (POPs) in the environment is well established. However, there is scarce information on these pollutants in southeast Alaska, although the limited data indicate they may be present at high concentrations (Day et al., 2004; Fitzgerald et al., 2006; Vander Pol et al., 2004). While local emission sources are insignificant, global sources of Hg and some forms of POPs are projected to continue rising. In particular, the rapid economic expansion of China, whose energy needs are being met by extensive Hg-laced coal burning, is suspected to be leading to large increases in Hg export to Alaska via atmospheric transport
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pathways (Streets et al., 2005). Both Hg and POPs are highly volatile and tend to become concentrated at high latitudes due to atmospheric circulation patterns and polar temperature controls (AMAP, 2002; Pacyna and Pacyna, 2002). In addition, salmon and birds may act as powerful biovectors of these contaminants; accumulating them in oceans and distant source areas and depositing them in riparian areas as they pass through to spawn or migrate (Blais et al., 2007). This project would provide original data that would evaluate the current scale of these contaminants in GLBA freshwater streams, examine the landscape patterns that explain their distribution, and also pertain to the Vital Signs program by serving as a baseline data set to which future contaminants monitoring can be compared.

**Findings and status of Scientific Study or accomplishments of Science Education Activity during the reporting year (maximum 4000 characters):**

Between June 18-22, 2007, we visited 14 streams in Glacier Bay National Park and Preserve and collected samples according to our permits and study proposal. Streams visited were (some names unofficial): Stonefly, Gull, Nunatak, Reid, Tyndall, Ice Valley, Vivid Lake, Oystercatcher, Fingers South, Berg Bay South, Rush Point, East Falls, and Rink Creeks, and the Carolus River. Travel to the sites was accomplished using the NPS research vessel Capelin and we encountered no significant logistical problems and were able to access all streams we targeted. At each site, our teams of five scientists measured streamflow; took in situ water quality measurements; collected 4 liters of water; several grams of streambed sediments, up to 100 mayfly larvae, and up to 20 juvenile coho salmon. Each site visit took between 2-4 hours to complete.

Water samples were split between USGS water quality labs (for chemical analyses) and to the University of Alaska Southeast (for sediment quantification). Most aquatic insect samples were sent to the USGS Wisconsin District Mercury Laboratory (WDML) for mercury analyses; the remaining fraction was preserved and used for genus or species-level identification by John Hudson in Juneau, AK. Half of the fish samples and all of the streambed sediment samples were sent to the WMDL for total mercury and methylmercury concentration determination. The other half of the fish samples was sent to the NOAA Northwest Fisheries Science Center in Seattle, WA for analyses of persistent organic pollutants (POPs).

Preliminary results are available to date only for streamflow measurements, in-situ water quality parameters (pH, dissolved oxygen, specific conductance, temperature, turbidity), total suspended solids, water chemistry, as well as insect identification. Results of total and methylmercury concentrations in sediment, insects, and fish, and for POPs in fish, are still pending from the analytical labs.

Initial evaluation of the water data indicates that our hypothesis regarding the importance of landscape type on regulating mercury concentrations is justified. Our results show that the concentration of total mercury is correlated with the percent of the watershed covered by wetlands. A better correlation ( $r^2=0.88$ ) is found between total mercury and the concentration of dissolved organic carbon (specifically, the hydrophobic fraction). Dissolved organic carbon is known to be preferentially transported out of wetland-rich environments and provides binding sites for mercury. In addition, methylmercury (the organic, particularly toxic form of mercury that is formed from inorganic mercury in wetland environments) was below detection in all of the newer, recently glaciated streams, but was found to be present above detection (up to 20% of the total mercury) in several of the older streams draining landscapes with relatively developed wetlands. Stream temperature was not dependent on stream age, but by the presence or absence of upstream lakes. Turbidity and total suspended solids were highest in the glacially influenced streams. More complex relationships among variables will be explored when the remaining data are received from the labs.

**For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis?**

Yes

**Funding specifically used in this park this reporting year that was provided by NPS (enter dollar amount):**

\$62,826.00

**Funding specifically used in this park this reporting year that was provided by all other sources (enter dollar amount):**

\$0.00

**List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting year:**

**For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis?**

Yes

**If "Yes", identify where the specimens currently are stored:**

Archival aquatic invertebrates (fewer than 100 individuals) preserved in ethanol are in the possession of John Hudson in Juneau, AK.

**Paperwork Reduction Act Statement:** A federal agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. Public reporting for this collection of information form is estimated to average 1.38 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the forms. Direct comments regarding this burden estimate or any aspect of this form to Dr. John G. Dennis,

Natural Resources (3130 MIB), National Park Service, 1849 C Street, N.W., Washington, DC 20240.

**Privacy Act Notice:** Scientific research, education and collecting activities within units of the National Park System that may impact parks invoke a permitting and reporting requirement per regulations at 36 CFR 1.6 (Permits), 36 CFR 2.1 (Preservation of Natural, Cultural and Archeological Resources), and 36 CFR 2.5 (Research Specimens). The National Park Service collects information about permit applicants and permittees to administer and document research, collecting, and reporting activities within parks. The information disclosed on this form is required and may result in denial of permit applications if not provided.