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Final Performance Report for USFWS Agreement
Agreement number F14AC01310
February 15, 2016
Prepared by Lisa Ka'aihue

Reporting Period: May, 2014–December 31, 2015
Due Date: March 31, 2016
Project Title: Early Detection of Elodea (*Elodea buttallii and E. Canadensis*) in MatSu Basin Waters

Project Background: The main objectives under this agreement were to:

1. Conduct surveys for the presence of *Elodea* spp. in 11 lakes in the Mat-Su Basin with high risk for *Elodea* infestation due to high use from boat and float plane traffic during 2014 and 2015
2. Post educational materials on *Elodea* presence and prevention of spread in southcentral Alaska to contact likely target groups.
3. Report results of surveys to State of Alaska, Department of Natural Resources and enter data into the Alaska Exotic Plants Information Clearinghouse database and include as part of progress reports.

Project Activities and accomplishments for the reporting period:

1. Conduct surveys:

   During the 2014 and 2015 field seasons Cook Inlet Aquaculture Association (CIAA) employees conducted early detection surveys for *Elodea* on 11 lakes in the Matanuska-Susitna (Mat-Su) drainage: Chelatna, Whiskey, Hewitt, Shell, Judd, Larson, Redshirt, Nancy, Caswell, Wasilla, and Big. Lakes were strategically chosen based on high floatplane and boat usage, importance to salmon stocks, and proximity to highly-populated areas. *Elodea* is Alaska's first invasive aquatic plant and has been found in Fairbanks, Cordova and the Copper Delta River, Anchorage, the Kenai Peninsula, and at Alexander Lake in the Susitna River drainage.

   Early detection of *Elodea* can help prevent the habitat degradation that will occur in many of the Mat-Su Basin lakes if *Elodea* is left to spread unchecked. By detecting the invasive weed early, it is much easier to respond and avoid harmful impacts such as habitat degradation. Invasive macrophytes such as *Elodea* can lead to increases in hypoxia, allelopathic chemicals, facilitation of other exotic species, and inferior food quality leading to a decrease in abundance of native fish species. Adult salmon can be displaced from spawning areas due to encroaching aquatic plants. Juvenile salmonids and other native fish species may be displaced from usual habitats as well, due to the dense vegetative mats *Elodea* creates.

The *Elodea* surveys were conducted from August 6 to September 5, 2014 on the 11 Mat-Su Basin lakes. Full shoreline surveys were done for Larson, Redshirt, Shell, Caswell, Whiskey, Hewitt, Chelatna, and Judd lakes. Several points were surveyed on Wasilla, Nancy, and Big lakes—the sites were chosen based on the highest likelihood for detecting *Elodea.* No instances of *Elodea* were found while surveying these 11 lakes.

The 2015 surveys began on June 4, 2015 and were completed by August 12, 2015. Similar to 2014, full shoreline surveys were done for Larson, Redshirt, Shell, Caswell, Whiskey, Hewitt, Chelatna, and Judd lakes. Several points were surveyed on Wasilla, Nancy, and Big lakes—the sites were chosen based on the highest likelihood for detecting *Elodea.* No instances of *Elodea* were found while surveying these 11 lakes.

The survey objectives for this grant were met without any problems to report.

2. Post educational materials:

During the reporting period, educational outreach materials were distributed to recreational users and landowners present at the time the surveys were conducted. In addition, CIAA had crews operating at Whiskey, Hewitt, Chelatna, and Shell lakes for the 2014 summer months and these crews distributed materials to landowners and recreational users as often as they had the opportunity. Staff talked to the Alaska Department of Fish and Game weir crews at Judd (2014) and Larson lakes (204 and 2015) about the survey project and to be on the lookout for *Elodea*. Staff spoke to Chelatna Lake Lodge and left materials for their visitors. Flyers were distributed to air charter operators including Regal Air, Rusts Flying Service, and Trail Ridge Air. Because CIAA uses Trail Ridge Air for other projects, staff spoke directly to their pilots about the project and the pilots said they were passing along information about *Elodea* to their clients. The educational outreach materials that were used are located at http://dnr.alaska.gov/ag/akpmc/invasives/elodea.htm.

In the 2014 Spring/Summer issue of *Smolts*, CIAA's twice-annual newsletter, a full article was devoted to the *Elodea* issue in Alaska, including a summary of the Mat-Su survey project. And an update was provided in the 2014 Fall/Winter issue of *Smolts*. This newsletter is distributed to over 1,000 commercial fishers in the Cook Inlet watershed, as well as to regulators, legislators, local and regional governments, and other interested parties.

Emily Heale from CIAA led a poster presentation on the survey project at the 7th annual Mat-Su Salmon Science & Conservation Symposium, held November 18 and 19, 2014 in Palmer, Alaska. Emily also led a poster presentation on the two-years worth of surveying and outreach at the 8th annual Mat-Su Salmon Science & Conservation Symposium, held November 18 and 19, 2015 in Palmer. At this symposium, CIAA staffer Lisa Ka'aihue chaired a session on the Aquatic Invasive Species *Elodea*, with presentations by the State of Alaska and the University of Alaska's Institute of Social and Economic Research.

Lisa Ka'aihue and Andy Wizik of CIAA also organized and co-chaired an invasive species session at the 42nd Annual Alaska Chapter of the American Fisheries Society held in Homer Alaska, November 3–6, 2015, which featured the first ever talk on *Elodea* at this organization's annual meeting. This presentation was given by Heather Stewart of the Alaska Department of Natural Resources and she focused on the management actions in Alaska, emphasizing how rapid response can work in eradicating the weed, including the importance of surveys in this work.

In December 2015, CIAA provided a small amount of funding ($2,150) to the Institute of Social and Economic Research (ISER) for a project led by Tobias Schworer entitled "Estimating Dispersal Potential and Risk to Alaska's Freshwater Ecosystem Services from Aquatic Invasive Species: A Spatially-explicit Floatplane Vector Analysis." These funds came from this grant and were intended to support outreach to the public about *Elodea*. ADF&G and ADNR also provided support. Lisa Ka'aihue consulted the grant point of contact, Elizabeth (Libby) Benolkin, prior to committing funding to this project.

The ISER project is ongoing as of this writing—ISER is currently in the middle of administering a survey to float plane pilots via mail and over the phone. The scope of work for this project is attached to this report; a summary is below:

The purpose of this study is to quantify the risk of statewide dispersal of freshwater aquatic invasive species and to spatially determine the statewide vector related to private and commercial float plane traffic across freshwater aquatic resources. The research objectives are as follows:

1. Quantify float plane traffic volume from urban home base and invasive source locations into remote waterbodies.
2. Develop economic models to quantify loss of economic value related to dispersal of aquatic invasive organisms across the state.
3. Create a statewide risk map to be used by resource management agencies to optimize detection and early response efforts (monitoring).

The risk map will be primarily shared with government agencies to help manage this invasive species.

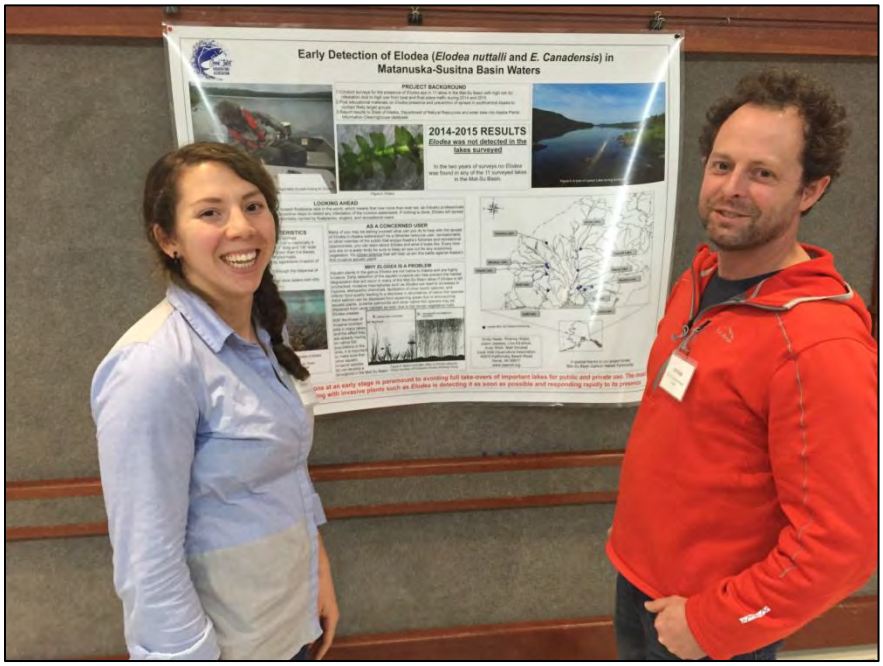
The educational objectives this grant were met without any problems to report.

3. <u>Report results of surveys:</u>
The survey results were informally communicated to the State of Alaska, Department of Natural Resources (phone call and email). The 2014 survey results were inputted into the Alaska Exotic Plants Information Clearinghouse database in October 14, 2014; and the 2015 survey results were imputed on September 14, 2015. These results are attached to this report.

The reporting objectives for this grant were met without any problems to report.

Above: Matt Smukall, former CIAA biologist, visually looking for *Elodea* in one of the 11 Mat-Su lakes during the 2014 survey.

Above: Joann Jeplawly, Seasonal Assistant with CIAA, using a vegetation rake at Hewitt Lake in 2015 to survey for the presence of *Elodea*.



Above: Emily Heale on the left, Temporary Project Technician with CIAA, talking about the *Elodea* project with a participant at the Mat-Su Salmon Symposium in 2015 during the poster session.

Estimating Dispersal Potential and Risk to Alaska's Freshwater Ecosystem Services from Aquatic Invasive Species: A Spatially-explicit Floatplane Vector Analysis

Proposed Scope of Work

Introduction

Based on recent events where *Elodea spp*. has been found in Lake Hood, the largest seaplane base in Alaska, there is a need to better understand the potential dispersal of invasive aquatic organisms via floatplanes. In order to optimize statewide detection and monitoring efforts for aquatic invasive species, a vector analysis of the float plane pathway can be used to develop propagule pressure models based on traffic patterns (Leung et al., 2004). As evident in multiple cases across Alaska, seaplanes are the primary vector to dispersing of *Elodea spp.* across the state (Hollander, 2014). These findings warrant that the proposed risk assessment more closely investigates the float plane vector and integrate this information into a spatially explicit risk assessment.

Scope of Work

The purpose of this study is to quantify the risk of statewide dispersal of freshwater aquatic invasive species and to spatially determine the statewide vector related to private and commercial float plane traffic across freshwater aquatic resources. The research objectives are as follows:

1. Quantify float plane traffic volume from urban home base and invasive source locations into remote waterbodies.
2. Develop economic models to quantify loss of economic value related to dispersal of aquatic invasive organisms across the state.
3. Create a statewide risk map to be used by resource management agencies to optimize detection and early response efforts (monitoring).

Detailed study tasks are as follows:

Task 1: Online survey with private float plane pilots and telephone survey with commercial float plane operators.

An online and telephone survey will be conducted to collect data on float plane traffic patterns related to commercial flights and flights taken for personal reasons. For the latter, there are a total of 2858 pilots with commercial and private floatplane ratings in the FAA Airmen database of pilots. 1733 reside in Anchorage and Mat-Su, 342 Fairbanks, 227 Kenai, 52 Kodiak, 233 in Southeast, and 271 in all other rural Alaska. A non-random sample of 1015 pilots will be drawn sampling all 271 pilots residing in rural places and picking proportionally but randomly from urban locations meaning 548 from Anchorage and Mat-Su, 108 from Fairbanks, 72 from Kenai, and 16 from Kodiak.

Pilots will be contacted with a letter containing a URL to an online survey. An incentive payment and educational material related to *Elodea spp.* will be included in the letter amounting to a $2 bill. This incentive increases the response rate by 10%, which is essential to gain representativeness (Dillman, 2007).

Since almost half of the state's float plane traffic is related to commercial operators who are employing pilots residing in and out of the state of Alaska, the FAA's airmen certification database only provides a portion of the commercial floatplane-rated pilots operating in the state. Thus, for the commercial part of floatplane traffic, a different approach is warranted.

Previous survey work conducted by Carey et al. (2015) determined a list of approximately 150 commercial float plane operators in the state of Alaska. The authors determined the set of alternative destinations, however, did not collect information on number of flights into these destinations. Carey et al. (2015) will supply their sample frame to support this project. Then a telephone survey will be conducted with the 150 commercial operators using the list developed by Carey et al. (2015) to collect information on the number of flights from which to estimate spatially-explicit propagule pressure. A stratified sampling plan will be developed to ensure spatial representativeness across the state.

For both surveys, an interactive mapping tool will be used to collect spatially-explicit responses about flight destinations (paths) and approximate annual frequencies. A prototype of the mapping tool is available in the following link:
http://www.cse.uaa.alaska.edu/~afkjm/leaflet/markers/circle.html

Task 2: Ecosystem service valuation.

The ecosystem service valuation will apply two methods, one to estimate the consumer surplus related to private float plane traffic into destinations, and a second method to estimate the producer surplus generated by commercial float plane operators. This combined method will allow a comprehensive look at the welfare effects related to invasions of Alaska's freshwater resources at risk.

First, the travel cost method is widely used by federal agencies as a non-market valuation technique to estimate consumer surplus (Hanley and Spash, 1993). Using data collected in Task 1 related to the set of alternative destinations, flight distances and frequencies, and available cost to operate float planes, we will develop a travel cost model to estimate the value of destinations to private float plane pilots. Based on stated responses on whether pilots would still land in destinations would these landing areas be infested with dense aquatic vegetation, we will estimate the change in value given an invasion of the destination water body.

Second, we will develop a rent model to quantify the producer surplus related to aquatic resources at risk (Schwörer, 2007; Sjaastad et al., 2005). The rent model will be parameterized using information collected in the survey with business owners in Task 1.

Task 3: Risk Map

A risk map will be developed that will incorporate both anthropogenic and ecological variables including results from the two previous tasks. Geographic Information Systems (GIS) and risk maps have been successfully used to track the spread of invasive species and help agencies focus their management efforts (Lippitt et al. 2008; Selsky et al. 2006). Based on results from surveys, expert opinion, and a literature review we will develop spatially explicit maps of social, environmental, and physical characteristics that influence the risk of *Elodea ssp*. infestation in lakes in Alaska. These maps will be

presented as raster layers in which cells will be assigned risk values which can then be visually assess independently or combined to assess the overall risk. The history of Elodea infestation in Alaska can be used to help assess the validity of risk maps. This process would be the first much needed step to develop a spatially more complex model of *Elodea ssp.* risk and help focus future research and monitoring efforts. Overall, the development of GIS risk maps will provide a systematic tool for managers to monitor and assess risk.

Budget

This study serves as an extension of ongoing ISER research estimating the risk of Elodea spp. to ecosystem services funded by Alaska Sustainable Salmon Fund (Project 44907) (UAA G9336 12015-233858). Based on recent events related to the detection of *Elodea spp*. in Lake Hood, the ISER research team in conjunction with an interagency working group consisting of ADFG, DNR, FWS, NPS, and some of Alaska's Soil and Water Conservation Districts, determined the need to conduct a statewide float plane vector analysis. Since this statewide approach is beyond the scope of the ongoing ISER research, we have developed a plan to fund the extension. DNR will contribute mailing costs and some interviewer time. Cook Inlet Aquaculture Association will cover incentive payments for survey respondents. The budget below outlines the additional costs of expanding the survey incurred by ISER (beyond the Elodea project), for which we are requesting ADF&G support.

The requested amount covers additional project management, interviewer labor, geospatial modelling and creation of the risk map.

ISER Budget for Survey Expansion and Spatial Modelling	
Salaries	
Project oversight	$ 213
Spatial Modelling	$ 1,704
Interviewers	$ 2,113
Total Salaries	$ 4,030
Benefits	$ 770
Travel	0
Contractual	0
Commodities	0
Total Direct Cost	$ 4,800
F&A @ 25%	$ 1,200
Total Cost	$ 6,000

Detail

Item	DNR match to SeaGrant funding	ISER funding from AK Sustainable Salmon and SeaGrant	Cook Inlet Aquaculture	ADFG RSA to ISER	Comments
Project oversight				**$ 213.00**	
Task 1					
Private pilot mail outreach with online survey					
Sample and survey design		$ 2,997			
Labor for designing&linking mapping tool to survey		$ 991			ISER programmer time
1st mailing - letter, 1015 total, expect 250 returns by Feb 22	$ 660				Great Originals printing and postage
2nd mailing - post card, expect 150 returns by March 7	$ 660				Great Originals printing and postage
3rd mailing - letter, expect 100 returns by March 21, total sample 500	$ 600				
Incentives			$ 2,030		Each letter will include a $2 bill as an
Fee for securing and holding currency			$ 120		Great Originals
Commercial floatplane operator telephone survey					
Commercial operator contacts					Carey et al. (2015) will provide sample
DNR match on personnel	$ 2,560				
Labor for additional interviewer time required				**$ 2,113**	
Task 2					
Data analysis and write up		$ 5,994			
Task 3					
Visualization and spatial modeling				**$ 1,704**	Arc GIS analysis, risk mapping, shapefiles
Benefits				$ 770	
Total direct cost	$ 4,480	$ 9,981	$ 2,150	$ 4,030	
Overhead rate depends on agreements				$ 1,200	
TOTAL requested			**$ 2,150**	**$ 6,000**	

References

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