

**Title:** Evaluation and Monitoring of Marine Mammal Health in the Mississippi Sound

Beth Peterman, Mark L. Lawrence, Stephen R. Reichley, Attila Karsi, Barbara Kaplan, Kaylin McNulty, Isaac Jumper and Sandra Correa

**Brief project Description/Overview:**

This proposed project will assess environmental factors affecting the health of dolphins in the Mississippi Sound (MSS). We aim to examine the effects of freshwater from Mississippi River diversion compared to native Mississippi rivers draining into the MSS on mortalities of bottlenose dolphins. **First**, we will modify an existing hydrodynamic model (Shahidzadehasadi et al., 2024) to simulate water quality parameters individual dolphins experienced in their habitat during the time before death. **Second**, we will assess the influence of river sources on MSS dolphins. The isotopic landscape of the MSS and river systems that contribute notable flow to the MSS will be analyzed, and then we will evaluate dolphins with stable isotope analysis (SIA) to determine if freshwater (FW) exposure occurred and the source of the exposure. This information will be useful for evaluating the environment because water quality not only affects dolphins but also the entire food web. **Third**, we will investigate the source of environmental toxicants we previously identified in MSS dolphins (Landrau Giovannetti et al., in review) through analysis of river sources and prey species. Toxicant levels of MSS river sources will be investigated, as well as toxicant levels in prey species of dolphins in the MSS. From these investigations, we seek to better understand toxicant presence throughout the food web and their accumulation in the environment. **Fourth**, this project will assess whether bacteria we previously identified in dolphin freshwater lesions (*Streptococcus* and *Aeromonas*) are statistically associated with dolphin skin lesions using microbiological and histological techniques. These bacteria were identified in the microbiome of dolphins stranded during the 2019 UME (Unusual Mortality Event). These findings are particularly important for delineating pathogenesis of skin lesions in dolphins. **Fifth**, this project will expand on previous work to determine the genetic diversity of dolphins in the MSS and investigate potential links between genetic subgroups and sources of water, toxicant exposure, and skin lesions. Additional dolphins that died after 2021 will be analyzed, and an established epidemiological database will be used to assess health trends of dolphins in the MSS over time. In summary, this project will utilize the above-mentioned analyses to improve our understanding of factors affecting the health of dolphins in the MS Sound.

**List Project Goal/Objectives:**

1. Hydrodynamic Modeling: The drifting nature of dolphin carcasses before stranding makes determining the precise location and environmental conditions at the time of death challenging. To address this, the objectives here are 1a) continue updating and refining a hydrodynamic/water quality/particle tracking model of the MSS (Shahidzadehasadi et al., 2024) and update it to run through 2023, 1b) simulate trajectories of dolphin carcasses, 1c) delineate habitat ranges for dolphin genetic subpopulations, 1d) ascertain the salinity, temperature, dissolved oxygen, and riverine flow levels experienced by dolphins leading up to their deaths. Simulations will be run for approximately 60 recently dead (code 2) dolphin carcasses whose genetic codes have been

identified (Arick et al. in preparation). The model will be used to identify water quality conditions (including salinity, temperature, dissolved oxygen, and riverine flow) for the habitat range of each dolphin in the time leading up to death.

2. Stable Isotope Analysis (SIA): FW exposure is a commonly recognized threat to bottlenose dolphins in the MS Sound (MSS) and many areas around the world. We will apply SIA tools using sulfur, oxygen, and/or carbon isotopes to assess FW exposure in stranded bottlenose dolphins to: 2a) determine if there is evidence of FW exposure among dolphins stranded in the MSS, 2b) determine if FW exposure is increasing over time, 2c) work to identify the source of FW exposure by assessing the "isotopic landscape" of coastal rivers and the Mississippi River, and 2d) determine if and how dolphin tissue decomposition affects isotopic ratios.

3. Investigate the source of environmental contaminants identified by Landrau-Giovannetti et al. (in review) by 3a) analyzing water from collected river samples for persistent organic pollutant (POPs) and heavy metals, 3b) analyzing microplastics in bottlenose dolphin tissue for carriage of toxicants, and 3c) analyzing water and tissue of prey fish in the MS Sound to determine if toxicants are originating from lower trophic levels.

4. Determine whether detection of *Streptococcus* and *Aeromonas* is significantly associated with FW lesions. Both pathogens were detected in the microbiome of dolphin FW skin lesions. PCR assays for *Streptococcus* and *Aeromonas* will be developed and utilized to determine association with FW lesions. Presence of the pathogens in lesions will be determined through in situ hybridization.

5. Determine if the population structure of MSS dolphins are shifting over time by extending our genetic analysis (Arick et al. in review) into recent years. Temporal and geographical analysis will be conducted to evaluate dolphin populations, and integration of genetic subgroup data into our epidemiology/pathology database will enable investigation of associations with toxicants, water sources, and pathogens.

### **Category B: Mitigation of damage to fish, wildlife or natural resources (650 characters)**

The MSS is a critical economic and natural resource for the State of Mississippi. Common bottlenose dolphins are not only an important natural resource, but as apex predators, their health reflects the environmental health of the MSS. Project goals address testing water and tissues of dolphins to delineate the impact of water conditions (including freshwater exposure from different river sources), environmental contaminants, and infectious agents on the health of these important animals. Findings from this project will inform MDMR for making important management decisions to mitigate threats to health of fish, wildlife, and natural resources in the MSS.

### **Project Timetable/Milestones:**

This is a 2-year project. Data collection, analysis, and reporting will be conducted in year 1, and data collection, analysis, reporting, and publication preparation will be done in year 2.

**Water quality.** By the end of this project, we aim to have a comprehensive understanding of the effects of water quality on mortalities of distinct genetic subpopulations of dolphins in the Mississippi Sound (MSS). In year 1, an existing 3D hydrodynamic model (EFDC+ 11.2) developed by Armandei et al (2021) will be refined and extended into 2021-23 through mapping of additional code 2 dolphins and by adding water quality data into the model. In year 2, the refined model will be used to map conditions individual dolphins experienced in the days and weeks before death.

**Stable isotope analysis.** This project will investigate river source effects on dolphins, particularly those with freshwater (FW) lesions. Water samples will be collected in year 1, and dolphin tissues will be identified for analysis. Stable isotope analysis will begin in year 1 and continue into year 2, followed by data analysis to determine impact of FW exposure among stranded dolphins, assess the relative exposure of MSS dolphins to different river systems, and determine whether tissue decomposition affects isotopic ratios.

**Bacterial pathogens.** We will investigate whether there is an association of *Streptococcus* or *Aeromonas* with FW lesions by PCR analysis and histological techniques. In year 1, PCR methods will be developed, and PCR analysis of selected tissues will be done. In situ hybridization to detect the pathogens in lesions will be done in year 2.

**Toxicant analysis.** Work previously performed described the presence of persistent organic pollutants (POPs) and heavy metals in dolphin tissues from the MSS (Landrau Giovannetti et al. in review). Water samples will be the same as those used for stable isotope analysis and will be collected in year 1. Prey fish samples will also be collected in year 1. Toxicant analysis will be conducted after sample collection in year 1 and completed in year 2. Methods for isolation of microplastics will be developed in year 1. In year 2, microplastics will be analyzed for carrying toxicants such as perfluorooctane sulfonate, 2,3,7,8-tetrachlorodibenzo-p-dioxin, and the polycyclic aromatic hydrocarbon naphthalene.

**Dolphin genetics.** Genetic analysis of MSS dolphins will be extended into 2022 and 2023 to enable analysis of changes in MSS subpopulations over time. Sample selection and genetic analysis will be conducted in year 1. In year 2, associations between genetic subgroups and water quality conditions, river water exposure, toxicant exposure, and bacterial pathogens will be analyzed. By the end of this project, we aim to generate results that will inform MDMR on their conservation and management of MSS dolphins and their habitat.

**In what way does this project meet the goals and objectives of the Department of Marine Resources, which includes enhancing, protecting and conserving the marine interest of Mississippi for present and future generations.?**

The Mississippi River drains 41% of the contiguous U.S. Industrial activities and agriculture potentially release environmental toxicants from the Mississippi River drainage basin into the Mississippi Sound (MSS) and may be responsible for toxicants we detected in bottlenose dolphin tissues (Landrau-Giovannetti et al., publication in review). The analyses outlined in this project proposal will provide important information about the health of Mississippi's marine resources and potential sources of contamination.

Specifically, this project aims to differentiate effects of the Mississippi River compared to native Mississippi rivers on the health of dolphins in the MSS. It will investigate potential sources of environmental toxicants by analyzing water, dolphin tissues, and prey fish from the MSS. This project looks to determine the river source effects on the MSS resident dolphin population through the use of stable isotope analysis. These investigations will reveal the level and source of freshwater (FW) and its effects on MSS dolphins, including their microbiome. By extending genetic analysis into most recent years from work previously performed (Arick II, in review), this project will help determine changes in the MSS resident dolphin populations over time.

These analyses would be beneficial to Mississippi and MDMR by providing up-to-date assessments on our resident dolphin population and a scientific basis for MDMR management of the MSS and adjacent waters. In particular, the effects of the MSS environment and river sources on health of resident MSS dolphins will be assessed. This data made available to MDMR will support management decisions and help MDMR enhance, protect, and conserve marine life and their habitats to support sustainable use of Mississippi's marine resources for present and future generations.

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			YEAR 1	YEAR 2	TOTAL
<b>Salaries and Wages</b>					
	Base Salary	Level of Effort			
Dr. Beth Peterman, PI	\$74,620	40.00%	\$29,848	\$30,743	\$60,591
Dr. Mark Lawrence, CoPI	\$239,618	2.00%	\$4,792	\$4,936	\$9,728
Dr. Stephen Reichley, CoPI	\$173,208	3.00%	\$5,196	\$5,352	\$10,548
Dr. Attila Karsi CoPI *9 month	\$139,828	5.00%	\$6,991	\$7,201	\$14,193
Dr. Barb Kaplan, CoPI *9 month	\$136,472	5.00%	\$6,824	\$7,028	\$13,852
Dr. Kaylin McNulty, CoPI	\$142,137	5.00%	\$7,107	\$7,320	\$14,427
Dr. Isaac Jumper, CoPI	\$133,250	3.00%	\$3,998	\$4,117	\$8,115
Dr. Sandra Correa CoPI *9 month	\$94,812	11.11%	\$10,534	\$10,850	\$21,383
Research Associate - Starkville - Jill Hudnall	\$39,449	50.00%	\$19,725	\$20,316	\$40,041
Research Associate - Gulfport - RYANNE MURRAY	\$42,745	50.00%	\$21,373	\$22,014	\$43,386
Post-Doctoral Research Associate (Basant Gomaa, 20%)	\$48,000	20.00%	\$9,600	\$9,888	\$19,488
Research Associate (Tony Arick, 2%)	\$91,155	2.00%	\$1,823	\$1,878	\$3,701
Graduate student - stable isotope analysis	\$24,000	100.00%	\$24,000	\$24,000	\$48,000
Graduate student - microplastics	\$24,000	100.00%	\$24,000	\$24,000	\$48,000
Graduate student - histopathology	\$24,000	100.00%	\$24,000	\$24,000	\$48,000
Student worker (520 hours per year at \$8.00 per hour)	\$4,160	100.00%	\$4,160	\$4,160	\$8,320
intermittent worker - stable isotope analysis	\$5,760	100.00%	\$5,760	\$0	\$5,760
<b>Salary Total</b>			<b>\$209,730</b>	<b>\$207,804</b>	<b>\$417,534</b>
Fringe Benefits - 12 month		41.02%	\$ 42,440	\$ 43,713	\$ 86,153
Fringe Benefits - 9 month		25.67%	\$ 6,250	\$ 6,438	\$ 12,688
Student Fringe Benefits		0.62%	\$ 472	\$ 472	\$ 944
intermittent worker Fringe benefits		8.33%	\$ 480	\$ -	\$ 480
<b>Fringe Benefits Total</b>			<b>\$ 49,642</b>	<b>\$ 50,623</b>	<b>\$ 100,265</b>
<b>Total Salaries, Wages, and Fringe Benefits</b>			<b>\$259,372</b>	<b>\$258,427</b>	<b>\$517,799</b>
<b>Nonexpendable Equipment</b>					\$ -
<b>Total Nonexpendable Equipment</b>			<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>Travel</b>					
CVM faculty/staff travel to pertinent conferences to present/represent GOMESA			\$ 15,000	\$ 15,000	\$ 30,000
Travel to Gulfcoast for sample collection			\$ 5,000	\$ 5,000	\$ 10,000
<b>Total Travel</b>			<b>\$ 20,000</b>	<b>\$ 20,000</b>	<b>\$ 40,000</b>
<b>Materials and Supplies</b>					
Microbiome - microbiology, sequencing reagents, PCR supplies			\$ 5,000	\$ 5,000	\$ 10,000
histopathology-In Situ Hybridization			\$ 5,000	\$ 5,000	\$ 10,000
General lab supplies			\$ 5,500	\$ 5,500	\$ 11,000
Toxicology			\$ 5,000	\$ 5,000	\$ 10,000
gDNA Kits			\$ 5,000	\$ 5,000	\$ 10,000
Bioanalyzer DNA Kit			\$ 3,000	\$ 3,000	\$ 6,000
microplastics supplies			\$ 5,000	\$ 5,000	\$ 10,000
Gasoline for MSU lab truck to conduct sampling at four rivers (750 miles per trip, \$5/gln, consumption rate is 15 miles/gln)			\$ 1,000	\$ -	\$ 1,000
Gasoline for MSU boat to access the river during sampling at 4 rivers (6 gln per trip, \$5/gln)			\$ 120	\$ -	\$ 120
<b>Total Materials and Supplies</b>			<b>\$ 34,620</b>	<b>\$ 33,500</b>	<b>\$ 68,120</b>
<b>Contractual Services</b>					
IGBB Service Center (DNA sequencing) 250 samples at \$565.18/sample			\$ 70,648	\$ 70,648	\$ 141,296
Microplastic analysis (200 samples at \$50/sample)			\$ 5,000	\$ 5,000	\$ 10,000
Toxicology analysis (RCRA metals + Aluminum) (200 samples analyzed at \$100/sample)			\$ 10,000	\$ 10,000	\$ 20,000
Toxicology analysis (polychlorinated Biphenyls Dutch 7 + Naphthalene) (200 samples at \$100/sample)			\$ 10,000	\$ 10,000	\$ 20,000
Toxicology analysis (persistent organic pollutants) (200 samples at \$100/sample)			\$ 10,000	\$ 10,000	\$ 20,000
Stable isotope analysis \$20 per sample sulfur isotopes. \$10 per sample carbon isotopes. \$30 per sample oxygen & deuterium isotopes from organic matter. \$10 per sample oxygen & deuterium isotopes from water (150 samples soil at \$20 with 2 replicates=\$6000; 150 samples soil at \$10=\$1500; 150 samples soil at \$30 with 2 replicates=\$9000; 60 samples water at \$20 with 2 replicates=\$2400; 60 samples water at \$30=\$1800; 60 samples water at \$10=\$600)			\$ 10,650	\$ 10,650	\$ 21,300
Conference registration fees, (PI, graduate students), one conference per year, project year 2 (2 people) (Cost per person: \$600 registration)				\$1,200	\$1,200
<b>Total Contractual Services</b>			<b>\$ 116,298</b>	<b>\$ 117,498</b>	<b>\$ 233,796</b>
<b>Subawards</b>					
Auburn University			\$ 110,536	\$ 50,351	\$ 160,887
<b>Total Subawards</b>			<b>\$ 110,536</b>	<b>\$ 50,351</b>	<b>\$ 160,887</b>
<b>Other</b>					
Graduate Tuition - 3 students: (stable isotope, microplastics, pathobiology)		100.00%	\$ 41,616	\$ 43,686	\$ 85,302
Graduate Student Insurance (3 students)			\$ 5,544	\$ 5,832	\$ 11,376
<b>Total Other</b>			<b>\$ 47,160</b>	<b>\$ 49,518</b>	<b>\$ 96,678</b>
<b>Total Direct Costs</b>			<b>\$587,986</b>	<b>\$529,294</b>	<b>\$1,117,280</b>
<b>Modified Total Direct Costs (MTDC)</b>			<b>\$ 460,835</b>	<b>\$ 435,257</b>	<b>\$ 896,092</b>
<b>Total Indirect Costs</b>		46.50%	<b>\$ 214,289</b>	<b>\$ 202,394</b>	<b>\$ 416,683</b>
<b>Total Project Costs</b>			<b>\$ 802,275</b>	<b>\$ 731,688</b>	<b>\$ 1,533,963</b>

## **Budget Justification**

### **Title: Evaluation and Monitoring of Marine Mammal Health in the Mississippi Sound**

#### **Mississippi State University Global Center for Aquatic Health and Food Security**

#### **SALARIES & WAGES: \$417,534**

Salaries and wages are requested for Beth Peterman (PI and project manager, 40% effort, 12 month), who will oversee the project and coordinate sample collection. The total requested salary for Dr. Peterman for the project is \$60,591.

Mark Lawrence (Co-PI, 2% effort, 12 month) will oversee microbiome analyses and will be assisted by Basant Gomma (post-doc, 20% effort). The total salary funds requested for Dr. Lawrence are \$9,728. Total salary funds requested for Dr. Gomma are \$19,488.

Stephen Reichley (Co-PI, 3% effort, 12 month) will oversee hydrodynamic modeling. The total salary requested for the project for Dr. Reichley is \$10,548.

Dr. Isaac Jumper (3% effort, 12 month) will assist with epidemiological analysis. Salary requested for Dr. Jumper is \$8,115 for the project.

Attila Karsi (Co-PI, 5% effort, 9 month, summer salary) will oversee genetic analyses of dolphins and sea turtles and will be assisted by Tony Arick (2% effort). The total salary requested for Dr. Karsi is \$14,193. Total salary requested for Tony Arick is \$3,701.

Barbara Kaplan (Co-PI, 5% effort, 9 month, summer salary) will oversee toxicology and microplastics analysis. Salary requested for Dr. Kaplan for the entire project is \$13,852.

Kaylin McNulty (Co-PI, 5% effort, 12 month) will conduct histopathological analysis. Jill Hudnall, research associate in Starkville (50% effort), and Ryanne Murray, research associate in Gulfport (50% effort) will assist with sample collection, database maintenance, sample and data analysis. The total salary requested for Dr. McNulty is \$14,427, Jill Hudnall salary requested is \$40,041, and salary requested for Ryanne Murray is \$43,386.

Three graduate students will be hired to do stable isotope analysis, microplastic analysis, and histopathology analysis. Each graduate student will be hired at the rate of \$24,000 per year.

Sandra Correa (Co-PI, 11.11% effort, 9 month, summer salary) will oversee, participate in and coordinate sample analysis for stable isotope analysis. Total salary requested for Dr. Correa is \$21,383. Sample analysis will be supported by an intermittent student worker in year 1 for a total of \$5,760 and an undergraduate student worker in year 1 and 2 (520 hours per year at \$8.00 per hour) for \$8,320.

#### **FRINGE BENEFITS: \$100,265**

Fringe benefits are calculated at 41.02% for 12-month benefits eligible employees. Fringe benefits are calculated at 25.67% for 9 month benefits eligible employees. Fringe benefits for students are calculated at 0.62% of salary. Fringe benefits for intermittent workers are calculated at 8.33% of salary.

**EQUIPMENT: \$0**

Funds are not requested for equipment.

**MATERIALS & SUPPLIES: \$68,120**

Materials and supplies are requested for microbiome analysis including microbiology, sequencing reagents, PCR supplies at \$5000 in year 1 and \$5000 in year 2 for a total of \$10,000.

Histopathology supplies including slides, stains, and antibodies for in Situ hybridization are requested for \$5000 in year 1 and \$5000 in year 2. General lab supplies funds are requested for material and supplies including gloves, labcoats, lab books, etc. at \$5,500 in year 1 and \$5,500 in year 2 for a total of \$11,000. Toxicology supplies are requested for reagents and materials for toxicological analysis including water bottles, coolers for transport, etc. at \$5000 in year 1 and \$5000 in year 2 for a total of \$10,000. gDNA kit funds are requested for isolation of DNA for \$5000 in year 1 and \$5000 in year 2 and Bioanalyzer DNA kit supplies are requested for \$3000 in year 1 and \$3000 in year 2. Funds are requested for microplastics research materials and supplies for analyzing samples for microplastic content for \$5000 for year 1 and \$5000 for year 2 for a total of \$10,000. Funds are requested for gasoline for the lab truck to conduct sampling at 4 rivers (750 miles per trip, \$5/gallon, consumption rate of 15 miles/gallon) for a total of \$1000. Funds are requested for gasoline for boat to access the river during sampling at 4 rivers (6 gallons/trip, \$5/gallon) for a total of \$120.

**TRAVEL: \$40,000**

Travel funds will be used for travel to the MS Gulf Coast from Starkville, or vice versa, for collection of samples including water, fish, and tissues. Travel funds will also be used for travel to conferences like Gulf of Mexico Conference (GOMCON), International Association of Aquatic Animal Medicine (IAAAM), the annual meeting of the American College of Veterinary Pathologists (ACVP), and/or the annual meeting of the Society of Toxicology to share findings.

**CONTRACTUAL: \$233,796**

Contractual funds will be used for DNA sequencing (250 samples at \$565.18 per sample), microplastic analysis (200 samples at \$50/sample), toxicology analysis (200 samples at \$100/sample for RCRA metals + Aluminum; 200 samples at \$100/sample for polychlorinated Biphenyls Dutch 7 + Naphthalene; 200 samples at \$100/sample for persistent organic pollutants), and stable isotope analysis (\$20 per sample sulfur isotopes. \$10 per sample carbon isotopes. \$30 per sample oxygen & deuterium isotopes from organic matter. \$10 per sample oxygen & deuterium isotopes from water (150 samples soil at \$20 with 2 replicates; 150 samples soil at \$10 with 1 replicate; 150 samples soil at \$30 with 2 replicates; 60 samples water at \$20 with 2 replicates; 60 samples water at \$30 with 1 replicate; 60 samples water at \$10 with 1 replicate).

**TUITION: \$85,302**

Tuition costs are requested for \$41,616 for year 1 and \$43,686 for year 2 for three students. That calculates to \$1,128 (FY25) per month for 6 months and \$1,184 (FY26) for 6 months for year 1.

Year 2 is calculated at 6 months at \$1,184 (FY26) per month and 6 months at \$1,243 (FY27) for each student.

**INSURANCE: \$11,376**

Insurance costs are requested for year 1 at the rate of \$150 (FY25) for 6 months per month and \$158 (FY26) for 6 months. In year 2 at the rate of \$158 (FY26) per month for 6 months and \$166 (FY27) for 6 months for each student. Total insurance requested for year 1 is \$5,544 and year 2 is \$5,832.

**SUBCONTRACT: \$160,887**

A subcontract will be issued to Auburn University. Funds requested in year 1 are \$110,536 and year 2 are \$50,351. Total requested is \$160,887.

**Total Direct Costs: \$1,117,280**

**Modified Total Direct Costs: \$896,092**

**Total indirect costs: \$416,683**

Indirect costs are calculated at 46.5% of the modified total direct costs.

**Total Costs: \$1,533,963**

**AUBURN UNIVERSITY OFFICE OF SPONSORED PROGRAMS**

**DRAFT BUDGET TEMPLATE (AU MTDC - excludes Participant Support from base)**

The following template is provided to allow AU investigators to develop budgets for sponsored programs activities. This budget is developed to allow for full Facilities and Administrative (F&A) costs and reflects AU's Modified Total Direct Cost (MTDC) Base - Excludes Participant Support from base

<b>Project Director:</b>	Anna Linohoss	
<b>College/School:</b>	Agriculture	\$ 125,693.00
<b>Department (required)</b>	120701 BSEN	\$ 35,194.04
		\$ -
<b>Sponsor:</b>	Mississippi State University-GOMESA	<b>\$ 160,887.04</b>
<b>Project Period:</b>	1/1/2025-12/31/2026	
<b>Type of Project (required)</b>		0
<b>On or off campus</b>		<i>Check to make sure this selection match</i>

<b>AUBURN PERSONNEL</b>				Year 1	Year 2	Total
Salaries	(Full-time)	Monthly Effort	Personnel Type			
					0.00	0.00
					0.00	0.00
					0.00	0.00
					0.00	0.00
					0.00	0.00
					0.00	0.00
<b>Total Full-time Personnel</b>				0.00	0.00	<b>0.00</b>
<b>Salaries</b>						
<b>Fringe benefits</b>				0.00	0.00	0.00

<b>POST DOC SALARIES</b>					
	<b>Salary</b>		42,000.00		42,000.00
	<b>Salary</b>			0.00	0.00
	<b>Salary</b>			0.00	0.00
	<b>Total Post Doc Salaries</b>		42,000.00	0.00	<b>42,000.00</b>
	<b>Fringe benefits</b>		4,494.00	0.00	4,494.00

<b>GRADUATE STUDENT SALARIES</b>					
	<b>Salary</b>		24,000.00	24,000.00	48,000.00
	<b>No. of Grad. Students</b>				0.00
	<b>Total Grad. Salaries</b>		24,000.00	24,000.00	<b>48,000.00</b>
	<b>Fringe benefits</b>		912.00	912.00	1,824.00
	<b>Tuition %</b>	10%	2,400.00	2,400.00	4,800.00

<b>EXPENDABLE MATERIALS/SUPPLIES</b>				
Type				
Software license	Expendable supplies	4,000.00	4,000.00	8,000.00
				0.00
				0.00
<b>Total Materials/Supplies</b>		4,000.00	4,000.00	<b>8,000.00</b>

<b>TRAVEL</b>				
Domestic:		6,050.00	3,025.00	9,075.00
Foreign:				0.00
<b>Total Travel</b>		6,050.00	3,025.00	<b>9,075.00</b>

<b>OTHER DIRECT COSTS</b>				
Description:	ODC Type			
	Publication expenses	0.00	5,000.00	5,000.00
Modeling computer	Computing devices	2,500.00		2,500.00
				0.00



## **Budget Justification**

### **Auburn University**

#### **I. Salaries**

In years 1-2, a graduate student will receive \$24,000/year in salary.

In year one a Postdoc will receive \$42,000 in salary based on working 9 months at \$56,000/year.

#### **II. Fringe Benefits**

For the graduate student, fringe is calculated using a rate of 3.8%. The graduate student fringe is \$912 per year for two years.

For the Postdoc, fringe is calculated using a rate of 10.7%. The postdoc fringe is \$4,494 for 9 months in year 1.

#### **IV. Travel**

Funds are requested for 2 people to travel to an American Society of Agricultural and Biological Engineering Conference in year 1 and one person to travel to an American Society of Agricultural and Biological Engineering Conference in year 2. Travel costs for each person and each trip are calculated as follows:

- Flight: \$755
- Ground transportation and parking: \$250
- Hotel (\$250 per night for 4 nights): \$1,000
- Per diem (\$34 per day for 5 days): \$170
- conference registration \$850
- Total: \$3,025

#### **IV. Other Direct Costs**

Other direct costs associated with the project include:

- software license \$4,000 x 2 years
- a modeling computer \$2,500
- publication expense \$2,500 x 2 papers
- tuition waiver that is budgeted at \$2,400 per year.

**Indirect costs:** Indirect costs are charged at a rate of 28% of the Total Direct Cost. Total Direct Costs include but are not limited to all salaries, wages, fringe, travel, contractual services, commodities, supplies, and subcontracts.