

Date: August 1, 2016

To: Academic Affairs

From: Frank Galey, Dean, College of Agriculture and Natural Resources

Re: Entomology Graduate Program Review

I would recommend this program be continued with additional review and study at the University of Wyoming with the following comments.

- This program has 4 faculty members; two of whom have significant extension/state service responsibilities. Despite that, the faculty have attracted significant grant funding and have been very productive in terms of publication.
- The program works closely at the PhD level mentoring students in the interdisciplinary Program in Ecology ("PIE).
- Courses for this program consistently attract appropriate enrollments and the material is important to students in other programs. In addition, graduates of the program fill an important niche in providing the state with expertise in invasive species management.
- Given the larger picture of having slightly below minimum graduation rates in other MS programs in the department, I would recommend investigating the consolidation of all of the MS programs in the department (ESM) under an agroecology or other similar rubric. Even if this is done, it would be difficult to see significant savings given the service requirements of two of the faculty members.

Thank you and please let me know if you wish to discuss this further.

Academic Program Review
Report Template
University of Wyoming
Office of Academic Affairs
March 2016

(adapted from SDSU)

Title of Program/Specialization: MS in Entomology

Indicate whether undergraduate or graduate program/specialization: Graduate

Department and College: Ecosystem Science & Management, Agriculture & Natural Resources

Department Head Name and contact information (phone, email): Scott Miller; 766-4274;

smiller@uwyo.edu

Part 1 – Program Review

1. Program Demand*:

- a. Number of graduates over 5-year period: 6 (plus 2 foreign exchange students)
- b. Enrollment in major/specialization over 5-year period: 6

2. Program Quality: Is the program of high quality?

- a. Program accreditation NA
 - i. For all other programs include:
 1. Date of most recent Academic Program Review (APR): N/A
 2. List of recommendations from the most recent APR and progress to date. N/A
- b. Credentials of faculty
 - i. Include a list of all faculty by name, highest degree and discipline of highest degree.

Name	Rank	Highest Degree	Discipline	Gender	Ethnicity
Scott Shaw	Professor	PhD	Entomology	Male	White /Not Hispanic
Alex Latchininsky	Professor	PhD	Entomology	Male	White /Not Hispanic
David Legg	Professor	PhD	Entomology	Male	White /Not Hispanic
Tim Collier	Assoc. Professor	PhD	Entomology	Male	White /Not Hispanic

- ii. Grants, both proposed and awarded to academic personnel: Previous 5 years. 3 faculty (Latchininsky, Collier, Shaw) held appointments with significant research percentages.

1. Amount applied for: \$1,553,794
2. Amount received: \$798,545

<u>Proposal Number</u>	<u>Title</u>	<u>Investigators</u>	<u>Department</u>	<u>Agency</u>	<u>Date Applied</u>	<u>Amount Applied For</u>	<u>Date Received</u>	<u>Amount Received</u>	<u>Date Range</u>	<u>Account Number</u>
PN-682	Travel Support Funding for the Mosquito Larval Control Workshop and West Nile Virus Prevention Training Conducted by the City of Laramie and UW-ES-Entomology.	Schell, Scott, Alexandre Latchininsky, and Keith Wardlaw.	ESM	Wyoming Department of Agriculture.	03/25/2016	\$5,200			05/19/2016 - 12/31/2016	
PN-654	Wyoming CAPS Infrastructure, Wyoming CAPS Bundled Small Grain Commodity Survey, Wyoming CAPS Nematode Survey.	Latchininsky, Alexandre, and Larry Debrey.	ESM	Animal and Plant Health Inspection Service (USDA).	02/15/2016	\$111,238	03/29/2016	\$27,810	02/16/2016 - 01/31/2017	1003079, A, B
PN-589	Wyoming School Integrated Pest Management Outreach and Training.	Latchininsky, Alexandre, and John Connett.	ESM	National Institutes of Food and Agriculture (USDA).	12/09/2015	\$30,000			03/01/2015 - 02/28/2017	
PN-551	Cooperative Agreement between Wyoming	Latchininsky, Alexandre, and John Connett.	ESM	Wyoming Department of Agriculture.	09/15/2015	\$97,068	09/21/2015	\$16,000	10/01/2015 - 09/30/2016	1002957

	Department of Agriculture and University of Wyoming, Cooperative Extension to update, develop and implement a School IPM Program.									
PN-440	Wyoming CAPS Infrastructure, Wyoming CAPS Bundled Small Grain Commodity Survey, Wyoming CAPS Nematode Survey.	Latchininsky, Alexandre, and Larry Debrey.	ESM	Animal and Plant Health Inspection Service (USDA).	08/15/2014	\$111,413	05/07/2015	\$111,413	02/01/2015 - 01/31/2016	1002688, A, B
2015										
PN-351	Wyoming Cooperative Agriculture Pest Survey - Bundled Small Grain Commodity Pest Survey.	Latchininsky, Alexandre, and Larry Debrey.	ESM	USDA APHIS.			08/12/2014	\$26,171	02/01/2014 - 01/31/2015	1002266B
PN-350	Wyoming Cooperative Agriculture Pest Survey - Nematode Survey.	Latchininsky, Alexandre, and Larry Debrey.	ESM	USDA APHIS.			08/12/2014	\$6,069	02/01/2014 - 01/31/2015	1002266A
PN-239	Crop Protection and Pest Management Competitive Grants Program Extension	Schell, Scott, Alexandre Latchininsky, Brian Mealor, John Connett,	ESM	USDA NIFA.	06/27/2014	\$501,492	11/14/2014	\$66,850	09/01/2014 - 08/31/2015	1002549

	Implementation Program.	and Scott Cotton.								
PN-238	Travel Support Funding for the Mosquito Larval Control Workshop and West Nile Virus Prevention Training for Abatement Personnel from District All Over Wyoming Being Conducted by the City of Laramie and UW-ES-Entomology Here in Laramie.	Schell, Scott, Alexandre Latchininsky, and Keith Wardlaw.	ESM	Wyoming Department of Agriculture.	05/16/2014	\$5,200	08/22/2014	\$5,200	06/20/2014 - 12/31/2014	1002379
PN-229	Wyoming Potato Cyst Nematode Survey.	Latchininsky, Alexandre, and Larry Debrey.	ESM	USDA APHIS.	06/09/2014	\$3,357	08/12/2014	\$3,357	07/01/2014 - 01/31/2015	1002374
PN-228	Wyoming CAPS Nematode Survey, Bundled Small Grain Commodity Survey, and Infrastructure.	Latchininsky, Alexandre, and Larry Debrey.	ESM	USDA APHIS.	03/11/2014	\$111,298	03/26/2014	\$27,854	02/01/2014 - 01/31/2015	1002266
PN-126	Wyoming CAPS Infrastructure, Wyoming CAPS Bundled Small Grain Commodity Survey, Wyoming CAPS Nematode Survey.	Latchininsky, Alexandre and Larry Debrey.	ESM	Animal and Plant Health Inspection Service (USDA).	12/02/2014	\$111,413				

iii. Publications by academic personnel

2015

Latchininsky A.V., Piou C., Franc A., Soti V. Applications of Remote Sensing to locust monitoring. Springer. 2015.

Latchininsky A.V., Kokanova E.O., Gapparov F.A., Childebaev M.K., Temreshev I.I. Harmful locusts and climate change. Bulletin of Al-Farabi Kazakhstan National University, Ecology Series, 2(2): 643-648. 2015.

Conett J., Latchininsky A. and Schell, S. WYOMING SCHOOL INTEGRATED PEST MANAGEMENT (IPM) FOR FILTH FLIES. B-1276 (16 pp.). 2015.

Chistobaev A., Latchininsky A., Sergeev M., Semenova Z., Latchininsky S. Locust control on post-Soviet territories: Preventive approach. Pp. 117-127 in: Role of Geography in disaster prevention in Commonwealth of Independent States and Georgia. Proceedings of an international conference. Moscow: Media-Press. 2015.

Loew F. and Latchininsky A.V. Application of Remote Sensing to Migratory locust monitoring in the Aral Sea zone, Uzbekistan. International Geography Union Conference, Moscow, August 2015. 2015.

Shaw, S.R. 2015. Planet of the Bugs. Korean language edition. Planet B Publishing Company. 352 pp. ISBN 978-89-97132-75-1 (03710) <http://blog.naver.com/hangseongb>
<http://press.uchicago.edu/ucp/books/book/chicago/P/bo18507885.html>. 2015

Shaw, S.R. 2015. Planet of the Bugs. Paperback edition in English. University of Chicago Press, Chicago. 239 pp. ISBN 13: 978-0-226-32575-0 (paper), DOI: 10.7208/chicago/9780226163758.001.0001
<http://press.uchicago.edu/ucp/books/book/chicago/P/bo18507885.html>. 2015

Valerio, A.A. and S.R. Shaw. 2015. Thirteen new Costa Rican species belonging to the genus *Trirhaphis* Ruthe (Hymenoptera: Braconidae, Rogadinae) with their host records. *Zootaxa* 3904 (4): 501-540.
<http://dx.doi.org/10.11646/zootaxa.39904.4.2>. 2015 *Zootaxa*.

Robinson, W.S., D. Barbosa, A. Kulikowski, and S.R. Shaw. 2015. Cloud forest studies of mating and defensive behavior of the parasitoid wasp, *Napo townsendi* Shaw (Hymenoptera: Braconidae: Euphorinae). *International Journal of Tropical*

Insect Science, Vol. 35, No. 3, pp. 103-116. doi:10.1017/S1742758415000107
<http://journals.cambridge.org/action/displayIssue?jid=JTI&tab=currentissue>. 2015

Eduardo Mitio Shimbori, Scott Richard Shaw, and Angélica Maria Penteado-Dias. 2015. Revision of New World *Aleiodes* Wesmael species of the compressor *Herrich-Schaeffer* species-group (Hymenoptera, Braconidae, Rogadinae). *The Canadian Entomologist* 00: 1–9 (2015), doi:10.4039/tce.2015.9,
<http://zoobank.org/urn:lsid:zoobank.org:pub:7711E7EF-4C27-4930-A35E-95DA67AB8465>. 2015

Helmuth Aguirre, Luis Felipe de Almeida, Scott Richard Shaw, and Carlos E. Sarmiento. 2015. An illustrated key to Neotropical species of the genus *Meteor* Haliday (Hymenoptera: Braconidae: Euphorinae). *Zookeys* 489: 33-94 (23 Mar 2015), doi: 10.3897/zookeys.489.9258 <http://zookeys.pensoft.net/articles.php?id=4942>. 2015

Shaw, S.R. The bare essentials of bugs. *Bare Essentials Magazine*, volume 131, pages 60-62. Available on-line at:
<http://bareessentialsmagazine.uberflip.com/i/437027/60>. 2015

Meyers, K., N. Pieropan and T. Collier. 2015. Monitoring of a gall midge population on Russian knapweed (*Acroptilon repens*). *Invasive Plant Science and Management* 8(4): 409-414.

2014

Taylor, M.M., A.L. Hild, N.L. Shaw, U. Norton and T.R. Collier. 2014. Plant recruitment and soil microbial characteristics of rehabilitation seedings following wildfire in Northern Utah. *Restoration Ecology* 22(5): 598-607.

Norton, J. B., H. R. Olsen, L. J. Jungst, D. E. Legg, and W. R. Horwath. 2014. Soil carbon and nitrogen storage in alluvial wet meadows of the southern Sierra Nevada Mountains, USA. *Journal of Soils and Sediments* 14: 34 - 43. 2014

Legg, D. E, J. G. Fidgen, and K. L. Ryall. 2014. Resampling simulator for the probability of detecting invasive species in large populations. *Journal of Software Engineering and Applications* 6: 498 - 505. 2014

- Reddy, K.J. C. Helmericks, A. Whitman, and D.E. Legg. 2014 (Invited) Geochemical processes controlling trace elemental mobility in coalbed natural gas (CBNG) disposal ponds in the Powder River Basin, WY. *International Journal of Coal Geology*. Published online January 2014. DOI:10.1016/j.coal.2014.01.001. 2014
- Impacts of Chronic Wasting Disease on the Movement Ecology of White-tailed Deer in Wyoming. David Edmunds, Matthew Kauffman, Shannon Albeke, Frederick Lindzey, Ronald Grogan, David Legg, Walter Cook, Brant Schumaker, Terry Kreeger, Todd Cornish. 2014 *Journal of Wildlife Management*
- Latchininsky A.V., Piou C., Franc A., Soti V. *Applications of Remote Sensing to locust monitoring*. Springer. 2015.
- Gapparov F.A., Belkharoev Kh.M., Govorov D.N., Zhiviykh A.V. & Latchininsky A.V., 2014. Locusts should be the focus of attention. *Plant Protection and Quarantine*, 1: 51-52 (in Russian). 2014
- Connett J.F., A.V. Latchininsky & Schell S.P., 2014a. Wyoming IPM. Standard Operating Procedure for mice in schools and other facilities. *UW Extension Bulletin B-1259*. 2014
- Connett J.F., A.V. Latchininsky & Schell S.P., 2014b. Wyoming weed control in turf and ornamentals. A comprehensive IPM approach for commercial, residential and schools. *UW Extension Bulletin B-1257* 2014.
- Schell S.P., R. Nelson Foster, L. E. Jech, K. C. Reuter and L. R. Black and A. V. Latchininsky, 2014. Initial analysis of diversity and abundance of non-target arthropod fauna collected during the 2013 field trial to determine the effective field dose of Chlorantraniliprole (Prevathon®) for control of rangeland grasshoppers. 2014.
- Dakhel W. and A. Latchininsky, 2014. A case of non-diapausing embryonic development of *Melanoplus bivittatus*. *Proceedings of the National Grasshopper Management Board Annual Meeting (electronic publication) Denver, CO, January 22-23, 2014* 2014.
- “Cicada Wyoming’s Summer Songsters” *Western Confluence Winter 2014 Issue 01* 2014.

arthropod evolution, insect biodiversity, insect paleontology, history of life, beneficial insects, insect ecology, terrestrial ecosystems

Haimowitz, L., P.M. Marsh, and S.R. Shaw. First record of the genus *Caenophanes* Foerster (Hymenoptera: Braconidae: Doryctinae) for America north of Mexico with a description of a new species from Wyoming USA. *Zootaxa* 390 (2): 287-293. <http://dx.doi.org/10.11646/zootaxa.3900.2.9> 2014.

Aguirre, H. and S.R. Shaw. *Meteorus* Haliday (Hymenoptera: Braconidae) parasitoids of Pyralidae: description and biology of two new species and first record of *Meteorus desmiae* Zitani, 1998 from Ecuador. *Journal of Natural History* 2014: 1-14. doi: 10.1080/00222933.2014.909061 2014.

Aguirre, H. and S.R. Shaw. Neotropical species of *Meteorus* Haliday (Hymenoptera: Braconidae: Meteorinae) parasitizing Arctiinae (Lepidoptera: Noctuoidea: Erebidae). *Zootaxa* 3779(3): 353-367. <http://dx.doi.org/10.11646/zootaxa.3779.3.3> 2014.

Zaldívar-Riverón, A., J.J. Martínez, S.A. Belokobylskij, C. Pedraza-Lara, S.R. Shaw, P.E. Hanson, and F. Varela-Hernandez. Systematics and evolution of gall-forming in the plant-associated wasp genera of the subfamily Doryctinae (Hymenoptera: Braconidae). *Systematic Entomology* (2014), DOI: 10.1111/syen.12078. 2014.

Shimbori, E.M, and S.R. Shaw. Twenty-four new species of *Aleiodes* Wesmael from the eastern Andes of Ecuador with associated biological information (Hymenoptera, Braconidae, Rogadinae). *Zookeys* 7402: 1-81. doi:10.3897/zookeys.7402.7402 2014.

Aguirre, H., S.R. Shaw, J.A. Berry, and C. de Sassi. Description and natural history of the first micropterous *Meteorus* species: *M. orocrambivorus* sp.n. (Hymenoptera, Braconidae, Euphorinae), endemic to New Zealand. *Journal of Hymenoptera Research* 38: 45–57 (2014), doi: 10.3897/JHR.38.7403 2014.

Shaw, Scott R. Bug Love. *The New York Times*, Sunday Review, Opinion, August 24, 2014, pages 6-7. Invited opinion article. 2014.

2013

- A. Latchininsky, R. Sivanpillai and F. Gapparov 2013. Mapping changes in the water bodies and vegetated areas of the Amudarya River Delta, Uzbekistan using Landsat data Editions Hermann Pp. 517-526 in: WATARID3 Usages et Politiques de l'Eau en zones arides et semi-arides. M-F Courel, T. Tashpolat and M. Taleghani, Eds.
- Latchininsky, Alexandre 2013. Locusts: and Remote Sensing: a Review Journal of Applied Remote Sensing Vol. 7: 32 pp.
- N. Bisadze, S. Jaronski, V. Khasdan, E. Abashidze, M. Abashidze, A. Latchininsky, D. Samadashvili, I. Sokhadze, M. Rippa, I. Ishaaya, A.R. Horowitz 2013. Joint action of Beauveria bassiana and the insect growth regulators diflubenzuron and novaluron, on the migratory locust, *Locusta migratoria* Journal of Pest Science 8 pp.
- Rashford, Benjamin, Ritten, John & Latchininsky, Alexandre 2013. Assessment of comprehensive values of Western Rangelands UW Extension
- J. Hastings and A. Latchininsky 2013. Early Assessment of Predictive Coverage of Approximate-Model-Based Adaptation HICSS 2014 6 pp.
- R.N. Foster, L.E. Jech, K.C. Reuter, L.R. Black, S.P. Schell, A.V. Latchininsky, D.E. Hill, B.A. Shambaugh, J.A. Gentle, B.D. Herring, & D. Asche. 2013. Determination of effective field dose of Chlorantraniliprole (Prevathon®) for control of rangeland grasshoppers Proceedings of the National Grasshopper Management Board Annual Meeting (electronic publication) Denver, CO, January 21-23, 2013
- J. G. FIDGEN, S. M. SALOM, and D. E. LEGG. 2013. A sequential sampling plan for counts of *Adelges tsugae* on eastern hemlock. Southern Journal of Applied Forestry 37: 75 - 80.
- Norton, J.B., H.R. Olsen, L.J. Jungst, D.E. Legg, and W.R. Horwath 2013. Soil carbon and nitrogen storage in alluvial wet meadows of the Southern Sierra Nevada Mountains, USA Journal of Soils and Sediments DOI 10.1007/s11368-013-0797-9. Published online: 31 October 2013

- Jones, G.Z. and S.R. Shaw. 2013. Ten new species of *Meteorus* (Hymenoptera: Braconidae) from Ecuador reared at the Yanayacu Biological Research Center for Creative Studies. *Zootaxa* 3547: 1-23.
- Shaw, S.R., P.M. Marsh, and M.A. Talluto 2013. Revision of North American *Aleiodes* (Part 9): the pallidator (Thunberg) species-group with description of two new species (Hymenoptera: Braconidae, Rogadinae). *Zootaxa* 3608 (3): 204-212. <http://dx.doi.org/10.11646/zootaxa.3608.3.4>
- Centrella, M.L. and S.R. Shaw 2013. Three new species of gall-associated *Allorhogas* wasps from Costa Rica (Hymenoptera: Braconidae: Doryctinae). *International Journal of Tropical Insect Science* 3686: 1-8. doi: 10.1017/S1742758413000143
- Mita, T. and S.R. Shaw 2013. A taxonomic study of the genus *Ettchellsia* Cameron (Hymenoptera: Megalyridae) with the description of three new species. *ZooKeys* 254: 99-108. doi: 10.3897/zookeys.254.4182.
- Aguirre, Helmut and Scott R. Shaw 2013. *Meteorus* Haliday (Hymenoptera: Braconidae) parasitoids of Pyralidae: description and biology of three new species and first record of *Meteorus desmiae* Zitani, 1998 from Ecuador. *Journal of Natural History*
- Castro, C.S. de, S.R. Shaw, and A.M. Pentead-Dias 2013. A new species of *Lissodoryctes* Marsh 2002 from Brazil (Hymenoptera: Braconidae: Doryctinae). *Entomological News* 123 (1): 1-4.
- Peters, J.M., N. Wolf, C.A. Stricker, T.R. Collier, and C. Martinez Del Rio. 2012. Trophic and metamorphic discrimination of hydrogen isotopes in cabbages (*Brassica oleracea*) and cabbage loopers (*Trichoplusia ni*): Implications for stable isotope ecology. *Integrative and Comparative Biology* 52: E309-E309
- Peters, J.M., N. Wolf, C.A. Stricker, T.R. Collier, and C. Martinez Del Rio. 2012. Effects of trophic level and metamorphosis on discrimination of hydrogen isotopes in a plant-herbivore system. *PloS One* 7(3): e32744.

Gapparov, Furkat, Latchininsky, Alexandre & Nurjanov, Allabergen 2012. Anthropogenic disturbances in the Aral Sea ecosystem and changes in grasshopper and locust (Orthoptera: Acridoidea) species complex. *Applied Entomology* Vol. III N2(8): 40-47

Gapparov, Furkat, Latchininsky, Alexandre & Govorov, Dmitri 2012. FAO UN workshop on locusts in Caucasus and Central Asia Plant Protection and Quarantine 2: 4-8

Rashford, Benjamin & Latchininsky, Alexandre 2012. Assessment of comprehensive values of Western rangelands NGMB 2012 annual meeting Proceedings (electronic publication)

Latchininsky, Alexandre 2012. FAO UN 5-year Program on locust management in Caucasus and Central Asia NGMB 2012 annual meeting Proceedings - electronic publication

Latchininsky, Alexandre 2012. Geospatial tools and locust IPM: The current state of the art 7th International IPM Symposium, Memphis, TN, March 2012. Proceedings, p. 47

Gapparov, Furkat, Sivanpillai, Ramesh & Latchininsky, Alexandre 2012. Remote sensing applications to locust monitoring and management in the Aral Sea region of Central Asia 7th International IPM Symposium, Memphis, TN, March 2012. Proceedings, p. 47

Mbugwa, G. W., J. M. Krall, and D. E. Legg 2012. Interference of Tifton burclover residues with growth of burclover and wheat seedlings. *Agronomy Journal* 104: 982 - 990.

Malherbe CR, Marquard J, Legg DE, Cammack CM, O'Toole D 2012. Right ventricular hypertrophy with heart failure in Holstein heifers at elevation of 1,600 m. *J Vet Diagn Invest.* 24(5):867-877.

Stoaks, R. D. and S. R. Shaw. 2012. Rediscovery and range extension of the stalk-eyed fly, *Sphyracephala subbifasciata* Fitch (Diptera: Diopsidae) in Colorado and Wyoming. *Journal of the Kansas Entomological Society* 84(3): 232-234.

Quicke, D., Smith, A., Janzen, D., Hallwachs, W., Fernandez, J., Laurenne, N., Zaldivar-Riveron, A., Shaw, M., Broad, G., Klopstein, S., Shaw, S.R., Hrcek, J., Rodriguez, J., Whitfield, J., Sharkey, M., Sharanowski, B., Jussila, R., Chesters, D., and Vogl 2012. Utility of the DNA barcoding gene fragment for parasitic wasp phylogeny (Hymenoptera: Ichneumonoidea): data release and new measure of taxonomic congruence. *Molecular Ecology Resources* 2012: 1-10. doi: 10.1111/j.1755-0998.2012.03143.x

Shaw, Scott R. 2012. A new genus and new species of Dinocampini (Hymenoptera: Braconidae: Euphorinae) from Napo province in Ecuador. *Journal of Tropical Insect Science* 32: 101-107. doi: 10.1017/S1742758412000112

Zaldivar-Riverón, A., J.J. Martínez, S.F. Ceccarelli and S.R. Shaw 2012. Five new species of doryctine parasitoid wasps of the genera *Lissopsius* Marsh, *Heerz* Marsh and *Ondigus* Braet, Barbalho and van Achterberg (Braconidae) from the Chamela-Cuixmala Biosphere Reserve in Jalisco, Mexico. *Zookeys* 164: 1-23. doi: 10.3897/zookeys.164.2201

Kula, R.R., O. Dix-Luna, and S.R. Shaw 2012. Review of *Ilatha* Fischer (Hymenoptera: Braconidae: Alysiinae) including descriptions of six new species and a key to species. *Proceedings of the Entomological Society of Washington* 114(3): 293-328. doi: <http://dx.doi.org/10.4289/0013-8797.114.3.293>

2011

Gasch, C. K., T. R. Collier, S. F. Enloe, & S. D. Prager. 2011. A GIS-based method for the analysis of digital rhizotron images. *Plant Root* 46-65.

Latchininsky A.V., Gapparov F.A., Utapov N. 2011. Improving locust control in Central Asia: ULV or full-volume spraying? *Plant Protection and Quarantine*, Issue 6: 5-10 in Russian w/English summary

Alexandre Latchininsky, Gregory Sword, Michael Sergeev, Maria Marta Cigliano, and Michel Lecoq 2011. Locusts and Grasshoppers: Behavior, Ecology, and Biogeography *Psyche*, Special issue Volume 2011, Article ID 578327, 4 pages doi:10.1155/2011/578327

Govorov, D., Latchininsky, A. & Gapparov F. 2011. International cooperation in locust control in Central Asia and Caucasus Plant Protection and Quarantine 2 (67-68)

Malko A.M., Govorov D.N., Latchininsky A.V. 2011. Plant protection from pest grasshoppers in the USA Plant Protection and Quarantine 11: 16-18.

Latchininsky A.V. & Gapparov F.A. 2011. Locusts problem in Central Asia St-Petersburg State University, Russian Entomological Society Proceedings of the international conference "Fundamental Problems of Entomology in the 21st century; St. Petersburg, 16-20 May, 2011, p. 30

Gatua wa Mbugwa,* James M. Krall, and David E. Legg 2011. Depth of sowing for 'Laramie' medic (*Medicago rigidula*) seedling emergence Journal of Sustainable Agriculture. 35:624-638.

Wu, D., and D. E. Legg 2011. Responses of benthic insect communities to effluent from the abandoned Ferris-Haggarty copper mine in southeast Wyoming Journal of Environmental Sciences 24: 1901-1910

Legg, D. E., J. G. Fidgen, and K. L. Ryall 2011. Computing union probabilities of many independent events: with a case study example on sampling of the invasive emerald ash borer, *Agrilus planipennis* web page URL: <http://w3.uwyo.edu/~dlegg/union2.html>

Barrantes, G., E. Triana, S. R. Shaw and G. Z. Jones. 2011. Characteristics of the cocoon and natural history of the gregarious *Meteorus restionis* sp. n. (Hymenoptera, Braconidae, Meteorinae) from Costa Rica. Journal of Hymenoptera Research 20: 9-21.

Vilhelmsen, L., Perrichot, V. and S. R. Shaw. 2011. Past and present diversity in the parasitic wasp family Megalyridae (Insecta: Hymenoptera). Systematic Entomology 35: 658-667. DOI: 10.1111/j.1365-3113.2010.00537.x

Aguirre Fernandez, H. C.E. Sarmiento, and S.R. Shaw. 2011. Taxonomic revision and morphometric analysis of *Meteorus Haliday 1835* (Hymenoptera: Braconidae: Meteorinae) from Colombia. Zootaxa 2938: 1-68. (taxonomic monograph)

Presentations by faculty, 2011-2015:

2015

Collier, T. 2011-2016. Weed Biological Control in Wyoming. Wyoming Weed and Pest Annual Fall Conference (presentations each year).

Latchininsky A.V. 2015 Biological control of grasshoppers: advances and obstacles. 11th ENTO Short Course, Laramie, WY. 19 March 2015.

Latchininsky A.V. 2015 A planet of insects: introduction to entomology. 11th ENTO Short Course, Laramie, WY. 17 March 2015..

Latchininsky A.V. 2015 Basics of grasshopper control. 11th ENTO Short Course, Laramie, WY. 18 March 2015..

Latchininsky A.V. 2015 How to use Peterson's Field Guide. 11th ENTO Short Course, Laramie, WY. 17 March 2015..

Latchininsky A.V. 2015 Locusts in Central Asia: an update. National Grasshopper Management Board annual meeting, Denver, CO. 22 January 2015..

Latchininsky A. 2015 Five-year Program to improve national and regional locust management in Caucasus and Central Asia. FAO UN International training on locust monitoring and information management. Kakheti, Georgia, 26 May 2015..

Latchininsky A. 2015 Locust and us. Overview of locusts in Caucasus (history and situation in the 21st century). Introduction to entomology. FAO UN International training on locust monitoring and information management. Kakheti, Georgia, 26 May 2015..

Latchininsky A. 2015 Biology and ecology of gregarious locusts in Caucasus: Italian Locust *Calliptamus italicus* (Linnaeus, 1758) and Moroccan Locust *Dociostaurus maroccanus* (Thunberg, 1815). FAO UN International training on locust monitoring and information management. Kakheti, Georgia, 26 May 2015..

- Latchininsky A. 2015 Basic principles and methods of locust control. Cultural, chemical and biological methods. Preventive approach. FAO UN International training on locust monitoring and information management. Kakheti, Georgia, 27 May 2015..
- Latchininsky A. 2015 Locust spraying techniques: ULV vs EC. FAO UN International training on locust monitoring and information management. Kakheti, Georgia, 27 May 2015..
- Latchininsky A. 2015 Basics of locust monitoring. Field methods of locust population assessment and sampling. FAO UN International training on locust monitoring and information management. Kakheti, Georgia, 27 May 2015..
- Latchininsky A. 2015 Standardization of locust information. The standard FАО locust survey form. FAO UN International training on locust monitoring and information management. Kakheti, Georgia, 27 May 2015..
- Latchininsky A. 2015 Analysis of standardized locust information. Basics of short, medium and long-term forecast of locust situation. Locust reporting and statistics. National locust bulletins. FAO UN International training on locust monitoring and information management. Kakheti, Georgia, 27 May 2015..
- Latchininsky A. 2015 Safety and environmental protection: how to mitigate risks to human health and the environment of locust treatments. FAO UN International training on locust monitoring and information management. Kakheti, Georgia, 27 May 2015..
- Latchininsky A. 2015 Remote sensing methods of locust information collection and their analysis. Use of satellites - for example, Eastern Siberia (Russia) and Lake Balkhash (Kazakhstan). Use of global positioning system (GPS). FAO UN International training on locust monitoring and information management. Kakheti, Georgia, 27 May 2015..
- Latchininsky A. 2015 Locusts and climate change. Current locust situation in the world: what's happening now?. FAO UN International training on locust monitoring and information management. Kakheti, Georgia, 28 May 2015..
- Latchininsky A. 2015 Use of Geographical Information System (GIS) for analysis and locust information management. Example from USA. FAO UN International training on locust monitoring and information management. Kakheti, Georgia, 28 May 2015..
- Latchininsky A. 2015 Environmental disaster in the Aral Sea and locust control effects in the region. Use of satellite information for monitoring of locust habitats. FAO UN International training on locust monitoring and information management. Kakheti, Georgia, 28 May 2015..

Latchininsky A. 2015 Field methods of locust surveys. Demonstration of field methods of population assessment, locust species and developmental stages. Workshop on filling in the FAO standard form survey. Practice on using GPS and ASDC. FAO UN International training on locust monitoring and information management. Kakheti, Georgia, 29 May 2015..

Latchininsky A. 2015 Master Gardener Entomology training. Fremont County Master Gardener program. .

Latchininsky A. 2015 Laramie County Master Gardener Entomology training. Cheyenne, WY. .

Fabian Loew and Alexandre Latchininsky. 2015 Application of Remote Sensing to locust monitoring in the Aral Sea zone, Uzbekistan. International Geography Union Conference. Moscow, Russia, 20 August 2015..

Latchininsky A.V. 2015 Aerial grasshopper control. Agricultural Aviation Association of Colorado annual convention, Loveland, CO. 11 November 2015..

Latchininsky A. 2015 Pollinators in Wyoming. Kiwanis Club, Laramie, WY. 8 September 2015..

Latchininsky A. 2015 Contingency planning of locust outbreaks: approaches and accomplishments. FAO UN International Workshop on Locust contingency planning. St. Petersburg, Russia, 29 October 2015..

Latchininsky A. 2015 Locust monographs on CIT, DMA and LMI. FAO UN International Technical Workshop on locusts in Caucasus and Central Asia. St. Petersburg, Russia, 1 November 2015..

Latchininsky A. 2015 Locusts and climate change: what to expect?. I.V. Stebaev Conference on Ecological Biogeography. Novosibirsk State University, Russia. 18 December 2015..

Karen Panter, Christopher Hilgert, Scott Schell, Bill Stump, Alex Latchininsky. 2015 Plants, Pests, and Pathogens. Statewide via zoom webinar, four different one-hour sessions on current problems on horticultural plants around Wyoming; held June 25, July 30, August 26, and September 24 in between 6 and 14 counties, depending on the date.

2014

Collier, T. 2014. Russian knapweed biological control using *Jaapiella ivannikovi*. W3185 Western Region Biological Control Multistate Project Meeting.

- Scott Schell & Alex Latchininsky. 2014. Master Gardener 3 hour Basic entomology program. Gillette MG for Hannah Hopp Feb. 1st, 2014.
- Scott Schell Alex Latchininsky. 2014. Master Gardener 3 hour Basic entomology program. Laramie County, Feb. 12th, 2014. for Catherine Wissner.
- Scott Schell, & Alex Latchininsky. 2014. Master Gardener 3 hour Basic entomology program. Rock Springs 22Feb2014.
- Scott Schell & Alex Latchininsky. 2014. Master Gardener 3 hour Basic entomology program. Evanston, Wyoming 9APR2014.
- Scott Schell & Alex Latchininsky. 2014. Master Gardener 3 hour Basic entomology program. Guernsey, WY 11MAR2014.
- S.P. Schell, R. Nelson Foster, L. E. Jech, K. C. Reuter and L. R. Black and A. V. Latchininsky. 2014. Initial analysis of diversity and abundance of non-target arthropod fauna collected during the 2012 field trial to determine the effective field dose of Chlorantraniliprole (Prevathon®) for control of rangeland grasshoppers. Annual National Grasshopper Management Board meeting, Denver, CO
- .
- Alex Latchininsky. 2014. Fremont County Master Gardener Entomology program. Titles presented by A. Latchininsky (6): Insects in the garden: pests or pets?; Order Lepidoptera; Plant damage by arthropods; Main orders of horticultural importance; Insect ID practice; How to use Pete. Riverton, WY. April 25.
- Wahid Dakhel & Alex Latchininsky. 2014. A case of non-diapausing embryonic development of *Melanoplus bivittatus*. National Grasshopper Management Board annual meeting 2014. Denver, CO, January 22.
- Alex Latchininsky. 2014. Locusts and us. Nukus, Uzbekistan. FAO UN Training on locust monitoring and information management, August.
- Alex Latchininsky. 2014. Biology and ecology of Migratory locust, *Locusta migratoria*. Nukus, Uzbekistan. FAO Training on locust monitoring and information management, August.
- Delina Dority, Andy Kulikowski, Scott R. Shaw, and Will Robinson. 2014. Cloud forest studies of mating and defensive behaviors of the parasitoid wasp, *Napo townsendi* Shaw (Hymenoptera: Braconidae: Euphorinae). University of Wyoming, Undergraduate Research Day, April 26, 2014. Supported by NSF REU and NSF ROA supplemental grant programs.

2013

Collier, T. 2013. Regulatory Aspects of Weed Biological Control (invited talk). National Association for Invasive Species Management and Awareness, Jackson, Wyoming.

Latchininsky. 2013. Introduction to Entomology. 9th ENTO Short Course, UW. 19 March 2013.

A. Latchininsky. 2013. Insects and Climate Change: What to Expect?. 9th ENTO Short Course, UW. 19 March 2013.

A. Latchininsky. 2013. Specimen handling. Insect identification to order. 9th ENTO Short Course, UW. 20 March 2013.

A. Latchininsky. 2013. Pesticide Spraying: Which Technology is Most Efficient?. 9th ENTO Short Course, UW. 21 March 2013.

A. Latchininsky. 2013. How to Attract and Protect Pollinators?. 9th ENTO Short Course, UW. 21 March 2013.

A. Latchininsky. 2013. Pollinator diversity. La Bonte Park pollinator expo. 17 June 2013.

R.N. Foster, L.E. Jech, K.C. Reuter, L.R. Black, S.P. Schell, A.V. Latchininsky, D.E. Hill, B.A. Shambaugh, J.A. Gentle, B.D. Herring, & D. Asche. 2013. Determination of effective field dose of Chlorantraniliprole (Prevathon®) for control of rangeland grasshoppers. National Grasshopper Management Board Annual Meeting. Denver, CO, January 22-23, 2013.

A. Latchininsky. 2013. The locusts are coming! How does climate change affect locust distribution and life strategies?. National Grasshopper Management Board Annual Meeting. Denver, CO, January 22-23, 2013.

A. Latchininsky. 2013. Locusts, grasshoppers and climate change. USDA-APHIS-CPHST. Phoenix, AZ.

A. Latchininsky. 2013. GIS in locust monitoring and management. International Training Course on Locust Monitoring and Information Management in Astrakhan, Russia. May 12-16, 2013.

2012

- Collier, T. and Meyers, K. 2012. Phenology of *Jaapiella ivannikovi*, a biological control agent for Russian knapweed. Annual Meeting of the Entomological Society of America.
- Latchininsky, Alexandre. 2012. Introduction to Entomology. 8th Annual University of Wyoming Entomology Short Course, Hilton Garden Inn, Laramie, WY. March 6, 2012.
- Schell, Scott & Latchininsky, Alexandre. 2012. Immature Insects. 8th Annual University of Wyoming Entomology Short Course, Hilton Garden Inn, Laramie, WY. March 6, 2012.
- Schell, Scott & Latchininsky, Alexandre. 2012. Insect Identification: Major Orders and Their Diagnostic Characters. 8th Annual University of Wyoming Entomology Short Course, Hilton Garden Inn, Laramie, WY. March 7, 2012.
- Latchininsky, Alexandre & Schell, Scott. 2012. Specimen Handling. 8th Annual University of Wyoming Entomology Short Course, Hilton Garden Inn, Laramie, WY. March 7, 2012.
- Latchininsky, Alexandre & Schell, Scott. 2012. Grasshopper control: What's New?. 8th Annual University of Wyoming Entomology Short Course, Hilton Garden Inn, Laramie, WY. March 7, 2012.
- Latchininsky, Alexandre. 2012. Natural Enemies of Grasshoppers. 8th Annual University of Wyoming Entomology Short Course, Hilton Garden Inn, Laramie, WY. March 7, 2012.
- Latchininsky, Alexandre. 2012. Habitats, life cycle and biology of Wyoming mosquitoes. Second annual Wyoming Mosquito Training Course, Laramie, WY. May 15, 2012.
- Latchininsky, Alexandre. 2012. FAO Five-Year locust program in Caucasus and Central Asia. National Grasshopper Management Board annual meeting 2012. Denver, CO, January 24, 2012.
- Latchininsky, Alexandre. 2012. Remote Sensing and Locusts: the Space Technology vs. the Ancient Enemy of Agriculturists. Center of Parasitological and Vector Studies (CEPAVE), La Plata, Argentina. 13 February 2012.
- Latchininsky, Alexandre. 2012. Peril in a Tropical Paradise: Grasshopper invasion impacts biodiversity on a tiny NW Hawaiian island. Museum of Natural History, University of La Plata, Argentina. 15 February 2012.

Shaw, Scott R. 2012. Into the cloud forests of Ecuador: where the wild things are. Harvard University, Museum of Comparative Zoology, October, 2012; and, Chamela Biosphere Reserve, Chamela, Mexico, November, 2012.

2011

Latchininsky, Alexandre. 2011. Workshop introduction. UW, Laramie, March 15, 2011. 7th Annual ENTO Short Course.

Latchininsky, Alexandre. 2011. Welcome to Alien Empire (Introduction to Entomology). UW, Laramie, WY, March 15, 2011. 7th Annual ENTO Short Course.

Latchininsky, Alexandre. 2011. Featured Order: Lepidoptera. UW, Laramie, WY, March 17, 2011. 7th Annual ENTO Short Course.

Schell, Scott & Latchininsky, Alexandre. 2011. Practice in Insect Identification. UW, Laramie, WY, March 16, 2011. 7th Annual ENTO Short Course.

Scott Schell, Alexandre Latchininsky. 2011. Schell, Scott & Latchininsky, Alexandre. 2011. Insect Identification for Master Gardeners. March 24. Gillette.

Scott Schell, Alexandre Latchininsky. 2011. 2011. Insect Identification for Master Gardeners. March 29. Wheatland.

Schell, Scott. 2011. Master Gardener Insect ID class. Evanston, May 14.

Schell, Scott. 2011. Master gardener insect ID class. Thermopolis April 28.

Latchininsky, Alexandre and Scott Schell. 2011. Reduced Agent and Area Treatments: Do More with Less. Visit of the Russian Ministry of Agriculture Delegation to UWyo, October 2011.

Latchininsky, Alexandre and Scott Schell. 2011. Butterflies and Moths. Riverton. Master Gardener Class.

Shaw, Scott R. 2011. Into the cloud forests of Ecuador: where the wild things are. UW Laramie campus and UW Casper College Center. Faculty Senate Speaker Series invited lecture.

iv. National/international awards

2015

Latchininsky: Best Poster Award, International Geography Union Conference, Moscow, August 2015. Title: Application of Remote Sensing to Migratory locust monitoring in the Aral Sea zone, Uzbekistan (with F. Loew)

2014

Shaw: My book, Planet of the Bugs, Evolution and Rise of the Insects, was selected by The Guardian as one of the Top Ten Science books of 2014. <http://www.theguardian.com/science/grrlscientist/2014/dec/17/the-best-science-books-of-2014-biological-sciences>

2012

Latchininsky: International Excellence in Integrated Pest Management Award for developing and delivering efficient, economic and environmentally less hazardous methods of grasshopper control on Western rangelands. Presented at 7th International IPM Symposium in Memphis, TN, March 2012.

v. Other

2015

Latchininsky received the University of Wyoming International Board of Advisors Faculty Award for Internationalization

2013

Latchininsky: Selection committee chair, Sir Boris Uvarov Award in Applied Acridology (2013)

Shaw: Nominated for UW Alumni Association Faculty Award by graduating senior Mary Centrella.

Shaw: One of my participating NSF-RET science teachers, Ms. Laurie Graves of Sheridan, was awarded the Presidential Award for Mathematics and Science Teaching, the highest honor given to U.S. teachers. I nominated Ms. Graves for the award, based on her work with our Biodiversity Project in Ecuador. She wins a \$10,000 award and a 3-day trip to Washington D.C.

Shaw: 2013, Research Associate, Museum of Comparative Zoology, Harvard University.

Shaw: 2013, honorary patronym, *Allorhogas scotti*, named by J.J. Martinez and A. Zaldivar-Riveron, a new wasp species from Chamela Biosphere Reserve, Mexico.

Shaw: 2013, honorary patronym, *Heterospilus shawi*, named by Dr. P. M. Marsh, Systematic Entomology Laboratory (retired), a Costa Rican wasp.

2012

Latchininsky: Fall 2012 semester UW Faculty Senate Speaker Award; Lecture on the Aral Sea ecological catastrophe. Two presentations, one at Casper college (November 1), the other at UW campus (November 29).

2011

Shaw: Outstanding Educator Award, UW College of Agriculture and Natural Resources, awarded December 2010.

Shaw: Nominated for Ellbogen Meritorious Teaching Award, spring semester 2011.

Shaw: Faculty Senate Speaker Series invited speaker, selected May 2011 for fall semester.

Shaw: 2011, Research Associate, Museum of Comparative Zoology, Harvard University

Shaw: Awarded a collection development budget of \$5,000 from the Berry Biodiversity Conservation Center to enhance the UW Insect Museum's collection, May 2011.

c. Program reputation

- i. If program is ranked, include rank and by what organization. N/A
- ii. Include a brief description of any other indicators of program reputation such as demand (e.g. waiting lists or over enrollment) for admission into program, employer data/feedback, etc.

d. Curriculum of major or specialization

- i. Include a list of courses by prefix, number, title required in the major or specialization (do not include general education course unless required as part of the major requirements.)

ENTO 5300 - Applied Insect Ecology (3 credits)
ENTO 5678 - Aquatic Entomology (3 credits)
ENTO 5682 - Insect Anatomy/Physiology (5 credits)
ENTO 5684 - Classification of Insects (4 credits)
ENTO 5687 - Insect Evolution (3 credits)
ENTO 5884 - Insect Behavior (3 credits)

- e. Distance delivery of program/major
 - i. None
- f. Quality of Assessment Plan/data. There are four components to the assessment plan for the MS program in Entomology
 - i. Informal review. Faculty are engaged in ongoing dialogue with the head and as a unit to ensure that adequate and appropriate courses are being taught and that students are receiving appropriate mentoring.
 - ii. Annual student evaluation. The students are reviewed annually by their major advisor using a rubric provided by the department. Continuation of funding and graduate school is contingent on adequate progress.
 - iii. Committee review. At the conclusion of the students' MS, each member of the graduate committee fills in a rubric that evaluates the student based on a range of metrics including (a) knowledge content; (b) communication ability; (c) professionalism / readiness; (d) intellectual contributions
 - iv. Student review. At the conclusion of the student's program the student is asked to meet with the department head for an exit interview, at which point the student provides feedback regarding his/her experience, workplace readiness, job prospects, overall satisfaction with the UW experience, and more.
- g. Strategic Plan
 - i. Include a brief description of any plans for the program or specialization that appear in the college/department strategic plan (i.e., facilities upgrades, curriculum changes, on-line or off-campus delivery, enrichment learning opportunities, etc.)
- h. Other:

3. Mission Centrality: Does the program advance the mission of UW including institutional strategy?

- a. Describe how the program supports the mission, vision and strategic goals of UW.

The Entomology MS program supports multiple goals from the most recent draft of the University strategic plan. After graduation, entomology MS students have taken jobs that contribute to the well-being of Wyoming citizens, particularly citizens involved in agriculture (see below). The Entomology MS program provides critical training in pest management that students need for future jobs in agriculture out in the state and beyond. During their programs, Entomology MS students conduct applied research that directly benefits Wyoming citizens involved in agriculture. Statewide engagement by Entomology faculty and graduate students with K12 educators also benefits Wyoming citizens. The Entomology MS program is an important component of two areas of distinction: STEM and Environment, Agriculture and Natural Resources.

- b. Describe how the program contributes to other programs across campus (i.e., general education courses, minor or support courses, interdisciplinary program, etc.)

Graduate courses in Entomology are taken by MS and PhD students in Agronomy, Ecology and Zoology and Physiology.

Graduate students in these outside disciplines often have an entomological focus to their research and require training that is provided by Entomology coursework. Students from several other departments (Zoology & Physiology, Plant Sciences, Botany, PiE) take courses in Entomology to gain a better understanding of the physiology, ecology and role of insects.

- c. Include placement data for graduates and indicate if graduates are working in the field or not.

All the recent MS graduates listed below are using their entomological skills in their chosen field.

- Kathleen Meyers – employed by the U.S. Dept. of Agriculture, Agricultural Plant Health Inspection Service, Plant Protection and Quarantine, Cheyenne, WY.
- Kelsey Swanson – works at the Wisconsin Game and Fish
- Megan Wilson – now a PhD student in ecology, UW
- Travis Gilchrist - works as US Army Entomologist, rank - captain.
- Arthur Kneeland - works as lecturer in Biology at U. of Wisconsin - Stout.
- Jerod Smith - works at Colorado cattlemen trust
- * Luis Felipe Almeida – visiting student from Brazil, mentored at UW for much of 2014, completed MS in entomology
- * Blanca Andrea Rodriguez Jimenez – visiting student from Colombia (2012-2015). Completed MSc in Biological Sciences from the Universidad Nacional de Colombia, Bogota

- d. Describe the uniqueness or duplication of this program across the UW.

The Entomology MS program is completely unique at the University. Faculty and students in the department take courses within other departments to fulfill science requirements for their research, but there is no duplicate effort being undertaken by other department or colleges.

e. Other: Nothing to report

4. **Cost: Is the program financially viable?**

a. Ratio of student credit hours per FTE.

Faculty job descriptions:

Last Name	First Name	Program	Teaching	Research	Extension	Service
Collier	Tim	ENTO	18	52	0	30
Latchininsky	Alex	ENTO	0	34	58	8
Legg	David	ENTO	47	0	0	53
Shaw	Scott	ENTO	40	40	0	20

Full-time faculty: 4.0

Faculty FTE (instruction): 1.05

Average SCH / yr: 429.67

Ratio: SCH/FTE: $(429.67 / 1.05) = 409.2$

b. Direct instructional expenditures: The department allocates annual funding based on faculty teaching appointments and laboratory requirements. Prior expenses are hard to quantify prior to 2015, but for FY 2015, entomology faculty were allocated \$3,391.12.

i. Per student credit hour

$$1. \$3,391.12 / 469.9 = \$7.22$$

ii. Per total degrees awarded

$$1. (\$3,391 * 5) / 6 = \$2,825$$

c. Course enrollment

i. Number of classes falling under University minimums. **One class** failed to meet minimum requirements but was still held. In several cases dual listed 4000/5000 courses were held when the graduate section of the course was below the minimum since the combined numbers justified the course going forward.

- ii. Lower-division courses falling under University minimums. **None**

- d. Other instructional cost drivers, such as:
 - i. Section fill rates
 - ii. Course completion rates
 - iii. Curricular complexity
 - iv. Faculty course load. Faculty in the Entomology department have fulfilled their teaching expectations according to their job descriptions and over the past five years all courses that have been offered in the bulletin have been taught by entomologists. We have not spent any money on contract hires to teach classes.

- e. Research expenditures per tenured/tenure-track FTE (and other academic personnel, where appropriate)

- f. Compare your data to national benchmarks (Delaware data). Not available.

- g. Other: The Department of Ecosystem Science and Management fully supports the Entomology MS degree program. Faculty in the program are highly regarded in their discipline and pursue excellence in education, research, and extension. The University expenses regarding this degree program are minimal, with a high return from the faculty in terms of academic engagement and research income. The Department has lost faculty members over the years without replacement, and the existing faculty have been shouldering a strong program for many years. Faculty in the program support numerous PhD students, and the MS program occasionally goes through lower enrollment numbers as faculty acquire grants and focus their attentions on PhD students, but the quality of the MS students has always remained high as evidenced by the excellent track record of placement in their chosen field and activity in entomology post-graduation.