

# Results of the New Zealand Mudsnaill Diverter Assessment Study

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February 6, 2006

## Summary

The invasive New Zealand mudsnaill, *Potamopyrgus antipodarum*, has rapidly spread throughout the western United States and can reach extremely high densities. Although its ecological impacts are considered to be severe, its economic impact on water users is unknown. It has been suggested that New Zealand mudsnaills may potentially affect hydroelectric facilities, irrigation diverters, and municipal water supplies. We conducted a literature review and contacted more than one hundred fifty water resource-related managers from seventy counties in the United States, and Australia, to determine if New Zealand mudsnaills had impacted water users.

Our survey resulted in three major findings. First, two streams were closed to recreational use due to possible spread of New Zealand mudsnaills to other water bodies, but these streams have since reopened. Second, many private, state, and federal fish hatcheries have become infected. They are required to eliminate the mudsnaills from their hatcheries and to control their spread to future fish stocking locations. Finally, we found no reported impacts of mudsnaills to hydroelectric facilities, irrigation diverters, or municipal water supplies. Our results suggest that economic impacts of New Zealand mudsnaills on water users are minimal, given their short history in the western USA.

## Introduction

The highly invasive New Zealand mudsnail, *Potamopyrgus antipodarum*, (NZMS; Fig.

1) has rapidly spread throughout the western USA, Europe, Asia, and Australia. It has been

reported in every state in the USA, west of the 105° longitudinal meridian, except New Mexico

(Fig. 2). No methods have been implemented for controlling NZMS populations once they have

been established in natural water bodies. However, the New Zealand Mudsnaill Management and

Control Plan Team has developed strategies for management of NZMS when it invades fish

hatcheries. These strategies include HACCP plans (for HACCP protocols see website at:

<http://www.esg.montana.edu/aim/mollusca/nzms/manage.html>).



Figure 1. New Zealand mudsnail, *Potamopyrgus antipodarum* (NZMS). Left photo is a newly reported clonal variety, currently found only in mid-Snake River, Idaho. Center and right photos are the most commonly encountered clone. Note operculum on right photo; all NZMS have operculum. (Photos courtesy of Dr. Dan Gustafson, Montana State University, Bozeman, MT)

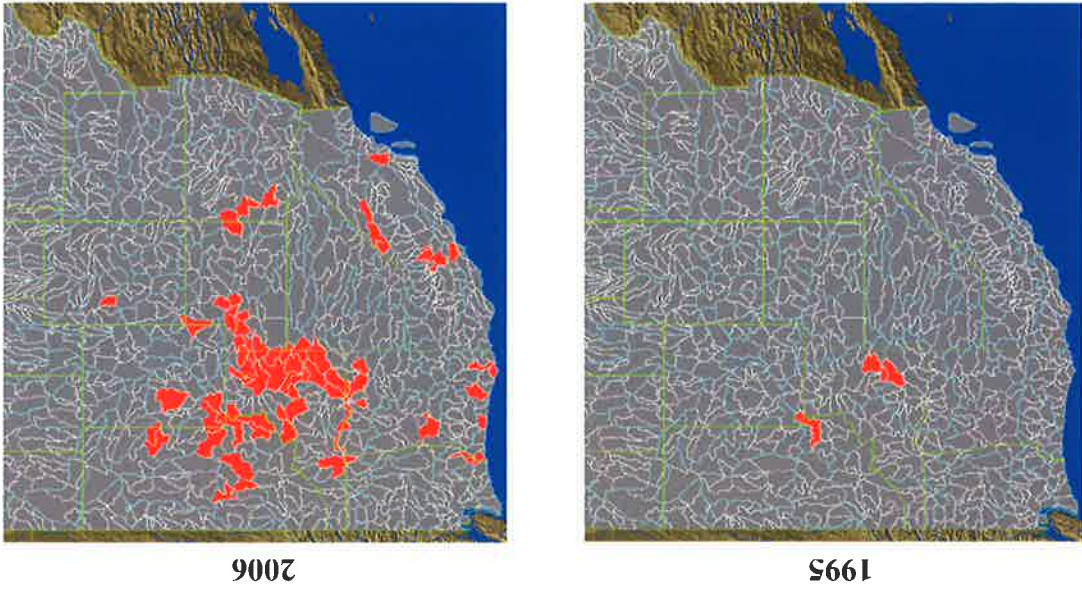


Figure 2. Reported hydrological unit locations (HUCs) of invasive New Zealand mudsnail, *Potamopyrgus antipodarum* in the western USA from 1995 to 2006. Maps from: <http://www.esg.montana.edu/aim/mol/usca/nzms/index.html>

To date, there is no centralized database or summary compilation of water diverters, hydroelectric facilities, or other users affected by NZMS in the western USA. This lack of accessible information makes it difficult for water agencies to monitor and manage NZMS infestations. Our goal was to fill this void. We prepared a database of water users that could potentially be affected by NZMS. We identified known NZMS infestations, potentially affected water users, and any impacts of NZMS on users. We then contacted users and report any NZMS impacts.

## Methods

We identified potential users that could be affected by NZMS based on locations, abundances, and dates reported of NZMS infestations on the NZMS website:

<http://www.esg.montana.edu/aim/mol/usca/nzms/status.html>. This web site is the most

comprehensive database of NZMS in the western USA available. They report all known NZMS

locations and list densities as either, 'sparse', 'moderate', or 'abundant'. There were

approximately 322 reported NZMS locations on the web site, most of which occurred in Idaho

(161), as of January 2006. To reduce redundancy and eliminate sites where NZMS were not

abundant enough to potentially affect water use, we developed a set of selection criteria for our

investigation (Fig. 3). NZMS typically take several years from initial introduction until they

become abundant and potentially cause problems to water users (Richards 2004). We elected to

'research further' (Fig. 3) only those populations of NZMS that were reported as 'abundant' or

could have reached 'abundant' levels by 2005, assuming that only 'abundant' populations would

affect water users. Because of their size ( $\leq 5.0$  mm) NZMS reported as 'sparse' or 'moderate'

densities should have little or no impact on water users. If our 'research further' criteria were

met (Fig. 3), we identified counties where those NZMS populations occurred and contacted

appropriate water resource-related managers.

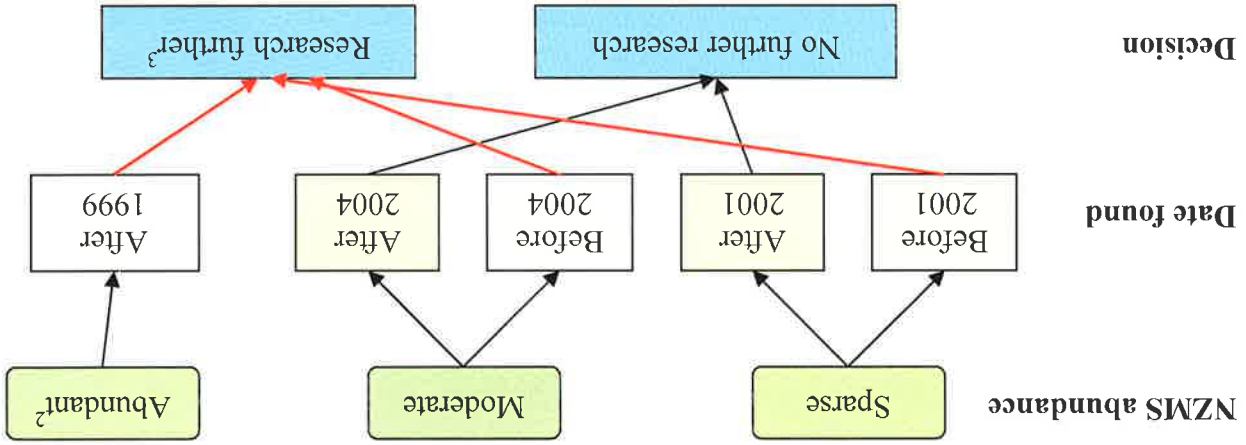


Figure 3. Flow chart of search criteria of reported NZMS locations<sup>1</sup>.

<sup>1</sup>based on NZMS website: <http://www.esg.montana.edu/aim/molusca/nzms/status.html>

<sup>2</sup>We assumed that only populations of NZMS that were reported as 'abundant' or could have reached 'abundant' levels by 2005 could have affected operations.

<sup>3</sup>If 'research further' criteria were met, we identified counties that the reported NZMS locations occurred in and then contacted appropriate managers (66 of 67 counties reporting NZMS met the decision criteria 'research further'. The exception was Los Angeles County which recently reported NZMS as 'sparse' in Piru Creek).



We also contacted hydroelectric power companies that could have been affected and all known management agencies that would have knowledge of NZMS impacts. Appendix 1 is our list of contacts and results which include agency, contact person, contact information, and NZMS impacts.

Following is a list of power companies that we contacted:

- Bonneville Power (Washington, Oregon, Idaho, Montana)
- Idaho Power (Idaho)
- PPL (Montana)
- PacificCorps
- Utah Power (Utah)
- Pacific Power (Oregon, Washington, Wyoming, and California)

We also conducted an intensive literature search on NZMS infestations and their impacts using

methods in Table 1.

**Table 1. Summary of Search Methods Used**

-NZMS website <http://www.esg.montana.edu/aim/mollusca/nzms/status.html>  
-Internet search using Google.com and the following combinations of search words:  
New Zealand mudsnail, mud snail, fouling, bio fouling, hydroelectric fouling, irrigation  
fouling, aquatic nuisance, municipal water  
-MSU Libraries abstract/journal/article internet search <http://www.lib.montana.edu/>  
-Contact search from NZMS Management and Control Plan Team PDF  
<http://www.esg.montana.edu/aim/mollusca/nzms/2005%20Control%20Plan%20Meeting%20Minutes.pdf>  
-Internet search for state with county names that meet criteria in Figure 3  
-Electronic mail to available contacts  
-Telephone communication to available contacts  
-Follow up communication with contacts

## Results

None of the power companies that we contacted reported problems to hydroelectric

facility operations due to NZMS infestations (Appendix 2). Bonneville Power Administration

representatives reported that they have not had to expend any monies for eradication of NZMS at this time (Andy Toms, Bonneville Power Administration, personal communication). Of the approximately 130 email and phone contacts, 60 responded. None of our contacts reported NZMS impacts on water diverters or users (Appendix 2). Many were unaware of its occurrence in their area. Our literature search did not find any published reports on impacts of NZMS on users. There have also been no reported impacts of NZMS on domestic water supplies since Ponder (1988), who reported NZMS in the 1960's being distributed through water pipes and emerging from domestic water taps in Sydney, Australia. Ponder (1988) also cited Cotton (1942) as having documented NZMS blocking water pipes and meters in South Australia. Filtration systems in Australia have advanced since the 1960's and there have been no recent accounts of NZMS fouling domestic water supplies (Sarina Loo, Monash University, Melbourne, Australia, personal communication).

Two renowned trout fisheries, Darlington Spring Creek, a tributary of the Madison River, MT and Putah Creek in central CA, were temporarily closed to public access due to NZMS invasion. These closures were made in an effort to slow NZMS spread to nearby waters. Darlington Spring Creek is located approximately 100 meters from the Madison River and its closure was intended to prevent NZMS spread to this fishery. The Madison River has since been documented NZMS positive; and Darlington Spring Creek is now open to recreational use, with the exception of the NZMS abundant sections that have been closed to the public by Montana Department of Fish, Wildlife and Parks (MDFWP). At one time, MDFWP considered using a molluscicide, Baylicide, for NZMS control in Darlington Spring Creek. Baylicide's effectiveness was considered to be potentially good, but before further action was instituted, the nearby Madison River became contaminated with NZMS. Control efforts in Darlington Spring Creek

were then curtailed (Pat Clancy, Fisheries Biologist, MDFWP, personal communication). Putah Creek, CA was also closed to public access, due to NZMS invasion and pending eradication options. Putah Creek has since been reopened to the public.

The most recent report of NZMS infestation has been in Piru Creek, below Pyramid dam, in the Los Angeles County, CA water supply. NZMS were collected in Piru Creek, January 10, 2006 and their densities were listed as 'sparse'. NZMS may have been introduced into Piru Creek because it is a popular whitewater kayaking and trout angling water body. Its impact on the LA municipal water supply system is unknown at this time. Currently, the LA Dept. of Water & Power Operations & Maintenance, the municipal water company for LA, has no eradication program for NZMS. However, they use NZMS standard control measures on personal and heavy equipment (Paula Hubbard, LA Dept. of Water & Power Operations & Maintenance, personal communication).

## Discussion and Conclusion

The NZMS has spread throughout the western USA with densities as high as 750,000/m<sup>2</sup> in some rivers (Hall et al. 2003). Many private, state, and federal fish hatcheries in the western USA are now contaminated with NZMS. Most hatcheries are adhering to HACCP protocols to eliminate and prevent their spread. To date, no hydroelectric facilities, irrigation diverters, and domestic water supplies have reported problems associated with NZMS. Although NZMS densities can become very high, their potential to directly affect water users seems to be negligible, given their recent introduction into the western USA. NZMS do not appear to be capable of fouling water systems to the level that zebra mussels, *Dreissena polymorpha*, have in the eastern USA (Strayer 1999). Ecological impacts of invasive species sometimes take 50 to



100 years to become fully realized (Elton 1958). Therefore, it is possible that future economic problems may occur if NZMS abundances increase substantially.

### Literature Cited

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- Elton, C. S. 1958. The ecology of invasions by animals and plants. University of Chicago Press. Chicago. 181 pp.
- Hall, R. O., J. L. Tank, and M. F. Dybdahl. 2003. Exotic snails dominate nitrogen and carbon cycling in a highly productive stream. Front. Ecol. Environ. 8:407-411.
- Ponder, W. F. 1988. *Potamopyrgus antipodarum* a molluscan colonizer of Europe and Australia. J. Molluscan Studies 54: 271-286.
- Richards, D. C. 2004. Competition between the threatened Bliss Rapids Snail, *Taylorconcha serpentina* (Gray) and the invasive, aquatic snail, *Potamopyrgus antipodarum* (Gray). Ph. D. dissertation. Montana State University. Bozeman, MT. 175pp
- Strayer, D. L. 1999. Effects of alien species on freshwater mollusks in North America. J. North American Benthological Society 18: 74-98.

### Acknowledgements

We would like to thank Solano County Water Agency for funding this project. We would also like to thank Brett Marshall and Tiffany Chandler at EcoAnalysts, Inc., Center for Aquatic Studies for review of this manuscript.

Appendix 1. List of states and counties with positive NZMS identifications reported at:  
<http://www.esg.montana.edu/aim/mollusca/nzms/index.html>

State (# of counties with positive ID)	County Name
Oregon (10)	Baker, Clatsop, Coos, Curry, Douglas, Lincoln, Malheur, Sherman, Wallowa, Wasco
Colorado (1)	Boulder
Wyoming (3)	Hot Springs, Park, Teton
Utah (9)	Cache, Daggett, Davis, Morgan, Salt Lake, Summit, Utah, Wasatch, Weber
Montana (8)	Beverhead, Big Horn, Cascade, Gallatin, Lewis & Clark, Madison, Park, Sweetgrass
Nevada (1)	Elko
Washington (4)	Asotin, Cowlitz, Klickitat, Pacific
California (8)	Calaveras, Inyo, Los Angeles, Mono, Napa, San Joaquin, Solano, Yolo
Idaho (24)	Ada, Adams, Bannock, Bingham, Blaine, Canyon, Caribou, Cassia, Custer, Elmore, Franklin, Fremont, Gooding, Idaho, Jerome, Lemhi, Minidoka, Nez Perce, Oneida, Owyhee, Payette, Power, Twin Falls, Washington

Appendix 2. Contact list and results of NZMS impacts on water use. NZMS Impacts: None = no impact, <sup>1</sup>Refer = contact referred us to another manager and that manager was contacted, <sup>2</sup> NR = no response

**Australia**

Contact Person	Agency and Contact Information	E-Mail	Telephone	NZMS Impacts
Loo, Sarina	Postgraduate Student, Monash University, Melbourne, Australia	Sarina.Loo@sci.monash.edu.au	+61 3 9905 5652	None <sup>1</sup>

**Arizona**

Contact Person	Agency and Contact Information	E-Mail	Telephone	NZMS Impacts
Anderson, Mark	Chief Aquatic Ecologist; Glen Canyon NRA Glen Canyon, AZ	mark_anderson@nps.gov	928-608-6266	None, Refer <sup>1</sup>
Kennedy, Ted	Aquatic Biologist; Grand Canyon Monitoring & Research Center, USGS, 2255 N. Gemini Dr.; Flagstaff, AZ 86001	tkennedy@usgs.gov	928-556-7374	NR <sup>2</sup>
Rihs, John	Earth Science Program Manager, Grand Canyon National Park P.O. Box 129,; Grand Canyon, AZ 86023	john_rihs@nps.gov	928.638.7905	None
Riley, Larry	Chief of Fisheries, Arizona Game and Fish Department 2221 West Greenway Road, Phoenix, Arizona 85023	lriley@gf.state.az.us	602-789-3257	None

**California**

Contact Person	Agency and Contact Information	E-Mail	Telephone	NZMS Impacts
Becker, Dawne	Region 6, Habitat Conservation, North; California Department of Fish and Game 407 West Line St.; Bishop, CA 93514	dbecker@dfg.ca.gov	760-872-1110	None
Bergendorf, David	Aquatic Nuisance Species Program Assistant; US Fish and Wildlife Service 4001 N. Wilson Way; Stockton, CA 95205	david_bergendorf@fws.gov	209-946-6400 X. 342	Refer <sup>1</sup>
Davis, Ken	WS & PS Army Corps of Engineers, Sacramento District	ken@wildlifefiles.com	916-747-8537	NR <sup>2</sup>
Diell, Mike	CA Fish and Game	idrury@dfg.ca.gov	916-557-6742	None
Drury, Ian	Invasive Species Coordinator, California Department of Fish and Game	sellis@dfg.ca.gov	916-653-8783/8983	NR <sup>2</sup>
Ellis, Susan	California Department of Fish and Game			
Herod, Jeffrey	US Fish and Wildlife Service	jeffrey_herod@fws.gov	209-946-6499 X. 321	NR <sup>2</sup>
Hosea, Bob	Pesticide Investigations Unit, California Department of Fish and Game 1701 Nimbus Road Suite F.; Rancho Cordova, CA 95670	bhosea@ospr.dfg.ca.gov	916-358-2954	None

Lacivita, Peter	Army Corps of Engineers, San Francisco District			415-977-8672	None
McDowell, Karen	San Francisco Estuary Project 1515 Clay Street, Suite 1400; Oakland, CA 94612	kmcowell@waterboards.ca.gov		510-622-2398	Refer <sup>1</sup>
Messer, Cindy	Department of Water Resources	cmesser@water.ca.gov		916-651-9687	None
Navicky, James	Environmental Scientist, CA Fish & Game			916-358-2030	Refer <sup>1</sup>
Noda, Gwen	Masters Student, Department of Organismic Biology, Ecology and Evolution Box 951606; 621 Charles E. Young Dr. South; Los Angeles, CA 90095-1606	gwenmoda@ucla.edu			Refer <sup>1</sup>
Otis, Dan	Chief, Municipal Water Quality, Department of Water Resources	dotis@water.ca.gov		916-657-9683	Refer <sup>1</sup>
Sommer, Ted	Department of Water Resources	tsommer@water.ca.gov		916-227-7537	None
Urquhart, Kevan	Senior Biologist Supervisor, Fisheries Dept., California Fish & Game Central Coast Region, 20 Lower Ragsdale Dr., Suite 100; Monterey, CA 93940	kurquhart@dfg.ca.gov		831-649-2882	None
Veldhuizen, Tanya	CA Department of Water Resources, Division of Environmental Services, Aquatic Ecology Section, Sacramento, CA	tanyav@water.ca.gov		916-227-2553	None, Refer <sup>1</sup>
Workman, Michelle	East Bay Municipal Utilities District	mworkman@ebmud.com		209-365-1486	None
Hubbard, Paula	LA Dept. of Water & Power Operations & Maintenance	paula.hubbard@ladwp.com		760-873-0327	None
Montalvo, Angie	Environmental Scientist, CA Aquatic Bioassessment Lab 2005 Nimbus Road; Rancho Cordova, CA 95670	amontalv@ospr.dfg.ca.gov		916-358-4398	Refer <sup>1</sup>
Ball, Douglas	LA Dept. of Water & Power Operations & Maintenance	douglas.ball@ladwp.com		213-367-3222	Refer <sup>1</sup>

**Colorado**

Contact Person	Agency and Contact Information	E-Mail	Telephone	NZMS Impacts
Card, Adrian	Ag Extension Agent	acard@co.boulder.co.us	303-678-6383	Refer <sup>1</sup>
Hamblen, Bob	Boulder County Extension Director	bhamblen@co.boulder.co.us	303-678-6380	Refer <sup>1</sup>
Keilbach, Kurt	Waste Water Utilities Lab		303-413-7350	None
Knox, Robin	Colorado Department of Natural Resources	robin.knox@state.co.us	303-291-7362	NR <sup>2</sup>
Kraft, Lisa	State Forest Service	lisa.kraft@state.co.us	303-870-5502	Refer <sup>1</sup>
Milano, Vicki	Deputy Fish Pathologist, Colorado Division of Wildlife, 122 East Edison; Brush, CO	Vicki.Milano@state.co.us	970-842-6308	None
PacificCorps Power Company	PacificCorps Power Company	customerservice@pacificcorp.com	1-888-221-7070	NR <sup>2</sup>
Proctor, Tina	USFWS, Denver	betina_proctor@fws.gov	303-236-4515	NR <sup>2</sup>

Scott, Donna	Storm Water Specialist, City of Boulder Public Works Department	ScottD@ci.boulder.co.us	303-413-7364	None
Swanson, Heather	Open Space Department, Boulder			Refer <sup>1</sup>
Gillespie, Elizabeth	Resource Stewardship Coordinator, CO State Parks & CO Natural Areas Program 1313 Sherman St. #618; Denver, CO 80203	Elizabeth.Gillespie@state.co.us	303-866-3203 X. 335	None

**Idaho**

Contact Person	Agency and Contact Information	E-Mail	Telephone	NZMS Impacts
Chavez, Natalie	Chavez Writing & Editing Boise, ID, 83702	natalie@chavezwriting.com	208-429-8944	NR <sup>2</sup>
DelMonte, Jessica	Ph.D. Student working on the Portneuf River in southeast Idaho, Idaho State University			NR <sup>2</sup>
James, Chris	Silver Creek Nature Preserve, The Nature Conservancy, Idaho	jame0667@uidaho.edu		Refer <sup>1</sup>
Meyers, Ralph	Environmental Biologist, Idaho Power Co., Boise, Idaho		208-388-2200	None
Smith, Dayna	Silver Creek Preserve Manager; The Nature Conservancy	dayna_smith@tnc.org	208-788-7910	None
McLain, Monty	Bureau of Reclamation for Palisades Reservoir and WA		208-378-5036	None

**Montana**

Contact Person	Agency and Contact Information	E-Mail	Telephone	NZMS Impacts
Beck, Linda	USFWS, Bozeman Fish Technology Center, Bozeman, MT	linda_beck@fws.gov	406-994-9947	NR <sup>2</sup>
Clancey, Pat	Fisheries Biologist; MT Fish, Wildlife, and Parks	pclancey@mt.gov	406-682-7807	None
Dwyer, Pat	Consultant to USFWS, Bozeman, MT	wdwyer6466@aol.com	406-587-0910	NR <sup>2</sup>
Gustafson, Dan	Research Scientist, Department of Ecology, Montana State University PO Box 173460, Bozeman, MT 59717-3460	dlg@rapid.msu.montana.edu.	406-994-2771	NR <sup>2</sup>
Kearns, Billie	Assistant Professor, Department of Ecology, Montana State University PO Box 173460; Bozeman, MT 59717-3460	bkerans@montana.edu	406-994-3725	None
Pickett, Frank	PPL Montana 45 Basin Creek Road; Butte, MT	fpickett@pplweb.com	406-533-3445	None
Ryce, Eileen	ANS Coordinator, Montana Fish, Wildlife and Parks, Fish Health Laboratory 4801 Giant Springs Rd.; Great Falls, MT 59405	eryce@state.mt.us	406-453-2275	NR <sup>2</sup>

North Dakota				
Contact Person	Agency and Contact Information	E-Mail	Telephone	NZMS Impacts
Schluefer, Lynn	Special Project Biologist; North Dakota Game and Fish Department	lschluef@state.nd.us	701-662-3617	None
New Mexico				
Contact Person	Agency and Contact Information	E-Mail	Telephone	NZMS Impacts
Lang, Brian	New Mexico Dept. of Game & Fish	blang@state.nm.uc	505-476-8108	NR <sup>2</sup>
Pinnan, Bob	USFWS, Albuquerque, NM	bob_pinnan@fws.gov	505-248-6471	NR <sup>2</sup>
Nevada				
Contact Person	Agency and Contact Information	E-Mail	Telephone	NZMS Impacts
Paxson, Jay	Elko County Extension Educator	paxsonj@uncc.unr.edu	775-738-4722	None
Shaul-Cook, Anita	Nevada Division of Wildlife	acoock@ndow.org	775-688-1532	NR <sup>2</sup>
Oregon				
Contact Person	Agency and Contact Information	E-Mail	Telephone	NZMS Impacts
Bonneville Power Administration	Bonneville Power Administration		1-800-282-3713	None
Chapman, John	Department of Fisheries and Wildlife, Oregon State University, Hatfield Marine Science Center 2030 SE Marine Science Dr.; Newport, Oregon 97365-5296	john.chapman@oregonstate.edu	541 867-0235	NR <sup>2</sup>
Chi-Chang Liu, Michael	Graduate student, Department of Fisheries and Wildlife, Oregon State University Hatfield Marine Science Center 2030 SE Marine Science Dr.; Newport, Oregon 97365	Chi-Chang.Liu@oregonstate.edu	541-867-0169	None
Draheim, Robyn	Research Assistant, Center for Lakes and Reservoirs Department of Environmental Sciences and Resources, Portland State University ESR: PO Box 751; Portland, OR 97207-0751	draheim@pdx.edu	503-725-4994	None
Eggers, Ron	Bureau of Reclamation; Area Manager		503-872-2795	None
Heimowitz, Paul	USFWS	paul_heimowitz@fws.gov	503-736-4722	NR <sup>2</sup>
Langeslay, Mike	Salmon Biologist, Army Corps of Engineers		503-808-4774	None
Summer, Tanya	Bureau of Reclamation, Portland District		503-872-2846	None
Helm, Steve	Army Corps of Engineers, Portland District		503-808-4778	Refer <sup>1</sup>



**South Dakota**

Contact Person	Agency and Contact Information	E-Mail	Telephone	NZMS Impacts
Shearer, Jeff	Fisheries Biologist, South Dakota Game, Fish & Parks 3305 W. South Street; Rapid City, SD 57702	jeff.shearer@state.sd.us	605-394-1759	None

**Texas**

Contact Person	Agency and Contact Information	E-Mail	Telephone	NZMS Impacts
Britton, David	USFWS	david_britton@fws.gov	817-703-2414	NZMS Impacts NR <sup>2</sup>

**Utah**

Contact Person	Agency and Contact Information	E-Mail	Telephone	NZMS Impacts
Archer, Don	Aquatic Invasive Nuisance Species Coordinator, Utah Div. of Wildlife Resources		801-538-4817	None
Gray, Lawrence	Professor of Biology, Utah Valley State College 800 West University Parkway; Orem, UT 84058-5999	grayla@uvsc.edu	801-863-8558	None
Oliver, George	Biologist, Utah Division of Wildlife Resources, Flaming Gorge Reservoir	georgeoliver@utah.gov	801-538-4820	None
Peterson, Randy	Bureau of Reclamation, Environmental Resources Division		801-524-3758	None
Radant, Randy	Utah Division of Wildlife Resources	randyradant@utah.gov	801-538-4760	NR <sup>2</sup>
Vinson, Mark	BLM / USU National Aquatic Monitoring Center Department of Aquatic, Watershed, & Earth Resources (AWER) Utah State University, 5210 Old Main Hill; Logan, UT 84322	aqua@cc.usu.edu	435-797-3945	None

**Washington**

Contact Person	Agency and Contact Information	E-Mail	Telephone	NZMS Impacts
Aitkin, Kevin	USFWS	kevin_aitkin@fws.gov	360-753-9508	NR <sup>2</sup>
Dybdahl, Mark	Washington State University	dybdahl@wsu.edu	509-335-7909	NR <sup>2</sup>
Smith, Scott	Washington Department of Fish and Wildlife 600 Capitol Way N; Olympia, WA 98501	smithsss@dfw.wa.gov	360-902-2724	None
Toms, Andy	Bonneville Power Administration		503-230-5827	None

**Wyoming**

Contact Person	Agency and Contact Information	E-Mail	Telephone	NZMS Impacts
Hall, Robert	Associate Professor, University of Wyoming U of WY, Laramie	bhall@uwyo.edu	307-766-2877	NZMS Impacts NR <sup>2</sup>

Koel, Todd	Supervisory Fisheries Biologist, Yellowstone National Park	todd_koel@nps.gov	307-344-2281	None
O'Ney, Sue	Resource Management Biologist, Grand Teton National Park P. O. Drawer 170, Moose, WY 83012	susan_oney@nps.gov	307-739-3666	Refer <sup>1</sup>
Stone, Mike	WY Fish & Game	mstone@wgf.state.wy.us	307-777-4559	NR <sup>2</sup>
Whaley, Roy	Assistant Fisheries Management Coordinator, Wyoming Game & Fish Dept.	roy.whaley@wgf.state.wy.us	307-473-3406	Refer <sup>1</sup>
Yekel, Steve	Regional Fisheries Supervisor, Wyoming Game and Fish Dept. 2820 State Hwy 120, Cody, WY 82414	Steve.Yekel@wgf.state.wy.us	307-527-7125	Refer <sup>1</sup>