A. Cover Page

1. Project Title: Development of a management program for voles in alfalfa.

2. Project Leaders:

Roger A. Baldwin, Ph.D.
Cooperative Extension Specialist
Dept. Wildlife, Fish, and Conservation Biology
One Shields Ave.
University of California, Davis
Davis, CA 95616
Phone: 530-752-4551
E-mail: rabaldwin@ucdavis.edu

3. Cooperators: NA

4. CDFA Funding Request Amount/Other Funding: PY 1 (2021-2022) = $89,046

5. Agreement Manager:

Grace I. Liu, J.D.
Associate Director, Research Administration
Sponsored Programs
1850 Research Park Drive, Suite 300
University of California, Davis
Davis, CA 95618
Phone: 530-754-7700
E-mail: awards@ucdavis.edu

B. Executive Summary

1. Problem: Alfalfa is an important commodity in California, valued at ~$770 million in 2018 (California Agricultural Statistics Review 2018-2019). Voles (*Microtus* spp.) cause extensive damage in alfalfa fields in California, with average losses in revenue estimated at 11.3% when voles are present (Baldwin et al. 2014b). Integrated Pest Management (IPM) programs are generally considered the best strategy for managing rodent damage in agricultural fields, but they rely on monitoring tools to identify when management actions are needed. Likewise, effective monitoring strategies are needed to test the efficacy of potential management tools, yet they are lacking in alfalfa and other hay crops. Limited management tools are available for controlling vole numbers in alfalfa, with zinc phosphide applications the most frequently used approach (Baldwin et al. 2014b). Alternative strategies are needed given potential bait avoidance issues with zinc phosphide (Marsh 1987). Targeted burrow flooding may be one potential tool, but rigorous testing is needed to assess the validity of this management strategy.

2. Objectives, Approach, and Evaluation: There are multiple objectives for this project. They include: 1) determining an effective attractant for voles, 2) developing an indexing approach that accurately reflects vole abundance in alfalfa fields, and 3) assessing the effectiveness of burrow flooding as a vole management strategy. To accomplish this, I will first identify one of three attractants from three separate classes of attractants (grain, vegetative, and commercial) that are most attractive to voles (Objective 1a). From there,

I will assess which of these three "finalists" are most attractive to voles (Objective 1b). I will then use that attractant to help develop an effective indexing approach for monitoring voles that will include some combination of remote-triggered cameras, tracking tunnels, chewing blocks, live trapping, and snap trapping (Objective 2). This indexing approach will allow me to compare vole activity before and after various treatment strategies to assess efficacy. The first of these treatment strategies that I will test is the impact of burrow flooding on vole survival. In addition, I will use radiocollared voles as a second measure of efficacy, as well as to assess potential vole displacement from treated areas (Objective 3). I will consider this project a success if: 1) I am able to identify at least one indexing strategy that accurately reflects vole populations in alfalfa fields, and 2) I am able to provide a good estimate of efficacy of targeted burrow flooding as a potential vole management tool. This information will then be used in a subsequent proposal to test additional management strategies, ultimately resulting in an IPM program to reduce vole damage in alfalfa.

3. Audience: Alfalfa growers are expected to be the primary beneficiaries of this project. This could have a substantial impact to California agriculture given the importance of alfalfa in the state. Although this research is targeted toward alfalfa fields, the results may be applicable to other similar field crop systems as well, thereby increasing the value of this project.

C. Justification

1. CDFA VPCRAC Mission and Responsibilities: At previous meetings, VPCRAC has identified projects that lead to effective management of voles in alfalfa and associated hay crops as a top priority. This proposed project will begin to address this need by first developing indexing strategies that will allow growers to assess changes in vole activity over time, as well as to allow researchers to determine the efficacy of various management programs for voles. I will then use this indexing strategy or strategies to assess the efficacy of targeted burrow flooding as a management tool for voles. This information will serve as the foundation for future research aimed at developing and testing the efficacy of alternative management strategies, ultimately allowing for the development of an IPM program for managing voles in alfalfa and similar hay crops. It is important to note that voles cause extensive agricultural damage throughout California and globally, not just in alfalfa, but in other crops as well (e.g., Jacob and Tkadlec 2010, Baldwin et al. 2014b). Therefore, results from this project may have substantial applicability across many crops in California, and potentially to other parts of the U.S. and globally. As such, this proposal fits very squarely within the VPCRAC mission.

2. Impact: Alfalfa is one of the most important commodities grown in California, with hay the 14th highest valued agricultural commodity in 2018 ($770 million; California Agricultural Statistics Review 2018-2019). Voles cause extensive damage to alfalfa through direct consumption of roots and aboveground vegetation (Clark 1984), with a recent study indicating an 11.3% loss in revenue to alfalfa growers when voles were present (Baldwin et al. 2014b). Voles are not just a California problem, with substantial losses in alfalfa reported in other parts of the U.S. and globally (e.g., Babińska-Werka 1979, Pugh et al. 2003). Effective management tools are needed to minimize vole

damage in hay fields, yet options are quite limited (Baldwin et al. 2014b, Jacob et al. 2020).

In order to develop and test new strategies for vole management, we first need to have an effective approach for monitoring vole numbers in fields, yet voles can be difficult to monitor at times. Common strategies have involved live trapping, snap trapping, remote-triggered cameras, chewing indices (cards or wax blocks), tracking plates or tunnels, and direct observation of vole activity (i.e., burrow entrances, foraging damage, etc.; Clark 1984, Whisson et al. 2005, Jareño et al. 2014, Engeman et al. 2016, Villette et al. 2016). Mark-recapture efforts associated with live-trapping are often considered the gold standard for assessing changes in populations over time, but they are expensive and time-consuming to implement and rely on assumptions that can be difficult to meet (Engeman 2005, Jareño et al. 2014). Rather, the development of an indexing approach that is user friendly, cost-effective, exhibits minimal observer bias, and has minimal assumptions while being sensitive to population changes is needed to assess the status of vole populations in a given area, while also allowing researchers to test the efficacy of various management actions (Engeman and Witmer 2000). Such indices have been created for voles in artichoke fields, but artichoke fields are substantially different from alfalfa fields. Indices should be verified in substantially new settings to ensure their validity for use (Engeman and Witmer 2000). This proposed project would hopefully yield an effective monitoring strategy for voles that could be used to test subsequent management tools, while also allowing growers to track changes in vole activity over time.

One tool that could be effective at reducing vole numbers in a field is burrow flooding. Flooding has been shown to negatively affect vole numbers in other agricultural systems (Jacob 2003, Golet et al. 2013, Bertolino et al. 2015). The effectiveness of flood irrigation could be increased by encouraging predator use of these areas to predate on escaping rodents (Haim et al. 2007). Traditionally, flood irrigation occurs by flooding the entire field. However, limits on water availability have substantially curtailed the use of flood irrigation in California over the last several decades. I am proposing to look at an alternative burrow flooding strategy that would combine the voles need to escape from flooding events along with lethal removal of escaping voles by field personnel as an alternative strategy for reducing vole numbers in alfalfa fields. If effective, this could serve as one part of an IPM program for reducing vole numbers in alfalfa fields.

3. Long-Term Solutions: Voles cause extensive damage to hay fields in California. The primary tool to manage voles in alfalfa is zinc phosphide bait applications (Baldwin et al. 2014b). However, zinc phosphide can only be used at most, twice per year in alfalfa. Furthermore, voles often exhibit bait shyness when exposed to zinc phosphide, thereby limiting its effectiveness in some settings (Marsh 1987). A more comprehensive management program is needed to effectively manage voles (Witmer et al. 2009, Jacob et al. 2020). This project will provide information on effective tools for monitoring vole populations in hay fields. This will benefit both my ability to assess efficacy of potential management tools, but also will allow growers to more effectively monitor changes in vole numbers over time. Secondly, I will begin to assess the effectiveness of potential management tools by first addressing the efficacy of burrow flooding. Additional research is planned for the future that will look at other strategies for reducing vole

numbers in fields (e.g., combination fencing and traps and multiple rodenticide application strategies). Collectively, I plan to incorporate all of this information together into an IPM program that will allow growers to more effectively manage voles in hay crops.

4. Related Research: A few studies have attempted to index vole populations in California over the last several decades. Traditional approaches have often focused on snap trapping (e.g., Clark 1984). However, a rigorous assessment is not available to assess its ability to track changes in vole activity over time. Chew cards, wax monitoring blocks, and tracking plates were compared to known numbers of California voles in penned and grassland field tests at UC Davis, with both wax monitoring blocks and tracking plates strongly correlated to population size (Whisson et al. 2005). Engeman et al. (2016) determined that wax monitoring blocks effectively tracked vole activity in artichoke fields, while several other studies have shown remote-triggered cameras to be effective at monitoring a number of rodent species (e.g., Engeman et al. 2006, Baldwin et al. 2014a, Villette et al. 2016). As such, I believe that tracking tunnels, remote-triggered cameras, wax monitoring blocks, and snap trapping could all be viable monitoring tools and worthy of investigation in this study.

   One tool that may potentially be included into vole IPM programs is flood irrigation. Bertolino et al. (2015) noted that flood irrigation significantly reduced Savi's pine vole (*Microtus savii*) numbers in apple orchards in Italy. Likewise, Jacob (2003) determined that flooded grasslands negatively affected common voles (*Microtus arvalis*), but did not reduce bank vole (*Clethrionomys glareolus*) numbers in Germany. Burrow flooding via flood irrigation is occasionally referenced as a tool to help manage voles in alfalfa fields in the western U.S. (Baldwin 2015), yet the efficacy of this approach has not been thoroughly tested for California (*Microtus californicus*) or montane voles (*Microtus montanus*). Additionally, the PI is not aware of any study that has looked at targeted burrow flooding as a potential vole management approach. Currently, some growers have used this approach in Scott Valley in Siskiyou County, California (B. Fawaz, *pers. comm.*). General observations by these growers have indicated some success associated with this management approach, but rigorous testing is needed to validate this assessment.

5. Contribution to Knowledge Base: Voles cause extensive damage in a number of crops, but perhaps none more so than in alfalfa and similar hay crops (Baldwin et al. 2014b). Understanding when to implement rodent management programs depends on effective monitoring tools (Engeman 2005, Jareño et al. 2014), yet voles can be a particularly difficult rodent to monitor, as low-density populations can explode into high-density populations over a couple of months (Pugh et al. 2003). This is particularly true in alfalfa, where thick vegetation can hide increasing vole populations until after cuttings. Therefore, an effective strategy to monitor voles is needed both for growers to monitor vole activity within fields, but also for researchers to determine the efficacy of various management tools (Whisson et al. 2005, Engeman et al. 2016). This proposed study provides a thorough assessment of several indexing tools. Successful indexing tools will then be used to determine if targeted burrow flooding is an effective strategy at removing voles from alfalfa fields. I hope to use this information in a subsequent study that will

develop and test alternative management strategies for vole control, ultimately providing the basis for the development of an IPM program for this damaging rodent species.

6. Grower Use: Alfalfa is one of the most important commodities grown in California, with hay the 14th highest revenue-generating agricultural commodity ($770 million; California Agricultural Statistics Review 2018-2019). Voles cause extensive damage to alfalfa through direct consumption of roots and aboveground vegetation. I aim to identify an effective indexing approach for monitoring vole abundance, which is needed to test the efficacy of various management strategies to help combat this damage. Furthermore, I will identify the effectiveness of targeted burrow flooding as a management tool for voles. I anticipate growers readily adopting efficacious management tools into an IPM program, ultimately allowing for increased crop production. Although this research is targeted toward hay fields, the results may be applicable to other crop systems as well, thereby increasing the value of this project.

Literature Cited

Babińska-Werka, J. 1979. Effects of common vole on alfalfa crop. Acta Theriologica 24:281–297.

Baldwin, R. A. 2015. Developing an IPM program for controlling pocket gophers and voles in alfalfa. In: Proceedings, 2015 Western States Alfalfa and Forage Symposium, Reno, NV.

Baldwin, R. A., N. Quinn, D. H. Davis, and R. M. Engeman. 2014a. Effectiveness of rodenticides for managing invasive roof rats and native deer mice in orchards. Environmental Science and Pollution Research 21:5795–5802.

Baldwin, R. A., T. P. Salmon, R. H. Schmidt, and R. M. Timm. 2014b. Perceived damage and areas of needed research for wildlife pests of California agriculture. Integrative Zoology 9:265–279.

Bertolino, S., L. Asteggiano, M. A. Saladini, L. Giordani, G. Vittone, and A. Alma. 2015. Environmental factors and agronomic practices associated with Savi's pine vole abundance in Italian apple orchards. Journal of Pest Science 88:135–142.

Clark, J. P. 1984. Vole control in field crops. Proceedings of the Vertebrate Pest Conference 11:5–6.

Engeman, R. M. 2005. Indexing principles and a widely applicable paradigm for indexing animal populations. Wildlife Research 32:203–210.

Engeman, R. M., R. A. Baldwin, and D. I. Stetson. 2016. Guiding the management of an agricultural pest: indexing abundance of California meadow voles in artichoke fields. Crop Protection 88:53–57.

Engeman, R. M., and G. W. Witmer. 2000. IPM strategies: Indexing difficult to monitor populations of pest species. Proceedings of the Vertebrate Pest Conference 19:183–189.

Engeman, R. M., J. W. Woolard, N. D. Perry, G. Witmer, S. Hardin, L. Brashears, H. Smith, B. Muiznieks, and B. Constantin. 2006. Rapid assessment for a new invasive species threat: the case of the Gambian giant pouched rat in Florida. Wildlife Research 33:439–448.

Golet, G. H., J. W. Hunt, and D. Koenig. 2013. Decline and recovery of small mammals after flooding: implications for pest management and floodplain community dynamics. River Research and Applications 29:183–194.

Haim, A., U. Shanas, O. Brandes, and A. Gilboa. 2007. Suggesting the use of integrated methods for vole population management in alfalfa fields. Integrative Zoology 2:184–190.

Jacob, J. 2003. The response of small mammal populations to flooding. Mammalian Biology 68:102–111.

Jacob, J., C. Imholt, C. Caminero-Saldaña, G. Couval, P. Giraudoux, S. Herrero-Cófreces, G. Horváth, J. J. Luque-Larena, E. Tkadlec, and E. Wymenga. 2020. Europe-wide outbreaks of common voles in 2019. Journal of Pest Science 93:703–709.

Jacob, J., and E. Tkadlec. 2010. Rodent outbreaks in Europe: dynamics and damage. Pages 207–224 *in* G. Singleton, S. Belmain, P. R. Brown, and B. Hardy, eds. Rodent Outbreaks: Ecology and Impacts. International Rice Research Institute, Los Baños, Philippines.

Jareño, D., J. Viñuela, J. J. Luque-Larena, L. Arroyo, B. Arroyo, and F. Mougeot. 2014. A comparison of methods for estimating common vole (*Microtus arvalis*) abundance in agricultural habitats. Ecological Indicators 36:111–119.

Marsh, R. E. 1987. Relevant characteristics of zinc phosphide as a rodenticide. Proceedings of the Great Plains Wildlife Damage Control Workshop 8:70–74.

Pugh, S. R., S. Johnson, and R. H. Tamarin. 2003. Voles. Pages 349–370 *in* G. A. Feldhamer, B. C. Thompson, and J. A. Chapman, eds. Wild Mammals of North America: Biology, Management, and Conservation. John Hopkins University Press, Baltimore, Maryland.

Villette, P., C. J. Krebs, T. S. Jung, and R. Boonstra. 2016. Can camera trapping provide accurate estimates of small mammal (*Myodes rutilus* and *Peromyscus maniculatus*) density in the boreal forest? Journal of Mammalogy 97:32–40.

Whisson, D. A., R, M. Engeman, and K. Collins. 2005. Developing relative abundance techniques (RATs) for monitoring rodent populations. Wildlife Research 2005:239–244.

Witmer, G. W., N. P. Snow, L. Humberg, and T. Salmon. 2009. Vole problems, management options, and research needs in the United States. Proceedings of the Wildlife Damage Management Conference 13:235–249.

D. Objectives: There are multiple objectives for this project. They include: 1) determining an effective attractant for voles, 2) developing an indexing approach that accurately reflects vole abundance in alfalfa fields, and 3) assessing the effectiveness of burrow flooding as a vole management strategy.

E. Work Plans and Methods (project dates: Sep 1, 2021 to Dec 31, 2022)

1. Work Plan: This proposed project is part of a longer-term tiered project. The initial goal as highlighted in this proposal is to develop effective strategies for monitoring changes in population size. This will involve a tiered process. The first Objective (1a) will be to identify one of 3 attractants from 3 separate classes of attractants (grain, vegetative, and commercial) that are most attractive to voles. From there, I will assess which of these three "finalists" are most attractive to voles (Objective 1b). I will then use that attractant to help develop an effective indexing approach for monitoring voles that will include some combination of remote-triggered cameras, tracking tunnels, chewing blocks, live trapping, and snap trapping (Objective 2). This indexing approach will allow me to compare vole activity before and after various treatment strategies to assess efficacy. The first of these treatment strategies that I will test is the impact of targeted burrow flooding on vole survival. In addition, I will use radiocollared voles as a second measure of efficacy, as well as to assess potential vole displacement from treated areas. I anticipate fieldwork initiating in early October 2021 and concluding in March or April 2022. The final product for the first part of this study will be the development of an indexing tool that will allow us to assess changes in population size following implementation of vole management strategies. The second product will be an assessment of the efficacy of targeted burrow flooding as a management tool. My final task will be the completion of our final report for this project. I anticipate a completion of analyses and the final report by December 31, 2022. This information will then be used to develop a proposal to explore additional management tools, ultimately allowing for the creation of an integrated management program to more effectively control voles in alfalfa.

2. Methods: I plan to initially test 9 different attractants to see if any result in greater visitation. These 9 attractants will be broken down into 3 categories: 1) grain (oat groats, peanut butter and oat groats, and maltose-coated oat groats [Schlötelburg et al. 2018], 2) vegetative (cabbage, carrot, and apple), and 3) commercial (two wax block formulations and a sachet). I will initially test their attractiveness by establishing a 3 × 3 grid (grid points separated by 50 m) across 5 fields. I will randomly assign one attractant category (i.e., grain, vegetative, and commercial) to each grid point, and I will ensure that each attractant category is assigned to 3 grid points per field. At each grid point, each of the 3 attractants for a given category will randomly be assigned in a linear line, with each attractant located 2 m apart. Each attractant will have a remote-triggered camera targeted at it, with the camera set to record 10-s videos. The cameras will be set with a 5-min delay after activation to reduce the impact of repeat visits to the attractant (Baldwin et al. 2014). Cameras will be operated for 2 days, with the attractant checked daily to replace any that might go missing. I will record the number of visits to each of the 3 paired attractants to determine any potential preference for a given attractant.

   Upon completion of the initial trial, I will determine which of the 3 attractants within each of the 3 attractant categories is most attractive. If no difference is found for a given category, I will select the easiest to use in subsequent trials. I will then test these 3 attractants in the same manner as the previous trial. This will allow us to determine which of the attractants works best for indexing trials. Again, if no difference is noted, I will use the attractant deemed easiest to use.

For indexing trials, I will establish three 5 × 5 grids per field to operate tracking tunnels, chewing indices, and remote-triggered cameras to assess vole activity in each plot. The points on the grid will be separated by 6 m. A 10-m buffer zone will be located on the outside of the plot for a total area of 0.19 ha per plot (Engeman et al. 2016). Each indexing plot will be located a minimum of 50 m from the next closest plot to maintain independence. For the tracking tunnel and remote-triggered camera plots, I will use the attractant deemed most desirable in the above-listed approach. For chewing indices, I will use wax monitoring blocks given the ease of comparing weights at the start and end of the trial period. These indexing tools will be operated for 2 days. Following the completion of this indexing period, I will live-trap voles by placing 2 live traps at each grid point. Traps will be checked daily, with new captures ear tagged for individual identification. This process will be repeated for up to 7 days per site, or until no new captures occur.

At the conclusion of the live-trapping period, I will place a single snap trap on the closest runway to each grid point for each indexing plot. The trap will be baited either with peanut butter or with the preferred attractant from the previous trials if possible. Traps will be checked daily to reset, and will be operated for 7 nights. This whole process will be repeated at 4 more sites, for a total of 5 sampled sites.

In early 2022, I will test the impact that burrow flooding has on vole survival. For this, I will capture and collar 13 voles per field with standard VHF radiotransmitters to track movements and survival. Voles will be tracked a minimum of 5 days prior to treatment application to allow them to become accustomed to wearing the collar. I will also conduct indexing trials at 2 separate locations per field to allow for a before and after comparison. Growers will then flood individual burrow openings through the use of a hand-held hose attached to a center-pivot irrigation system. This causes voles to move aboveground where they may be removed by predators, farm dogs, or by farm workers. I will monitor for mortality of voles from this approach via the use of the radiotransmitters, and will conduct indexing trials 4 days after the completion of the burrow flooding event to assess efficacy. I will continue to track surviving voles for 1-2 weeks post-treatment to determine any residual mortality, as well as potential displacement from the flooding event. This process will be repeated across 2 additional fields for a total of 3 test sites.

3. <u>Experimental Site:</u> Treatment sites will be determined at the time of the study based on current vole activity in alfalfa fields. That said, I anticipate sites occurring in or around Scott Valley in Siskiyou County.

<u>Literature Cited</u>

Baldwin, R. A., N. Quinn, D. H. Davis, and R. M. Engeman. 2014. Effectiveness of rodenticides for managing invasive roof rats and native deer mice in orchards. Environmental Science and Pollution Research 21:5795–5802.

Engeman, R. M., R. A. Baldwin, and D. I. Stetson. 2016. Guiding the management of an agricultural pest: indexing abundance of California meadow voles in artichoke fields. Crop Protection 88:53–57.

Schlötelburg, A., G. Jakob, S. Bellingrath-Kimura, and J. Jacob. 2018. Applied Animal Behaviour Science 208:75–81.

F. Project Management, Evaluation, and Outreach

1. Management: R. Baldwin will serve as the PI for the project and will oversee all aspects of the project. He will utilize staff members to conduct most field aspects of the project.

2. Evaluation: Success for this project will depend on my ability to identify one or more strategies that are effective at tracking vole numbers. Such an index will then allow me to test the efficacy of various methods for reducing vole numbers in alfalfa fields. The first such tool that I will assess is burrow flooding, but I ultimately plan to test efficacy of multiple rodenticides and potentially repellents and fence/trap combinations as well. I also plan to assess how vole movement patterns could provide insight into a more effective vole management strategy. Collectively, this would allow me to combine that information into an IPM program that would allow for safe, practical, efficacious, and sustainable vole management. Such future activities and evaluation are beyond the scope of this proposed project, though. That said, long-term cost of management programs would be key, as high costs would pose a substantial barrier to implementation of such an IPM program.

G. Budget Narrative

Personnel Expenses

Salaries - $27,436: *Salary costs use fiscal year 2020/2021 (July 1, 2021 through July 31, 2021) rates.*

Ryan Meinerz (Staff Research Associate II): Ryan will largely lead coordination of data collection. This will include travel to field sites to conduct all aspects of this study. Extensive lab time will be required for analyzing data as well. Effort is estimated at 1,044 hours for year 1 at a wage of $26.28 for 2021-22. This is equivalent to 100% time for 6 months (PY1 = $27,436).

Fringe Benefits - $14,569: *Employee Benefits are based on Federally Approved Composite Benefit Rates. The University of California's current Composite Benefit Rates have been federally reviewed and approved through June 30, 2021.*

Ryan Meinerz (Staff Research Associate II): Fringe benefits calculated at 53.1% for 2021/22 (PY1 = $14,569).

Operating Expenses

Supplies - $11,908:

VHF radiocollars ($223/collar × 39 collars = $8,697)

Lithium AA batteries for remote-triggered cameras ($30/pack × 10 packs = $300)

Remote-triggered cameras (7 × $330/camera = $2,310)

SD cards for cameras (7 × $11/card = $77)

Bait/attractants for trials ($150)

Snap traps (165 traps × $0.75/trap = $124)

Bedding for traps ($50)

Chemical immobilization materials ($50)

Miscellaneous field items (e.g., flags, flagging tape, cable ties, Ziploc bags, data notebooks, etc. = $150)

Equipment:
N/A

Travel - $22,760:
Trip 1: From Oct 9 to Oct 20, SRA II will travel from Davis to anticipated field site in the Etna area (TBD). This travel will correspond with site establishment and data collection for first part of the attractant trial. Mileage will include travel to hotel, as well as to field sites in each area (anticipated at 1,000 miles round trip). Mileage is for a rental vehicle ($0.29/mile). The trip is anticipated to be 12 days/11 nights in duration with hotel ($110/night for 11 nights) and meals ($35/day x 12 days per trip) associated with this trip (PY1 = $1,920).

Trip 2: From Oct 10 to Oct 12, PI will travel from Davis to anticipated field site in the Etna area (TBD). This travel will correspond with site establishment and data collection for first part of the attractant trial. Mileage will include travel to hotel, as well as to field sites in each area (anticipated at 620 miles round trip). Mileage is for a personal vehicle ($0.575/mile). The trip is anticipated to be 3 days/2 nights in duration with hotel ($110/night for 2 nights) and meals ($35/day x 3 days per trip) associated with this trip (PY1 = $682).

Trip 3: From Oct 24 to Nov 3, SRA II will travel from Davis to anticipated field site in the Etna area (TBD). This travel will correspond with site establishment and data collection for second part of the attractant trial. Mileage will include travel to hotel, as well as to field sites in each area (anticipated at 920 miles round trip). Mileage is for a rental vehicle ($0.29/mile). The trip is anticipated to be 11 days/10 nights in duration with hotel ($110/night for 10 nights) and meals ($35/day x 11 days per trip) associated with this trip (PY1 = $1,787).

Trip 4: From Nov 7 to Nov 24, SRA II will travel from Davis to anticipated field site in the Etna area (TBD). This travel will correspond with site establishment and data collection for indexing trial at site 1. Mileage will include travel to hotel, as well as to field sites in each area (anticipated at 1,200 miles round trip). Mileage is for a rental vehicle ($0.29/mile). The trip is anticipated to be 18 days/17 nights in duration with hotel ($110/night for 17 nights) and meals ($35/day x 18 days per trip) associated with this trip (PY1 = $2,848).

Trip 5: From Nov 7 to Nov 11, PI will travel from Davis to anticipated field site in the Etna area (TBD). This travel will correspond with site establishment and data collection for indexing trial at site 1. Mileage will include travel to hotel, as well as to field sites in each area (anticipated at 670 miles round trip). Mileage is for a personal vehicle ($0.575/mile). The trip is anticipated to be 4 days/3 nights in duration with hotel ($110/night for 3 nights) and meals ($35/day x 4 days per trip) associated with this trip (PY1 = $855).

Trip 6: From Nov 29 to Dec 22, SRA II will travel from Davis to anticipated field site in the Etna area (TBD). This travel will correspond with site establishment and data collection for indexing trial at sites 2-3. Mileage will include travel to hotel, as well as to field sites in each area (anticipated at 1,450 miles round trip). Mileage is for a rental vehicle ($0.29/mile). The trip is anticipated to be 24 days/23 nights in duration with hotel ($110/night for 23 nights) and meals ($35/day x 24 days per trip) associated with this trip (PY1 = $3,791).

Trip 7: From Jan 2 to Jan 24, SRA II will travel from Davis to anticipated field site in the Etna area (TBD). This travel will correspond with site establishment and data collection for indexing trial at sites 4-5. Mileage will include travel to hotel, as well as to field sites in each area (anticipated at 1,410 miles round trip). Mileage is for a rental vehicle ($0.29/mile). The trip is anticipated to be 23 days/22 nights in duration with hotel ($110/night for 22 nights) and meals ($35/day x 23 days per trip) associated with this trip (PY1 = $3,634).

Trip 8: From Jan 31 to Mar 3, SRA II will travel from Davis to anticipated field site in the Etna area (TBD). This travel will correspond with site establishment and data collection for burrow flooding treatments. Mileage will include travel to hotel, as well as to field sites in each area (anticipated at 1,760 miles round trip). Mileage is for a rental vehicle ($0.29/mile). The trip is anticipated to be 32 days/31 nights in duration with hotel ($110/night for 31 nights) and meals ($35/day x 32 days per trip) associated with this trip (PY1 = $5,040).

Trip 9: From Jan 31 to Feb 7, PI will travel from Davis to anticipated field site in the Etna area (TBD). This travel will correspond with site establishment and data collection for burrow flooding treatments. Mileage will include travel to hotel, as well as to field sites in each area (anticipated at 800 miles round trip). Mileage is for a personal vehicle ($0.575/mile). The trip is anticipated to be 8 days/7 nights in duration with hotel ($110/night for 7 nights) and meals ($35/day x 8 days per trip) associated with this trip (PY1 = $1,510).

Trip 10: From Feb 13 to Feb 15, PI will travel from Davis to anticipated field site in the Etna area (TBD). This travel will correspond with data collection for burrow flooding treatments. Mileage will include travel to hotel, as well as to field sites in each area (anticipated at 640 miles round trip). Mileage is for a personal vehicle ($0.575/mile). The trip is anticipated to be 3 days/2 nights in duration with hotel ($110/night for 2 nights) and meals ($35/day x 3 days per trip) associated with this trip (PY1 = $693).

Professional/Consultant Services:
N/A

Other Expenses - $4,278:
A rental truck will be needed to haul supplies around for project. The rental truck also comes with a lower mileage rate, which will save funds when compared to using a personal vehicle. The cost of the rental truck is $713/month and will be used for 6 months (PY1 = $4,278).

Indirect (F&A) Costs - $8,095

Indirect costs are calculated in accordance with the University budgeted indirect cost rate in Exhibit B.

Per the agreement between the University of California and the California Department of Food and Agriculture, indirect costs have been calculated at 10% Total Direct Cost (MTDC) for the project (PY1 - $8,095).

Other Funding Sources – $0

NA

California Department of Food and Agriculture
PHPPS - Integrated Pest Control Branch

2021 VPCRAC Project Proposal Budget Template

State of California
VPCRAC-B1
Revised 2/25/2021

Complete the budget template below by filling in information. This template uses formulas to automatically calculate totals. **Do not** alter the formatting or formulas in cells. Rows may be added to accommodate additional personnel or funding sources, if necessary. Contact the CDFA staff at (916) 262-1102 or David.Kratville@cdfa.ca.gov for help filling out this template.

Project Title: Development of a management program for voles in alfalfa.
Project Leader(s): Roger Baldwin

		2021-2022	2022-2023	2023-2024	Total
A.	**PERSONNEL (name, role, % based on full time salary)**				
	Salary				
	Ryan Meinerz, SRA II: 1,044 hours/yr at $26.28/hr	$27,436.00			$27,436.00
					$0.00
					$0.00
					$0.00
	Salary Total	$27,436.00	$0.00	$0.00	$27,436.00
	Benefits				
	SRA II, 53.1%, includes 3% escalations at beginning of each F	$14,569.00			$14,569.00
					$0.00
					$0.00
					$0.00
	Benefits Total	$14,569.00	$0.00	$0.00	$14,569.00
	Personnel Cost (A)	$42,005.00	$0.00	$0.00	$42,005.00
B.	**OPERATING EXPENSES**				
	Supplies	$11,908.00			$11,908.00
	Equipment				$0.00
	Travel	$22,760.00			$22,760.00
	Professional/Consultant Services(Cannot exceed $65/hour)				$0.00
	Other	$4,278.00			$4,278.00
	Operating Cost (B)	$38,946.00	$0.00	$0.00	$38,946.00
	TOTAL Costs (A+B)	$80,951.00	$0.00	$0.00	$80,951.00
C.	Indirect Costs (Cannot Exceed 10% of Total Costs (A+B))	$8,095.00			$8,095.00
	TOTAL CDFA FUNDING REQUESTED (A+B+C)	$89,046.00	$0.00	$0.00	$89,046.00
D.	**OTHER FUNDING SOURCES**				
					$0.00
					$0.00
					$0.00
					$0.00
					$0.00
	TOTAL OTHER FUNDING (C)	$0.00	$0.00	$0.00	**$0.00**
	TOTAL PROJECT BUDGET (A+B+C+D)	$89,046.00	$0.00	$0.00	$89,046.00