SUGGESTED REVIEWERS:
List of Suggested Reviewers or Reviewers Not To Include

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btimm@ku.edu

REVIEWERS NOT TO INCLUDE:  
N/A
<table>
<thead>
<tr>
<th>PI/CoPI/Senior Personnel</th>
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<th>Conflict of Interest Type</th>
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<td>Rundell, Rebecca J.</td>
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<td>Barker, Gary</td>
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<td>Wheeler, Quentin D.</td>
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COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

| NSF PROPOSAL NUMBER | 1561706 |

FOR NSF USE ONLY

**PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE:**

NSF 15-577 09/10/15

FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S): (Indicate the most specific unit known, i.e. program, division, etc.)

DBI - Biological Research Collections

**DATE RECEIVED** | **NUMBER OF COPIES** | **DIVISION ASSIGNED** | **FUND CODE** | **DUNS#** (Data Universal Numbering System) | **FILE LOCATION**
---|---|---|---|---|---
09/10/2015 | 1 | 08080000 DBI | 1197 | 152606125 | 08/30/2017 10:26am S

**EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN):**

141368361

**NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE:**

SUNY College of Environmental Science and Forestry

**AWARDEE ORGANIZATION CODE (IF KNOWN):**

0028514000

**NAME OF PRIMARY PLACE OF PERF:**

SUNY Environmental Science and Forestry

**ADDRESS OF PRIMARY PLACE OF PERF, INCLUDING 9 DIGIT ZIP CODE:**

SUNY Environmental Science and Forestry
1 Forestry Drive
Syracuse, NY, 132102712, US.

**IS AWARDEE ORGANIZATION (Check All That Apply):**

- SMALL BUSINESS
- MINORITY BUSINESS
- FOR-PROFIT ORGANIZATION
- WOMAN-OWNED BUSINESS
- IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE

**TITLE OF PROPOSED PROJECT:**

CSBR: Natural History: Securing, Expanding, and Making Accessible the Roosevelt Wild Life Collections at the SUNY College of Environmental Science and Forestry

**REQUESTED AMOUNT:**

$ 491,705

**PROPOSED DURATION (1-60 MONTHS):**

24 months

**REQUESTED STARTING DATE:**

06/01/16

**THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW:**

- BEGINNING INVESTIGATOR (GPG I.G.2)
- DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C.1.e)
- PROPRIETARY & PRIVILEGED INFORMATION (GPG I.D, II.C.1.d)
- HISTORIC PLACES (GPG II.C.2.i)
- VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date
- PHS Animal Welfare Assurance Number
- FUNDING MECHANISM: Research - other than RAPID or EAGER
- COLLABORATIVE STATUS

**PI/PD DEPARTMENT:**

Environmental Science and Forest Biology

**PI/PD POSTAL ADDRESS:**

PO Box 9
Albany, NY 122010009
United States

**PI/PD FAX NUMBER:**

**NAMES:**

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<th>Yr of Degree</th>
<th>Telephone Number</th>
<th>Email Address</th>
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Page 1 of 3
Certification for Authorized Organizational Representative (or Equivalent) or Individual Applicant

By electronically signing and submitting this proposal, the Authorized Organizational Representative (AOR) or Individual Applicant is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding conflict of interest (when applicable), drug-free workplace, debarment and suspension, lobbying activities (see below), nondiscrimination, flood hazard insurance (when applicable), responsible conduct of research, organizational support, Federal tax obligations, unpaid Federal tax liability, and criminal convictions as set forth in the NSF Proposal & Award Policies & Procedures Guide, Part I: the Grant Proposal Guide (GPG). Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U.S. Code, Title 18, Section 1001).

Certification Regarding Conflict of Interest

The AOR is required to complete certifications stating that the organization has implemented and is enforcing a written policy on conflicts of interest (COI), consistent with the provisions of AAG Chapter IV A.; that, to the best of his/her knowledge, and all financial disclosures required by the conflict of interest policy were made; and that conflicts of interest, if any, were, or prior to the organization’s expenditure of any funds under the award, will be, satisfactorily managed, reduced or eliminated in accordance with the organization’s conflict of interest policy. Conflicts that cannot be satisfactorily managed, reduced or eliminated and research that proceeds without the imposition of conditions or restrictions when a conflict of interest exists, must be disclosed to NSF via use of the Notifications and Requests Module in FastLane.

Drug Free Work Place Certification

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent), is providing the Drug Free Work Place Certification contained in Exhibit II-3 of the Grant Proposal Guide.

Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency? Yes ☐ No ☒

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) or Individual Applicant is providing the Debarment and Suspension Certification contained in Exhibit II-4 of the Grant Proposal Guide.

Certification Regarding Lobbying

This certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding $100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding $150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, “Disclosure of Lobbying Activities,” in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1392, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Certification Regarding Nondiscrimination

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is providing the Certification Regarding Nondiscrimination contained in Exhibit II-6 of the Grant Proposal Guide.

Certification Regarding Flood Hazard Insurance

Two sections of the National Flood Insurance Act of 1968 (42 USC § 4012a and § 4106) bar Federal agencies from giving financial assistance for acquisition or construction purposes in any area identified by the Federal Emergency Management Agency (FEMA) as having special flood hazards unless the:  

(1) community in which that area is located participates in the national flood insurance program; and  

(2) building (and any related equipment) is covered by adequate flood insurance.

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) or Individual Applicant located in FEMA-designated special flood hazard areas is certifying that adequate flood insurance has been or will be obtained in the following situations:

(1) for NSF grants for the construction of a building or facility, regardless of the dollar amount of the grant; and  

(2) for other NSF grants when more than $25,000 has been budgeted in the proposal for repair, alteration or improvement (construction) of a building or facility.

Certification Regarding Responsible Conduct of Research (RCR)

(This certification is not applicable to proposals for conferences, symposia, and workshops.)

By electronically signing the Certification Pages, the Authorized Organizational Representative is certifying that, in accordance with the NSF Proposal & Award Policies & Procedures Guide, Part II: Award & Administration Guide (AAG) Chapter IV.B., the institution has a plan in place to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduates, graduate students and postdoctoral researchers who will be supported by NSF to conduct research. The AOR shall require that the language of this certification be included in any award documents for all subawards at all tiers.
Certification Regarding Organizational Support

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that there is organizational support for the proposal as required by Section 526 of the America COMPETES Reauthorization Act of 2010. This support extends to the portion of the proposal developed to satisfy the Broader Impacts Review Criterion as well as the Intellectual Merit Review Criterion, and any additional review criteria specified in the solicitation. Organizational support will be made available, as described in the proposal, in order to address the broader impacts and intellectual merit activities to be undertaken.

Certification Regarding Federal Tax Obligations

When the proposal exceeds $5,000,000, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Federal tax obligations. By electronically signing the Certification pages, the Authorized Organizational Representative is certifying that, to the best of their knowledge and belief, the proposing organization:

1. has filed all Federal tax returns required during the three years preceding this certification;
2. has not been convicted of a criminal offense under the Internal Revenue Code of 1986; and
3. has not, more than 90 days prior to this certification, been notified of any unpaid Federal tax assessment for which the liability remains unsatisfied, unless the assessment is the subject of an installment agreement or offer in compromise that has been approved by the Internal Revenue Service and is not in default, or the assessment is the subject of a non-frivolous administrative or judicial proceeding.

Certification Regarding Unpaid Federal Tax Liability

When the proposing organization is a corporation, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Federal Tax Liability:

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that the corporation has no unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

Certification Regarding Criminal Convictions

When the proposing organization is a corporation, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Criminal Convictions:

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that the corporation has not been convicted of a felony criminal violation under any Federal law within the 24 months preceding the date on which the certification is signed.

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<td><a href="mailto:wjniuchol@esf.edu">wjniuchol@esf.edu</a></td>
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Direct for Biological Sciences  
Div of Biological Infrastructure  
Biological Research Collections  

Proposal Classification Form  
PI: Rundell, Rebecca / Proposal Number: 1561706

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<td>☐ TRAINING</td>
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<td>☐ Multi-, Cross-, Interdisciplinary Training</td>
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<td>☐ K-12 involvement</td>
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**CATEGORY V: HABITAT**  
(No selection required)

**CATEGORY VI: GEOGRAPHIC AREA OF THE RESEARCH**  
(No selection required)

**CATEGORY VII: CLASSIFICATION OF ORGANISMS**  
(Select 1 to 4)

- VIRUSES
- PROKARYOTES
- PROTISTA (PROTOZOA)
- FUNGI
- LICHENS
- SLIME MOLDS
- ALGAE
- PLANTS
- ANIMALS
- INVERTEBRATES
- VERTEBRATES
- TRANSGENIC ORGANISMS
- FOSSIL OR EXTINCT ORGANISMS
- NO ORGANISMS

**CATEGORY VIII: MODEL ORGANISM**  
(Select ONE)

- NO MODEL ORGANISM

[Enter your own model organism - up to 9 characters]

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Page 2
**PROJECT SUMMARY**

**Overview:**
Overview. The Roosevelt Wild Life Collections (RWLC) at the State University of New York College of Environmental Science and Forestry (SUNY-ESF) in Syracuse has supported research and education in natural history and environmental science of the northeastern United States since its establishment in 1919. The RWLC are extensive and heavily used but have deteriorated from inadequate space and antiquated cabinetry. This proposal seeks to leverage an award of $2M made in May 2014 by the State of New York to install concrete floors and finish this entirely new 5290 sq. ft. space within a recently opened campus building, immediately adjacent to the biology building. By saving, expanding, and making accessible the RWLC within a Roosevelt Wild Life Collections Research and Education Center (under construction), we will foster a deep connection between natural history collections and our future environmental leaders (hundreds of SUNY-ESF students will take classes in the Center each year). Requested CSBR support will enable us to resolve current conservation problems created by inadequate collections housing and to directly involve students in the process. To implement Phases I-III of our long-term strategic plan for our collections? safety and accessibility we seek CSBR support for 1) installing new compactorized cabinets and drawers, and 2) making our bird, mammal and parasite collections accessible through assessment, digitization and a major collections move. Our ultimate goal is full digital accessibility (images/data available in a publicly-accessible relational database).

**Intellectual Merit:**
Intellectual merit. The RWLC, named for and endorsed by President Theodore Roosevelt, is not only an active repository for research specimens that document North American (particularly northeastern) environmental change over the past century, but the collections are central to one of the most heavily subscribed graduate and undergraduate organismal biology education programs in the United States. Unlike typical pre-med-focused programs, at ESF we have the opportunity to educate environmentally-inclined students about the explicit link between whole-specimen data and our nation?s ability to solve regional, national and global environmental problems (e.g. understanding the impacts of climate change and finding ways to mitigate species losses). Increasing specimen security and physical and digital access to specimens will also enhance researchers? ability to use the collections (e.g. New York Natural Heritage Program now located at ESF). Many northeastern species in our collections have declined sharply in the past few decades. CSBR funding will allow conservation agencies to finally access these data as well as to contribute specimens. In addition, RWLC will host one of only four remotely operable digital microscopes in the world that will facilitate remote taxonomic collaboration projects, e.g. linking professionals in the field and at other institutions with morphology and identification resources at RWLC.

**Broader Impacts:**
Broader impacts. Our project centers around the idea that collections are open to everyone and help us solve important environmental problems. First, the new centrally located collections Center will catalyze a campus-wide initiative linking SUNY-ESF students with collections and their relevance to research and education in environmental biology by directly involving students from underrepresented groups as ?collections ambassadors.? These interns will be trained in modern curation techniques and digitization, and will develop their own independent collections-based research to be presented at the annual student research spotlight symposium. Second, we will make select high-resolution specimen images web-accessible in order to share them with Syracuse inner city high school science students, using established contacts with teachers (ESF in the High School program) as both a conduit and a source of ideas for expanding this wild life on the web concept in future years. The goal of this work is to bring the natural world to students where they are and generate excitement about nature by viewing it up-close, including seemingly ?common? species around them like urban squirrels (series of which reside in our collections). Third, the public will have the opportunity to tour and view the new space through natural history collections-focused exhibits and large windows onto the collections research space and its new cabinetry. The visual openness of the new space delivers the message that collections belong to all of us.
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<tr>
<th>Total No. of Pages</th>
<th>Page No.* (Optional)*</th>
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| Project Summary (not to exceed 1 page) | 1 |       |
| Table of Contents | 1 |       |
| Project Description (Including Results from Prior NSF Support) (not to exceed 15 pages) (Exceed only if allowed by a specific program announcement/solicitation or if approved in advance by the appropriate NSF Assistant Director or designee) | 15 |       |
| References Cited | 3 |       |
| Biographical Sketches (Not to exceed 2 pages each) | 4 |       |
| Budget (Plus up to 3 pages of budget justification) | 6 |       |
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| Appendix Items: | | |

*Proposers may select any numbering mechanism for the proposal. The entire proposal however, must be paginated. Complete both columns only if the proposal is numbered consecutively.
The Roosevelt Wild Life Collections (RWLC) at the State University of New York College of Environmental Science and Forestry (SUNY-ESF) has supported research and education about birds, mammals, insects, non-insect invertebrates, vascular and non-vascular plants, fungi, fishes and parasites of the northeastern United States since their establishment in 1919. Even though many specimens (particularly birds and mammals) are now inaccessible due to overcrowding, pests, antiquated cabinetry, and lack of digitization, the RWLC is still heavily used. Without immediate attention, however, most RWLC specimens will deteriorate to an unusable state from inadequate space and the ability to isolate and address pest problems. This proposal seeks to leverage an award made in May 2014 by the State of New York of $2M to add concrete floors and associated infrastructure to finish an entirely new 5290 sq. ft. dedicated collections space—the Roosevelt Wild Life Collections Research and Education Center—within the recently opened, award-winning Gateway Building on campus, which is immediately adjacent to the collections’ current location in the biology building (SD.1-3). The Gateway Building is the only large meeting place for students on SUNY-ESF’s urban campus, and therefore, in contrast to most other universities, Collections will feature prominently in ESF campus life. Requested CSBR support for equipping this new collections center will enable us to keep our collections on campus, address significant specimen conservation problems, and make collections accessible to researchers, faculty, students, and the public. The central tenet of this RWLC Research and Education Center is to directly involve SUNY-ESF students (future environmental leaders and ambassadors for Collections) in the collections move, specimen conservation, digitization, and specimen-based research, so that they understand the importance of natural history collections and the direct connection between whole-specimen data and our nation’s ability to solve regional, national and global environmental problems. Notably, SUNY-ESF hosts among the largest enrollments in taxonomy-based courses anywhere in the United States with ~1500 students enrolled annually). Here we seek to implement Phases I-III of a long-term strategic plan for our collections’ security, expansion ability, and accessibility by: 1) installing rails, carriages, new cabinets and drawers and digitizing specimen data; 2) implementing specimen assessment, stabilization and staging (Nelson et al. 2012), followed by integrated pest management (IPM), moving, and reorganizing collections (according to modern Tree of Life taxonomy). The organismal biology classroom and collections education spaces will also be established in this phase. 3) Digitizing bird and mammal collections will then continue in the new Center (e.g. barcoding). The proposed assessments, the move, expansion, and rehousing of the first set of collections—the birds, mammals and parasites—will mobilize RWLC’s Vertebrates Collections Manager, the RWLC Parasitologist, and a team of student trainees under the leadership of RWLC Head Curator and PI Rundell, and co-PI Wheeler.

I. HISTORY, DESCRIPTION AND SIGNIFICANCE OF THE COLLECTIONS

The RWLC—the large, historically significant collections component of the Roosevelt Wild Life Station (RWLS) at SUNY-ESF—is the only entity bearing the Roosevelt name that was approved by United States President Theodore Roosevelt himself during his lifetime (Adams 1921; Frair and Gibbs 2011). The RWLC holds some of our county’s most stark reminders of human impacts on the biota: passenger pigeons (*Ectopistes migratorius*; with data and egg; Fig. 1), heath hens (*Tympanuchus cupido cupido*), and a pair of ivory-billed woodpeckers (*Campephilus principalis*; with data), as well as research specimens of birds, mammals and plants from the 1800s, pre-dating the RWLC’s founding. The RWLC now contains well over 400,000 lots and specimens (Table 1). RWLS and RWLC were established in order to ensure the long-term stewardship of North American “wild life,” the term of the day used to describe all life that is wild or “biodiversity” in the parlance of today. Its geographical emphasis has been New York State (NYS), and especially the biota of the “forever wild” Adirondack Park (e.g. Roosevelt and Minot 1877, 1923), where SUNY-ESF holds title to >20,000 acres. Although the public’s idea of *wildlife* is game animals, we have retained the usage of the two-word term *wild life* originally applied to the collections to signal interest in all taxa.
In the early 1900s, the RWLC formed the basis of what is now SUNY-ESF’s biology department currently in Illick Hall known as the Department of Environmental and Forest Biology (see SD.1, 2 map and floorplan). RWLC’s early history was as a repository and center for study of research-quality specimens related to ecological- and resource-driven studies on the native northeastern biota (e.g. Johnson 1922; Adams 1923; McAtee 1926; Kendall and Dence 1929). The field research and educational activities of SUNY-ESF’s early faculty greatly expanded the collections, which were used to advance knowledge about our then little-known North American biota (Frair and Gibbs 2011) and to educate the first biologists for federal and state service about “wild life” protection. At this time conservationists (including Roosevelt) had just begun to arouse society’s awareness of the need for scientific research and natural history collections to provide basic understanding of the biology of forest-dependent organisms and to inform Americans’ use and management of these species.

By the 1960s, collections growth had exceeded existing space capacity in one of the original College buildings and spaces for collections were designed for Illick Hall, their current location (SD.1, 2). The bird and mammal collections—the focus of our proposed project—still reside in the same 1351 sq. ft. room that former Professor and RWLC Director Maurice Alexander (Director from 1964-1990) designed for them in the late 1960s (SD.2A). However, since our Vertebrates Collections Manager Mr. Ronald Giegerich (SD.13) arrived in the late 1970s, hundreds more bird and mammal specimens have been added by him, local and state agencies, faculty, and outside donors, meaning that RWLC can no longer safely accommodate more specimens. RWLC’s collections still use cabinets that date to their establishment in the early 1900s, mixed with “newer” quarter unit Geology-style cabinets from the 1960s -1970s, all of which are packed (Fig. 1). This first and only significant upgrade to RWLC facilities (in the 1960s) is a relevant milestone, because by this time some of the most significant environmental changes to the northeastern United States had been noted by Roosevelt field biologists, and RWLC specimens deposited early in the century became an irreplaceable physical record of what once was. For example the RWLC’s Squires and

![Figure 1. RWLC cabinets, passenger pigeon display, sample of current Gateway Building exhibits.](image)

Table 1: Estimated Size of the Roosevelt Wild Life Collections; “Lot”= specimens of same species, from same collecting event

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<th>Uncataloged Lots</th>
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<td>Birds</td>
<td>3984 lots</td>
<td>&gt;3000 lots</td>
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<tr>
<td>Mammals</td>
<td>2238 lots</td>
<td>&gt;2000 lots</td>
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<td>Parasites (e.g. flatworms)</td>
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<td>&gt; 200 lots, including 24 type specimens</td>
<td>&gt; 200</td>
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<tr>
<td>Non-insect Invertebrates</td>
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<td>Fishes and Herps (Wet)</td>
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<td>&gt;1000 lots</td>
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<td>Entomology</td>
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<td>&gt;407,240 specimens</td>
<td>&gt;415,732</td>
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![Table 1]


Sudworth Collections both pre-date the widespread use of DDT in the 1950’s and 1960’s, and thus provide species records (including eggs) prior to DDT metabolite-imposed eggshell thinning (Blus 2011).

Roosevelt Station biologists Kendall and Dence (1929) collected in the 1920s in Adirondack Lakes before centrarchid sportsfishes were introduced and obliterated the native minnows and before acid rain had damaged many lakes. Minutes away from the RWLC in Syracuse, NY, W.A. Dence collected in Onondaga Lake before it was severely impaired by industrial pollution, eventually becoming one of the United States Environmental Protection Agency’s most famous Superfund sites. RWLC has specimens of Onondaga’s last *Moxostoma* red horse suckers, fish that require clean rivers for spawning, and thereby provide proof of past conditions and hence targets for current restoration of the lake.

Specimen-based research in the RWLC is just as active today, leading to numerous publications and theses on ecology (Eager 2010; Skabeikis 2012; Standley 2012; Warsen 2012; Fierke et al. 2013) introduced species (Eager et al. 2011; Hellman 2011; Rockerman 2011; Standley et al., 2012; Hellman and Fierke 2014), and environmental change (Gibbs and Karraker 2006; Bauer and Whipp 2013; Chaudhary 2014; Quinn et al. 2013), as well as recent prominent guides to North American animals (Werner, 2004; Gibbs et al. 2007; Baldassarre 2014) and an advanced textbook (Baldassarre 1994).

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<td>2</td>
<td>2</td>
<td>~250</td>
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<td>2013</td>
<td>2</td>
<td>25</td>
<td>4</td>
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<td>~100</td>
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<td>2014</td>
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<td>7</td>
<td>4</td>
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<td>26</td>
<td>17</td>
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Despite the cramped conditions of the RWLC the collections remain valuable for many research, teaching and outreach efforts; increased space and enhanced accessibility in the RWLC would be a boon for environmental research at SUNY-ESF, environmental organizations in the Northeast (e.g. NY Natural Heritage Program), and across North America.

Furthermore, the RWLC has been central to SUNY-ESF’s rigorous and heavily subscribed graduate and undergraduate organismal biology program since its establishment in the early 1900s. Current courses that depend heavily on teaching-designated specimens within the RWLC include: Mammal Diversity, Mammalian Winter Ecology, Ecology of Mammals in the Adirondack Mountains, Ornithology, Ichthyology, Fisheries Science and Management, Herpetology, Field Herpetology, Vertebrate Museum Techniques, Comparative Vertebrate Anatomy, Entomology, Forest Entomology, Aquatic Entomology, Systematic Entomology, Diversity of Life I and II, Invertebrate Zoology, Parasitology, Dendrology, Flowering Plant Diversity, Evolution, Systematics, and Diversity of Plants, Adirondack Flora, Mycology, Ecology of Mosses, and Environmental Interpretive Methods. In the 2014-15 academic year, these courses had an enrollment of ~1500 students. In contrast to most pre-med-focused university biology programs, most of ESF’s organismal courses are major requirements offered annually. Other classes, e.g. fine arts at Syracuse University, also access RWLC specimens annually.

The RWLC, currently located in SUNY-ESF’s biology department’s Illick Hall, is situated next door to the new natural history collections space that is the focus of the proposed project (this space, which will become the Roosevelt Wild Life Collections Research and Education Center, is hereafter referred to as the Gateway Shell, SD.1-3). Despite the recent cessation in collections behind-the-scenes tours of the collections for safety reasons (the aisles are too full to safely maneuver Fig. 3), >1000 primary and secondary schoolchildren have continued to benefit from the RWLC through natural history interpretation programs at local schools (Table 2). Visitors to our main campus, including participants in the many large events hosted in the Gateway Building event space also view our new exhibits, including a new musk ox exhibit (opened in April 2015), and a glassed wall of professionally designed wild life programs.
exhibits (featuring birds, mammals, fishes and insects; opened in 2013, Fig. 1, right side). We also maintain wild life exhibits at our field stations, including the Adirondack Interpretive Center in northern NY. These ongoing exhibits and outreach opportunities are cultivated with the express intent of generating interest in nature and the importance of natural history collections. We are expanding this idea within the planned Roosevelt Wild Life Collections Research and Education Center by surrounding the collections research spaces with captivating exhibits about natural history collections and a naturalist’s perspective, and by building our premiere organismal biology classroom within the Center (SD.7,15). We have also been given display space at Destiny USA (a Syracuse mall with a projected 29 million visitors annually; Yogerst 2011) to exhibit an RWLC humpback whale skeleton there, linking the RWLC with diverse audiences that normally would not even think about collections.

II. USE, VALUE AND IMPACT OF ROOSVELT WILD LIFE COLLECTIONS

The focus of the proposed project is to complete Phases I-III in a strategic campus plan for collections detailed in section VI, below. Without further support we cannot complete Phases I-III since the NYS $2M allocation covers only basic infrastructure. There are well over 400,000 specimens in the RWLC (Table 1), distributed across diverse collections ranging from herbaria to entomology (SD.2A-G); here we focus on securing, moving and digitizing a small yet valuable >10,000 of these lots, in the bird, mammal and parasite collections, at least half of which are from NYS. This will be a realistic and substantial first step in a set of planned major collections renovations and accessibility improvements on campus over the next eight years. These three focal collections—birds, mammals and parasites—comprise extraordinary specimens from across North America and the American West. RWLC’s greatest strength is in northeastern animals, particularly those from the forests of northern and central NYS.

Bird specimens include dry research skins (Fig. 1), skeletal material, eggs, and mounted specimens with data (some of the latter, which are of lesser research value than the skins, will be moved to exhibits as appropriate). The RWLC is a repository for NYS migratory bird kills and thus is a record of these species and the modes of extirpation within wild populations. Two prominent waterfowl books, Ducks, Geese and Swans of North America (Baldassarre 2014) and Waterfowl Ecology and Management (Baldassarre 1994) relied heavily on RWLC bird collections. Among our most-prized bird specimens are our waterfowl but also owls, raptors, and our (now-extinct) passenger pigeons, heath hen, and ivory-billed woodpeckers (Table 3).

The Sudworth and Steinbrenner Bird Skin Collections both document birds of the late 1800s northern United States, including many species of Special Concern (NYS Dept. of Environmental Conservation (NYSDEC)): e.g. the golden-winged warbler Vernivora chrysoptera (significant decline due to habitat loss and brown-headed cowbirds, with only one remaining county stronghold in NYS (NYSDEC)), cerulean warbler Setophaga cerulea (IUCN listing: Vulnerable), vesper sparrow Poecetes gramineus (declined 49% in NY between 1988 and 2008; Eaton 1988, Smith 2008), the red-headed woodpecker Melanerpes erythrocephalus (suffered declines due

<table>
<thead>
<tr>
<th>Taxonomic Group</th>
<th># Lots</th>
<th>Geographic Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.B. Sudworth 1875-1878 Egg Collection</td>
<td>201</td>
<td>Michigan, USA</td>
</tr>
<tr>
<td>K. Squires 1907-1931 Egg Collection</td>
<td>220</td>
<td>Florida, USA</td>
</tr>
<tr>
<td>Bird Mounts, most with data</td>
<td>&gt;700</td>
<td>North America</td>
</tr>
<tr>
<td>Anseriformes</td>
<td>300</td>
<td>North America</td>
</tr>
<tr>
<td>Galliformes</td>
<td>140</td>
<td>North America</td>
</tr>
<tr>
<td>Gaviiformes</td>
<td>9</td>
<td>North America</td>
</tr>
<tr>
<td>Podicipediformes</td>
<td>30</td>
<td>North America</td>
</tr>
<tr>
<td>Procellariiformes</td>
<td>3</td>
<td>North America</td>
</tr>
<tr>
<td>Pelicaniformes</td>
<td>40</td>
<td>North America</td>
</tr>
<tr>
<td>Accipitriformes</td>
<td>207</td>
<td>North America</td>
</tr>
<tr>
<td>Gruiformes</td>
<td>60</td>
<td>North America</td>
</tr>
<tr>
<td>Charadriiformes</td>
<td>240</td>
<td>North America</td>
</tr>
<tr>
<td>Columiformes</td>
<td>34</td>
<td>North America</td>
</tr>
<tr>
<td>Cuculiformes</td>
<td>20</td>
<td>North America, Central Amer.</td>
</tr>
<tr>
<td>Strigiformes</td>
<td>230</td>
<td>North America</td>
</tr>
<tr>
<td>Caprimulgiformes</td>
<td>10</td>
<td>North America</td>
</tr>
<tr>
<td>Apodiformes</td>
<td>40</td>
<td>North America, Central Amer.</td>
</tr>
<tr>
<td>Coraciiformes</td>
<td>20</td>
<td>North America</td>
</tr>
<tr>
<td>Piciformes</td>
<td>170</td>
<td>North America</td>
</tr>
<tr>
<td>Passeriformes</td>
<td>&gt;1300</td>
<td>North America, Central Amer.</td>
</tr>
<tr>
<td>Psittaciformes</td>
<td>10</td>
<td>Australia, Africa</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3984</td>
<td></td>
</tr>
</tbody>
</table>
to starling competition and hunting (NYSDEC)), the black-backed woodpecker *Picoides arcticus* (considered “Sensitive” by the Forest Service; Corace et al. 2001), whip-poor-will *Antrostomus vociferus* (which has disappeared from many parts of the state; Medler 2008), piping plover *Charadrius melodus* (Endangered in NY and Federally Threatened) and the chestnut-collared longspur *Calcarius ornatus* (IUCN status: Near Threatened). These 1800s-age specimens all have valuable label data, including sex, degree of molt, amount of fat, and size of gonads, all of which are critical for studies of geographic variation, sexual dimorphism, biogeography and age/sex ratios, and which are not always common on older specimens (Corado 2005). Many species in the RWLC also have records extending from the late 1800s into the 1930s and through to the 1960s and the present, including the horned lark *Eremophila alpestris* (NY Species of Special Concern).

**Mammal holdings** (Table 4) include skins, hides, mounted specimens, and skeletal material. More skeletal specimens very soon will come from our new dermestid colony, and our Collections Manager has also added large numbers of road-killed specimens and specimens from Syracuse’s zoo (Table 5). Rodents and bats are also prominent in the RWLC. Northeastern bats have been severely impacted by the cold-loving fungal disease white-nose syndrome, which spread to most of NYS’s bat species (e.g. *Myotis lucifugus, M. septentrionalis, Eptesicus fuscus, and Perimyotis subflavus*), and impacted many hibernacula (Blehert et al. 2008). RWLC specimens and data are important for understanding die-offs and preventing future declines. RWLC mammal collections have also been drivers for research creativity, e.g. two pending NSF research proposals “Urbanization as a driver of contemporary evolution in gray squirrels (*Sciurus carolinensis*)” (Population Biology Panel), which focuses on visual properties of squirrels in the collection, and “The role of land use in mediating evolutionary response to climate change” (Evolutionary Biology Panel), which focuses on striping frequencies in the plethodontid collection over time. The RWLC’s **parasite collection**, comprising >200 slides (whole mounts, sections, and blood smears) that fit in just two small table-top cabinets, is just as impressive. It comprises a range of taxa such as trematode flatworms and arthropods (as well as unicellular eukaryotes, e.g. ciliates), many of which are freshwater fish parasites, and thus important for the management and protection of American fish stocks. The geographical focus is northern and central NYS lakes, where many new parasites were discovered and described in the early 1900s (Mueller 1932, 1934; Mueller and VanCleave 1932; VanCleave and Mueller 1932, 1934).

Knowledge of this collection to date has been by word of mouth, but because of the importance of its Type specimens, RWLC must secure and make accessible this collection, as well as highlight its link to the vertebrate collections. Recent work on this collection includes Bauer and Whipps (2013, 2015; and Accepted w/Revisions).

Our goal is to secure these three collections, **free them from current over-packing**, and make them accessible. We expect dramatically improved physical access to the specimens, but also expanded, designated space for digitization and assembling loans. As these collections improvements are made it will become increasingly safer for specimens to be loaned and examined by researchers. Such access is vital for solving practical environmental problems and protecting northeastern and North American natural resources—the foci of much of RWLC research to date (Table 6). The RWLC bird, mammal and parasite collections obviously do not represent all of global diversity, however, RWLC is critical for collections-based research on biotic changes in the northeastern United States, particularly given our

### Table 4. Mammal Holdings

<table>
<thead>
<tr>
<th>Taxonomic Group or Special Collection</th>
<th># Lots</th>
<th>Geographic Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mammal Head Mounts, many with data</td>
<td>&gt;100</td>
<td>North America</td>
</tr>
<tr>
<td>Didelphimorpha</td>
<td>20</td>
<td>North America</td>
</tr>
<tr>
<td>Edentata</td>
<td>1</td>
<td>South America</td>
</tr>
<tr>
<td>Lagomorpha</td>
<td>&gt;200</td>
<td>North America</td>
</tr>
<tr>
<td>Rodentia</td>
<td>&gt;1200</td>
<td>North America</td>
</tr>
<tr>
<td>Chiroptera</td>
<td>&gt;400</td>
<td>North America</td>
</tr>
<tr>
<td>Insectivora</td>
<td>&gt;100</td>
<td>North America</td>
</tr>
<tr>
<td>Carnivora</td>
<td>&gt;200</td>
<td>North America</td>
</tr>
<tr>
<td>Artiodactyla</td>
<td>12</td>
<td>North America</td>
</tr>
<tr>
<td>Perissodactyla</td>
<td>5</td>
<td>North America</td>
</tr>
<tr>
<td>Cetacea</td>
<td>16</td>
<td>North America</td>
</tr>
<tr>
<td>TOTAL</td>
<td>&gt;2254</td>
<td></td>
</tr>
</tbody>
</table>
proximity to the Adirondacks and ESF’s field stations. This region is among the most rapidly changing on the planet in terms of climate change and the RWLC provides a window into the past 100+ years while doing so in the context of a practical problem- and management-oriented faculty and student body that is collectively passionate about organism-based environmental research.

### Table 5. Rate of Growth (Specimen Accessions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Birds</th>
<th>Mammals</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>~25</td>
<td>~25</td>
</tr>
<tr>
<td>2011</td>
<td>~25</td>
<td>~25</td>
</tr>
<tr>
<td>2012</td>
<td>~25</td>
<td>~25</td>
</tr>
<tr>
<td>2013</td>
<td>~25</td>
<td>~25</td>
</tr>
<tr>
<td>2014</td>
<td>~150</td>
<td>~50</td>
</tr>
<tr>
<td>2015</td>
<td>44</td>
<td>45</td>
</tr>
<tr>
<td>TOTAL</td>
<td>~294</td>
<td>~195</td>
</tr>
</tbody>
</table>

### Table 6. Publications & Products Using RWLC, (e.g. Rockermann 2011; Warsen 2012; Baldassarre 2014; Bauer & Whipps 2013, 2015)

<table>
<thead>
<tr>
<th>Year</th>
<th>Professional</th>
<th>Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>No data</td>
<td>1</td>
</tr>
<tr>
<td>2011</td>
<td>No data</td>
<td>3</td>
</tr>
<tr>
<td>2012</td>
<td>No data</td>
<td>4</td>
</tr>
<tr>
<td>2013</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2014</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2015</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>7</td>
<td>14</td>
</tr>
</tbody>
</table>

### III. COLLECTIONS POLICIES

The RWLC’s first official Collections Management Policy was written and adopted in 1968 (Alexander 1968) and since then has been modified to accommodate growing demands. The current specimen acquisition policy focuses on accessioning specimens that add depth to current strengths (e.g. northeastern waterfowl, raptors and rodents), and all accessions and deaccessions are made with the approval of the Head Curator (Rundell). RWLC’s deposited specimens must be accompanied by the required state or federal permits and such permits remain part of specimens’ permanent accessions records. RWLC is also in compliance with state and federal laws regarding collection and salvage of vertebrate species, including marine mammals (National Marine Fisheries Service Greater Atlantic Region Marine Mammal Stranding Network Marine Mammal Hard Parts Permit), but particularly migratory birds (e.g. New York State Department of Environmental Conservation (NYSDEC) License to Collect or Possess #1360; U.S. Fish and Wildlife Service (USFWS) Permit, Special Purpose: Salvage MB703381-0; USFWS Permit: Taxidermy MB676823-0; USFWS Permit: Eagle Exhibition; NYSDEC Endangered/Threatened Species: Scientific License #277). Specimen loans are handled by the Collections Manager with final approval by Rundell. All borrowers must be associated with a research institution or agency and have access to facilities for the proper care and storage of loaned specimens. No destructive analyses are allowed without prior approval of the Head Curator. There is no charge for loaned materials. Visitors are welcomed, space permitting under current conditions. In the case of parasite type material, no loans are currently made, but visits may be granted by Rundell in consultation with the RWLC parasitologist (C. Whipps; SD.14).

### IV. URGENCY: Current state of collections facilities is dire

Previous assessment and catastrophe: In Fall 2013, a preservation assessment funded by the Institute of Museum and Library Services (IMLS) under the Conservation Assessment Program (CAP) (Goldberg 2013) indicated stark shortfalls in the current RWLC facilities, particularly in the current location of birds and mammals in Illick Hall where theft prevention, human safety (e.g. fire and toxic dust exposure), and specimen safety (e.g. fire, flooding and pests) are all major issues. In February 2014, just as RWLC leadership was working on a strategic plan to address these major conservation issues, our vascular plant herbarium two floors above the bird and mammal collections (see SD.2, A, C) was struck with a catastrophic flooding event. Since our last CSBR submission some funds were secured from insurance, which facilitated the now ongoing process of remounting (by graduate trainees), supervised in part by PI Rundell. The 2014 herbarium flooding event precipitated a movement among EFB faculty and the Roosevelt Wild Life Station Honorary Advisory Council (and now its newly-formed Collections Committee) to address the most pressing collections conservation issues, starting with seeking a safe place for our most highly prized collections, the birds and mammals.
Fig. 2. The RWLC herbarium flood soaked cabinets, detached specimens, and destroyed data.

**Physical Space:** The RWLC is currently located in approximately 1351 sq. ft. in Illick Hall (see floor plan SD.2A). This space lacks a sprinkler system, and is currently protected only by a single fire extinguisher. The aging HVAC system of our ca. 1968 biology building has received few significant upgrades to date. The collections space is usually heated in the winter (except during winter breaks and construction-related planned outages) but is otherwise not climate-controlled, and ventilation is inadequate. Temperature and humidity fluctuations in the space (10-32°C and 20%- >70% RH) expose specimens to damaging shrinking and expansion cycles (Thomson 1986; Goldberg 2013).

Fig. 3. Vertebrate specimens covered with plastic due to risk from flooding; limited work space; skins packed too tightly, creating damage.

**Cabinets:** Both bird and mammal specimens are housed in quarter-unit metal Geology cabinets (28.5 x 28.5 x 39.5 in.) with wooden drawers, the older examples of which date to the early 1900s, and all of which have old felt or other types of deteriorated seals. These cabinets were never appropriate for these collections: the drawers do not pull out smoothly and so specimens are easily jostled when the drawer is pulled. The wooden drawers also expose bones and other materials to acids. In combination with Syracuse’s characteristic summer humidity, some eggs and skeletal material already show signs of Byne’s disease (National Park Service 2008), and some labels show reactivity with drawer materials. Still other specimens are stacked on top of cabinets (Fig. 3) and are thus unprotected from UV light, dust, pests, or accidental damage caused by researcher, staff, and student movement within the cramped quarters.

**Specimens:** All cabinets are either full or beyond capacity. Almost all specimen drawers are over-packed and/or too close to adjacent drawers (Fig. 1, 3), leading to irreparable specimen damage (e.g. fur and feathers constantly getting caught in neighboring drawers) and subsequent deterioration. There is no room for curation or collection growth. Donations remain bagged in freezers or stacked in non-archival boxes. Specimen packing also makes isolation and effective treatment of conservation problems impossible. For example, the RWLC bird and mammal collections are undergoing a severe clothes moth infestation. Because RWLC lacks a suitable walk-in freezer for integrated pest management (IPM) collections staff have spot-treated cabinets with pesticides. These efforts have failed and in July 2014 one third of RWLC’s specimens of southern flying squirrels (*Glaucomys volans*) were eaten by moth larvae and were subsequently deaccessioned and disposed of. The lack of not only properly sealed cabinets but also the packing of all specimens means that pests can rapidly move from one specimen to the next. These problems are compounded by inadequate climate control, mentioned above, which can lead to sudden blooms of pests that can spread rapidly throughout the cabinetry. When pesticides are applied, their vapors, like the pests themselves, easily spread throughout the space and therefore can impact any visitor
or student entering the space, even long after the pesticides were applied. For this reason, our Collections Manager’s office was recently relocated outside of the bird and mammal space.

**Work spaces:** Because of the space limitations imposed by this bird and mammal space, cabinets are packed tightly together, and moveable cart “work spaces” packed with curatorial materials and specimens ready for integration into the collections consistently block cabinets and prevent cabinets from being opened for regular pest monitoring and other standard collections functions (Fig. 3). This tight cabinet packing combined with the deteriorated seals means that chemical vapors from specimen dusts can freely escape the cabinets, and thus specimens that have been preserved using different chemicals (e.g. arsenic) cannot be separated, exposing staff and students to potentially severe health hazards. The problem with limited collections space also applies to workers within the space. As a result of our CAP assessment, Goldberg (2013) strongly recommended that RWLC prioritize separation of collections tasks in the bird and mammal collections as well as isolation of different specimen-preservation types. Currently, however, by necessity, messy specimen preparation (e.g. receiving and processing of roadkill, de-fatting of waterfowl, prepping of hides and bird skins, boiling of skulls), and even teaching of a popular Vertebrate Museum Techniques course (taught by Collections Manager Giegerich) must take place in a cramped space (SD2.A) within inches of 1800s-era research skins. Inability to provide visitors with a chemical- and carcass-free workspace severely limits our ability to be fully accessible to the public (e.g. hosting scientific researchers for study and visitors for outreach programs). It also limits our ability to effectively train students who wish to work in collections and learn modern curation techniques.

Lack of workspace separation also jeopardizes the safety of our already-preserved research collections and their associated data. Regular collections functions such as packing and unpacking of loans, archiving of labels, cataloging and data entry cannot take place without significant risk to specimens and their data. The only table spaces available for these activities are chemical and/or skin prep areas, which are already crowded with specimen preps in progress. This issue impairs our ability to make RWLC web-accessible, because there is little safe, dry space for effective data capture (Goldberg, 2013).

**Bird and mammal collections expansion ability in jeopardy:** The RWLC must continue to strategically expand in order to meet its research mission. This will mean moving many specimen mounts (e.g. those with limited data) into exhibits and teaching collections, preparing and digitizing the frozen backlog of e.g. songbird and other vertebrate skins, and accelerating the acceptance of high priority vertebrates from across the region and nationally. As NYS’s designated higher education institution focused on environmental science, SUNY-ESF and its RWLC have long maintained a connection with state and federal agencies, many of which are staffed by SUNY-ESF graduates, and that require a local repository for important and potentially rapidly-decaying killed or confiscated vertebrates (e.g. mammals, migratory songbirds and waterfowl) and their associated data (e.g. condition, age, mode of death, and therefore potential emerging conservation threats). In order for RWLC to receive the taxonomic and geographic breadth and quantity of these specimens necessary for scientific research, RWLC needs adequate space. The consequences of not accepting these specimens are dire. For example, during winter 2014 central NY experienced consistently low temperatures and lakes remained frozen for longer than is typical. Lacking the ability to adequately forage, many waterbirds died *en masse*. Despite the research significance of this event, RWLC was unable to thoroughly document these events because space constraints meant we were able to accession very few of the available specimens. This amounted to a major loss of opportunity for increasing our understanding of biotic impacts of climate fluctuations and the winter physiology of northeastern waterbirds. In the past, RWLC was also a major repository for NYSDEC Wildlife Health Unit and Federal Refuges such as the local Montezuma National Wildlife Refuge (which is in the path of one of the most active waterfowl flyways in the Atlantic Flyway, and thus a source of diverse migratory birds, especially waterfowl), but due to space constraints we have not been able to take in these specimens in recent years, many of which are rare or new distribution records and therefore should be held in trust for scientific research and the American public. Unfortunately, in many cases such specimens are disposed of due to agencies’ lack of will, expertise, and proper facilities.

The RWLC’s dearth of expansion space also means that donations we might accept in their entirety may be split or accepted only in part, for example North America’s most complete waterfowl
collection, which has been promised to us by an avid sportsman and conservationist. The RWLC has also been challenged to accept another recent donation of at least 3000 specimens of northeastern mammals and birds to the RWLC (doubling our number of cataloged lots) over the next six years, but we have no space to put the specimens. Some of these specimens will include skeletal material, for which we have built a small and thriving dermestid colony in the biology building (particularly to skeletonize fine bones of rodents and songbirds). The RWLC also has strong ties with the local Rosamond Gifford Zoo. When zoo animals there die, particularly large mammals, RWLC needs to have the capacity to respond quickly to salvage hides and skeletons for research and educational purposes. Many of these large vertebrates are difficult or impossible to collect due to their conservation status in the wild.

The RWLC is also poised to receive specimens from the NY Natural Heritage Program (now housed in Illick Hall), as well as our own field stations in the Adirondacks, some of which possess inadequately maintained and insecure research collections that need to move to the main Syracuse campus (RWLC). Such active collections include rodents, bats, and songbirds, and although a move has been discussed, at this time RWLC lacks the cabinetry to take on the specimens (Adirondack Interpretive Center, Newcomb, NY; Assoc. Director S. McNulty, pers. comm.). The RWLC is also increasingly called on to inventory private and public lands (e.g. ESF faculty Drs. Gibbs and Leopold on Pawling, NY private estate). These bioblitzes often lead to collections of rare species, new distribution records and mandates for conservation activity, but our ability to incorporate specimens into our collections is compromised due to lack of space. SUNY-ESF’s graduate and undergraduate students also contribute specimens through upper-division organismal biology courses and independent projects, many of which take place on ESF’s substantial land holdings that include a variety of ecosystems, and the opportunity for long-term monitoring of bird and mammal populations. Unfortunately, lack of space and pest-free cabinets has resulted in a marked decrease in the regular deposition of specimens from these areas.

Parasite collection inaccessibility: The third major RWLC collection included in this project—parasites—suffers mainly from lack of public accessibility and climate control. The parasite slides (including many Type specimens in excellent condition: e.g. Oneida Lake trematodes and bird blood smears) are currently locked in a parasitologist’s faculty office (Whipps: SD.2B, 14) for lack of a safer space in Illick Hall. These slides need to be in a location where they will be protected from potential leaks and temperature fluctuations and where visiting researchers can be hosted by RWLC and study them.

V. INSTITUTIONAL COMMITMENT AND COLLECTIONS OPERATIONS

The RWLC has been severely underfunded since the 1950s when the line item in the State budget for the RWLC was discontinued. The last major investment in the RWLC was the purchase of new cabinetry in 1968. More than 40 years later state budget shortfalls meant that the RWLC bird and mammal collections were run on an operating budget of < $1000 per year with a Collections Manager and a team of Federal Work-Study students to maintain collections functions. Collections materials, including old cabinets, freezers and furniture have been salvaged from SUNY surplus. Many of the curatorial supplies purchased in the 1960s and 1970s are still in use, and RWLC’s current freezers were purchased in the 1980s. The facilities harken to the 1940s, and although historically charming, they are functionally woeful.

Investment and staffing: Despite past setbacks, RWLC is entering a new era as a centerpiece of the College and also a regional gateway for natural history education and biodiversity exploration. Natural history displays featuring RWLC specimens were given great prominence in SUNY-ESF’s new Gateway building, a LEED Platinum certified facility with a native plant green roof meant to be the “Gateway” for all visitors and students on campus. These displays along with our collections-oriented new College President (co-PI Wheeler, inaugurated Sept. 2014) and dire collections needs have catalyzed a renewed interest and investment in RWLC collections. The College has increased our annual operating budget to $5000 and made other important commitments to the long-term success and growth of collections. The CAP assessment also spurred the department to purchase a HEPA-filtered professional vacuum (recommended by Goldberg (2013) for the RWLC’s exclusive use in pest-monitoring.

The department Chair Professor Donald Leopold (support letter attached: SD.13) has also committed $500 beyond RWLC operating funds to address some of the clothes moth issues with new pest strips that were installed in the old cabinets in February 2015. Although this is not a permanent solution,
it will protect bird and mammal specimens until the move is underway in 2016 and IPM can commence. The Chair has also committed funds and precious space to a dermestid colony, which has enabled RWLC to finally prepare small mammal and bird skeletons more easily. Although these investments are small relative to our needs, they are non-trivial relative to the size of the biology department’s annual budget and show the college’s commitment to keeping the RWLC in operation.

The institution has also continued to fund a Collections Manager position at $75,000 per year plus benefits (currently held by Mr. Giegerich; SD.13). The Department has recently agreed to invest 20% FTE to Dr. Rebecca Rundell (PI) to serve as Head Curator for RWLC. She now provides oversight, sets policies and procedures, makes decisions on accessions and deaccessions, works on strategic planning, and leads a Collections Committee composed of faculty with specific taxonomic expertise and/or that undertake specimen-based research. Notably Rundell fills the role of Head Curator for the first time in RWLC history. Dr. Rundell’s teaching and research (at 40% FTE each) also rely heavily on natural history collections. For example, she gives presentations to students in her Evolution (180 students) and Invertebrate Zoology (40 students) courses on RWLC specimens and leads small groups on behind-the-scenes collections tours. Her students also contribute to collections (e.g. undergraduates collect invertebrates on her 2 fossil field trips to local Middle Devonian outcrops).

Rundell’s active museum-based systematics research program is at the heart of what RWLC does. She brings a wealth of museum experience, having worked continuously in museums since 1996, first at the Paleontological Research Institution/Museum of the Earth (1996-1998), Cornell University (1996-1997), then Bishop Museum (1998-2001), Field Museum of Natural History in Chicago (2001-2008), Beaty Biodiversity Museum in Vancouver (2008-2011), and the University of Arizona Museum of Natural History (2011-2012). Rundell has pursued a variety of projects at these museums including specimen-based research and curation, training of volunteers and students in museum techniques, computerization, developing and leading educational outreach programs, designing, editing and producing exhibits, ensuring proper specimen selection and care during exhibit installation, and specimen acquisition. Despite Rundell’s invertebrate diversity research focus, she is broadly educated in comparative vertebrate morphology, diversity and taxonomy and understands related research and teaching needs in sufficient detail to oversee the proposed project and vertebrate collections strategic planning. Co-PI Wheeler has more than thirty-five years experience as an insect taxonomist, describing more than 100 new species and publishing taxonomic revisions and monographs on several families of beetles and a cladistics analysis of the orders of insects. He coined the term “cybertaxonomy,” hiring the first cybertaxonomist while Keeper of Entomology in London’s Natural History Museum where he was responsible for a collection of 30 million specimens and a staff of 130 curators and researchers. He led recent teams to engineer and construct a network of remotely operable digital microscopes to revolutionize access to type and rare museum specimens (Wheeler et al. 2012a) and to explore options for an inventory of species (Wheeler et al. 2012b).

Security vs. accessibility. The proposed move to the Gateway Shell that will be facilitated in part by the $2M collections-specific state award for basic infrastructure will finally provide a safe space for collections as well as a walk-in freezer for IPM. This collections stabilization effort is the number one priority for the long-term security of our specimens (Goldberg 2013). However, data accessibility continues to be the primary interest of most RWLC-associated faculty and our agency partners (Goldberg 2013). Specimen data for birds, mammals and parasites are now kept on a mixture of old card files and spreadsheets, which are difficult for faculty to access, problematic to search, and impossible for outside researchers and students to access. These data archives represent the culmination of four separate attempts at computerization, each time requiring complete re-keying of data. The majority of collections cards were previously batch-scanned (at that time records were not linked to RWLC catalog numbers) so that separate copies could be stored off-site in case of fire or flood. The RWLC recently adopted a relational database that will help connect researchers and the public with our specimens. Along with this effort, Collections Manager Giegerich has become increasingly conversant with the iDigBio program (e.g. he attended the 20 August 2015 Small Collections Network Webinar on digitization).
VI. PROJECT DESCRIPTION

A long-term plan. Solving RWLC’s monumental equipment and space needs will require sustained effort in four phases over the next eight years. Such a strategic, measured approach will ensure long-term specimen security, collections expansion, and accessibility. Phases I-III (this proposal) rely on first finishing the completely new Roosevelt Wild Life Collections Research and Education Center using SUNY-ESF’s $2M state award. The $2M covers walls, plumbing, floors, glazing, doors, security, electricity, ventilation, walk-in freezer and embedded floor rails, but not carriages and cabinets. In the past year we have hired architects (QPK Design LLP, Syracuse, NY) and an exhibit design firm (Experience Design, Boston, MA) and plans for the space are now well-advanced (see SD.3, 7, 15).

Phase I (this proposal) involves embedding compactorized storage system rails in the concrete as it is poured (see SD.4 TechData Rail Systems), installing new cabinets and drawers, and digitizing specimen card data. Phase II (this proposal) is focused on specimen stabilization, and involves “pre-digitization” specimen curation and staging (sensu Nelson et al. 2012) including assessing specimen health, barcoding, then packing and moving our most valuable collections—birds, mammals and parasites (the latter of which will not be frozen)—to the new Gateway Shell (see SD.1, 7). Phase III (this proposal) involves IPM (freezing) of all moved specimens followed by label capture and reorganization of collections. The organismal biology classroom and collections education and training spaces will also be established in this phase. Phase IV involves completing the full complement of cabinetry in the Center as well as securing safe, modern, environmentally stable storage spaces through further renovations (e.g. Illick Hall), that would allow RWLC to re-house the remainder of its natural history collections (see attached floorplans and quotes for Illick Hall: SD.2, 6, 8, 11, 12). These collections moves would involve the installation of new compactorized storage systems for entomology collections, herbaria, and wet collections (fishes and herpetofauna) in Illick Hall. Phase IV will also involve advanced digitization such as select image capture of entire specimens and georeferencing of recently collected specimens (with Lat./Long. data; Nelson et al. 2012). Accelerated strategic expansion of collections will occur in this phase.

Phase I: The Gateway Shell is the last room in an already-complete new building on campus, which is the primary student gathering place on campus, and only a few meters from the biology building where the RWLC currently resides (SD.1-3). The Gateway Shell is a high-ceilinged space with double doors, a gravel floor, easy convenient access to a large service elevator, access to internal pedestrian traffic from two directions, as well as a direct outdoor entrance. The finished space will only have windows on the classroom and so collections will be protected from significant UV. There are minimal obstructions in the Shell and two compactorized storage systems companies have assessed the space and identified the location of the embedded rails. Embedding these rails as the concrete is poured in two steps (SD.4) is our highest priority for Phase I, because all future activities and expansion in the space rest on this (see SD. 4, TechData Rail System). If the floor is poured without the rail system RWLC would have to retrofit the space with a ramped “track and deck,” which is suboptimal due to maintenance issues (e.g. pealing floor tiles). Since the Gateway Shell will be our premiere collections center on campus, we expect it to receive the heaviest traffic from researchers (including students) and behind-the-scenes tours.

Following the curing of the floor, the -20° C walk-in freezer and new compactorized storage systems with new cabinetry and drawers will be installed (floor loading analysis, SD.5, and quotes SD.6, 7, 9, 10 attached). In this proposal RWLC is seeking one-half of the total amount of the quoted equipment for birds and mammals (~1000 sq. ft. of cabinet floor plant; see section VII.), which we have calculated will re-house all of our current birds and mammals and leave sufficient expansion space for the next ~3 years after moving. We will secure additional funds to incrementally add more cabinets in Phase IV. New cabinets will not only protect specimens from the elements, but they will confine any chemicals that have been previously applied and keep potential pests out. The clean drawers lined with acid-free drawer liners will also improve our ability to monitor for pests. Proximity of the new cabinets to our new walk-in freezer will allow for a regular schedule of IPM.

In the beginning of Phase I (summer 2016) a large staging area will be set up in the neighboring classroom to RWLC’s birds and mammals (SD.2). All of the initial specimen activities will occur here
until enough empty space has been created in the Illick collections area. Specimen data in the bird and mammal collections card files (card catalog) will be individually image-captured by RWLC catalog number and linked to the Specify database. Because these cards are already separate from the specimens, their digitization is straightforward, but linking them with RWLC numbers is an important step. Although the ideal solution would be to digitize each card with its specimen, the process of matching each specimen to its card will be too time consuming in this phase given the current organization of the collections, and the need to move specimens from damaging pests as soon as possible (i.e. cost-benefit and “efficient data capture process”: Nelson et al. 2012).

**Phase II:** Each specimen will be tagged with a barcode that is linked to its RWLC catalog number or accession number (if no catalog number), and current drawer location will be tracked in Specify so that no specimens are misplaced during the move. Each specimen will then be graded on a scale from 1 to 10 (1 = conservation problem, and 10 = specimen in good condition with data fully captured in relational database). Specific conservation problems will be triaged. We will adapt an assessment system to our collections needs using e.g. Favret et al. (2007) or the Williams et al. (1996) system for vertebrates. This quantitative approach to curation will allow us to set accessibility and remediation priorities in the future, which will allow us to properly allocate curation resources. The assessments will also provide a metric for judging staff progress and accomplishments (e.g. as specimens move from 1 to 5 within the year). During the specimen handling and move process, prior chemical treatments to specimens will be identified by Giegerich and Rundell and all personnel will be protected from those specimens using Nitrile gloves and hand-washing. Important chemical treatments will be noted for the relevant specimens in Specify, so that specimens can be separated in the Gateway Shell facility as necessary. All personnel involved with specimen assessment and data capture will be fully trained and carefully supervised to ensure data quality and consistency. The assessment process will be closely monitored by Collections Manager Giegerich. Because specimen security is paramount, PI Rundell will also evaluate workflow efficiency early in Phase II. If data capture and barcoding of specimens prior to IPM is inefficient, specimens will be carefully bagged and evacuated to the new Center, and then be barcode and digitized following IPM. In either case, this will ensure that all specimens entering the new facility have been treated for pests. Additional care will be taken with specimens entering IPM prior to digitization to minimize the potential for data loss (e.g. loose labels will be immediately identified).

Mounted specimens with limited data will be set aside for IPM in Phase III and moved to exhibits staging to make room for specimens with higher research value in the new space. Old, vacated cabinets will be cleaned, moved and immediately put into service to house our expanding Teaching Collections elsewhere in the biology building. During the assessment process, specimens will also be selected and imaged for our growing draft website (https://sites.google.com/site/rooseveltwildlife/home) to generate excitement about the move and help our audiences understand why we are doing it. The website will be promoted among Syracuse City schools as part of our Wild Life on the Web Project, with which we were able to purchase imaging equipment. Our graduate Collections Assistant and undergraduate Collections Intern will work with PI Rundell to create the images and video (e.g. https://sites.google.com/site/rooseveltwildlife/videos) and upload them to the RWLC website. Specimens will be carefully packed and bagged in heavy-duty freezer plastic and loaded onto padded carts to ensure minimal specimen movement.

**Phase III:** Bagged specimens will be rolled to the Gateway Building service elevator to be loaded into the new Roosevelt Wild Life Research and Education Center walk-in -20°C freezer for a two-stage freezing cycle (-20°C for 48 hrs. followed by 24 hrs. at room temperature and a second cycle of 48 hrs. at -20°C, for a total of 5 days; Florian 1990) to kill pest larvae. Bags will remain closed during the final thaw to protect specimens from condensation. A plan for modern taxonomic organization will be implemented, led by the RWLC graduate Collections Assistant in consultation with PI Rundell. Spaces within the new compactor ranges will be assigned to different taxonomic groups, to be adjusted slightly as the move progresses. RWLC will follow the phylogenetic structure from NSF’s Tree of Life website (tolweb.org) and associated references for birds and mammals and also for parasites. This will be the first taxonomic reorganization for the RWLC since the 1970s, and the phylogenetically-based reorganization
will be incorporated into SUNY-ESF’s Evolution course (taught by Rundell) using up-to-the-minute images from the move progress to generate excitement about macroevolutionary questions, phylogenetic uncertainty, types of phylogenetic data, and natural history collections.

As trays move out of IPM and are ready to be opened, data from specimen foot tags will be keyed into Specify database, each record linked to RWLC number and barcode. The decision was made to move this manual data entry into the Center, following IPM, since not only will the space be clean and more conducive to data entry, but some of the tags contain important information not on the card system, that is often in light brown ink on brown paper (difficult to image), e.g. data from a prairie warbler captured in 1875: “Beech and maple country; open place; low bushes.” Our concern is that careful keying of entries will take too long to occur in Phases I and II, and that it is more important to save the specimens from pests first, and key additional data in Phase III (Nelson et al. 2012 also recognized that complete data capture specimen-by-specimen is slow, and not always the best practice). Specimens awaiting tag digitization will remain in a bank of drawers and later will be moved to their final destination. Any archival materials needed to isolate individual specimens (paper liners, boxes) will be purchased with RWLC’s normal operating budget. The new drawers and cabinets will finally accommodate different specimen sizes and thus specimens will no longer be damaged by fur and feathers getting caught in neighboring tightly packed drawers. The parasite collection will be moved onto a padded cart and carefully moved to the Center, under the supervision of RWLC’s parasitologist (C. Whippes; letter SD.14). It will be placed in a secure area on view to visitors learning about different types of natural history collections and the ecological importance of invertebrates. The original, now vacated bird and mammals space in Illick Hall will become a new Vertebrate Preparation Area (SD.2A), since it is equipped with several sinks and a fume hood for boiling carcasses. Prep work will finally be isolated from old, fragile and valuable collections. This will accomplish the isolation of collections tasks recommended by the CAP (Goldberg 2013). The new collections Center (in Gateway building) is designed with ample work spaces for separating computerization, curation, loans processing, and collections education activities.

VII. PROJECT MANAGEMENT, TASK ANALYSIS AND TIMELINE
RWLC will implement a nested organizational hierarchy during the proposed project. Head Curator PI Rundell and co-PI and SUNY-ESF President Wheeler will work together on oversight of the project, ensuring that all steps are conducted properly and on schedule. Rundell will work with the contractors and the SUNY project manager to ensure that the collections space is properly designed and finished and that all components of the equipment are installed correctly and on time. Communication with other members of the project team (Giegerich, students, etc.) will be facilitated by a shared Google Docs spreadsheet with tasks and completion dates. Rundell will also seek the input of the RWLS Collections Committee as needed. Rundell will supervise Giegerich and the Collections Assistant (biology graduate student). The Collections Assistant will learn management skills by providing immediate supervision to the undergraduate Collections Interns, with oversight from Giegerich. Rundell and Giegerich will schedule regular meetings to ensure adherence to the move, IPM, and specimen assessment plans, and taxonomic organization. SUNY will provide a project manager and architect for the duration of the project (Table 7).

Table 7. Project Timeline and Personnel Allocation

<table>
<thead>
<tr>
<th>Phase Number and Project Component</th>
<th>Personnel</th>
<th>Start Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Rail and concrete floor installation</td>
<td>Henderson-Johnson, SUNY, Rundell</td>
<td>May 2016</td>
<td>May 2016</td>
</tr>
<tr>
<td>I. Finishing of Gateway Shell</td>
<td>SUNY architect, project manager</td>
<td>May 2016</td>
<td>July 2016</td>
</tr>
<tr>
<td>I. Walk-in freezer installation</td>
<td>SUNY architect, project manager</td>
<td>July 2016</td>
<td>July 2016</td>
</tr>
<tr>
<td>I. Carriage, cabinet and drawer installation</td>
<td>Henderson-Johnson, Rundell</td>
<td>July 2016</td>
<td>August 2016</td>
</tr>
<tr>
<td>I. Collections card file digitization</td>
<td>Rundell, Giegerich, students</td>
<td>June 2016</td>
<td>August 2016</td>
</tr>
<tr>
<td>II. Barcoding, spm. assessment, packing</td>
<td>Rundell, Giegerich, students</td>
<td>June 2016</td>
<td>Sept. 2017</td>
</tr>
<tr>
<td>III. Move of birds and mammals</td>
<td>Rundell, Giegerich, students</td>
<td>August 2016</td>
<td>May 2018</td>
</tr>
<tr>
<td>III. IPM: Freezing of specimens</td>
<td>Rundell, Giegerich, students</td>
<td>August 2016</td>
<td>May 2018</td>
</tr>
<tr>
<td>III. Taxonomic reorganization, digitization</td>
<td>Rundell, Giegerich, students</td>
<td>August 2016</td>
<td>May 2018</td>
</tr>
<tr>
<td>III. Move of parasite collection</td>
<td>Rundell, Whippes</td>
<td>March 2018</td>
<td>March 2018</td>
</tr>
<tr>
<td>III. Reorganize old space for vert. prep</td>
<td>Rundell, Giegerich, students</td>
<td>April 2018</td>
<td>May 2018</td>
</tr>
</tbody>
</table>
**Student staff time.** The most intense initial work on the project will occur in summer 2016 when RWLC will employ a full-time undergraduate paid Collections Intern and a full-time graduate Collections Assistant to work with Giegerich and Rundell. During the school year, the graduate Collections Assistant will be committed part time (20 hours/week), plus we will recruit high-quality undergraduate volunteer Collections Interns who will participate for independent research course credit at 10 h/w. Collections students on the project will be trained and mentored in collections techniques and taxonomy by Rundell and Giegerich and evaluated regularly, particularly before the subsequent enrollment period.

**Effort allocation for specimen tracking, assessments, IPM.** It will take an average of 10 min. per bird or mammal or parasite specimen to enter its name, catalog number (or accession number if catalog number is absent) and rate its condition (and possibly deal with any minor damage issues as they are discovered, saving bigger jobs for later), once that specimen has been located and is in front of the staff member processing it. At this rate, doing nothing but this for 105,000 minutes in the working year, RWLC staff would process 10,500 specimens, the approximate number of bird, mammal and parasite specimens in our collections, in one working year. However, these basic tasks will be interspersed with other tasks such as specimen padding, packing, freezing, moving and reorganizing.

If we estimate 100 specimens to be moved, bagged and frozen per 5-day IPM, the IPM process alone will take (10,000 bird and mammal specimens/100 specimens per IPM=100 IPM cycles x 5 days/cycle = 500 days). Considering that some of our songbirds, rodents and bats have small body sizes and we can therefore fit more specimens in the freezer at once, we expect to accomplish IPM of all of our specimens in just under a year, with tasks such as moving the carts, reorganizing specimens taxonomically, and setting up the new space to fit in during freeze cycles. Therefore we estimate that two years is a reasonable duration for the proposed project. During this time when our collections team is digging deep into the collections, we will also be selecting about 30 of the most interesting specimens to image using photographic equipment from our Wild Life on the Web program in order to connect our audiences with the collections-on-the-move. This work will take about 1 h/specimen or 30 h.

**Cabinet space.** The current floor plant for the bird and mammal collections in Illick 215 is 1351 sq. ft. (SD2.A) of which ~700 sq. ft. of floor plant is over-packed bird and mammal cabinets. If we consider both the uncrowding of the current specimens as well as accelerated expansion of the collections with donations from e.g. Montezuma Wildlife Refuge, SUNY-ESF field stations, etc., RWLC would need approximately 300 additional sq. ft. of modernized cabinetry over the next 3-4 years to fulfill its research mission (a total of >1000 sq. ft.). The total available floor plant of the cabinet space in the new Center is 2079 sq. ft. out of the total 5290 sq. ft. area (SD.7; some of which is dedicated to the dedicated organismal course classroom, collections-themed exhibits (SD.15), and collections lab, scientific visitor, microscope and digitizing spaces as well as freezers, storage, room ventilation/mechanics and collection manager office). Given this, we will need one-half of the total complement of cabinetry and carriages (i.e. 1039 sq. ft. (floor plant) of new cabinets and carriages) to fulfill Phases I-III of this project (see budget justification). During phases I-III we will be seeking the additional funds for the full number of cabinets as well as for transforming collections conditions within Illick Hall (herbaria, entomology, fishes etc.; SD.2, 6, 8, 11, 12). Rails will be installed throughout the floor where this future cabinetry is expected.

**VIII. DISSEMINATION OF RESULTS**

We plan to disseminate our results in five key ways: (1) Move progress will be disseminated broadly via our new website https://sites.google.com/site/rooseveltwildlife/home, including videos about the move, e.g. https://sites.google.com/site/rooseveltwildlife/videos (e.g. SD.16). News will also be disseminated to the university community and central NY via the President’s blog, (esfpresident.wordpress.com), via Twitter @PresidentESF and specimen snapshots will be shared via Instagram; (2) ~30 specimens will be selected for high-resolution imaging and placement on iDigBio.org as well as the RWLC’s website; (3) Digitized data (including assessment data) will be entered using Specify and the Specify Web Portal and uploaded onto iDigBio.org for wide access; and (4) Rundell and one graduate student will attend the Society of Systematic Biologists and American Society of Naturalists joint meeting in Portland, OR in summer 2017 and present at least one talk and a jointly authored poster to promote the RWLC and new facilities. SSB/ASN has a broad attendance of organismal biologists that includes both ornithologists and
mammalogists. (5) Undergraduate Collections Interns will develop independent collections-based research projects that they will present at the annual ESF Spotlight on Student Research Symposium, where they will serve as “Collections Ambassadors,” promoting the research use of collections.

IX. INTELLECTUAL MERIT
RWLC, named for and endorsed by US President Theodore Roosevelt (the only memorial to him that he approved of personally), is not only a growing repository for research specimens that document North American (particularly northeastern) environmental change over the past century, but the collection continues to be central to SUNY-ESF’s rigorous and heavily subscribed graduate and undergraduate organismal biology education program (likely one of the largest in the US, with ~1500 students enrolled in taxony-based courses annually). The creation of the RWLC Research and Education Center will catalyze a lasting connection between SUNY-ESF students (future environmental leaders) and research collections by directly involving them in the collections accessibility effort. Unlike typical pre-med-focused programs, at ESF we have the opportunity to educate environmentally-inclined students about the explicit link between whole-specimen data and our nation’s ability to solve regional, national and global environmental problems (e.g. understanding the impacts of climate change and finding ways to mitigate species losses). Many of the students trained in the Center using specimens secured in Phases I-III will go on to lead conservation and wild life management agencies across the region and nation. Increasing specimen security and physical and digital access to specimens will also enhance researchers’ ability to use the collections. For example, the RWLC will be able to more readily provide the New York Natural Heritage Program critical biodiversity information for land-use planning by NYS (NYNHP was adopted in 2013 into the biology department at SUNY-ESF). Data from the 1800s onward remain buried in the drawers of the RWLC, and as described in Sec. I, much of these data describe species that have declined sharply in the past few decades. Conservation and state organizations need this information as well as the ability to keep growing these collections. RWLC will also host one of only four remotely operable digital microscopes in the world (currently in Rundell’s lab), which will allow for remote taxonomic collaboration projects, e.g. linking professionals in the field and faculty at other institutions with species morphology and identification resources at the RWLC. During the move we will also conduct a thorough collections assessment on each specimen in the collection in order to establish a baseline of specimen condition and accessibility status that will serve the RWLC in priority-setting for the next hundred years.

X. BROADER IMPACTS
(1) We will train and mentor at least six students (one grad and 5 undergrads) in intensive curation work throughout the two-year project. We will emphasize underrepresented groups when selecting interns. SUNY-ESF ranked number three in 2010 for educating women in STEM fields, and we plan to expand on this as well as involve ethnically diverse students that are normally excluded from organismal biology fields. Our goal is to mentor students in every aspect of a working museum so that they can become natural history and collections ambassadors for the rest of campus and in their future careers. (2) We will make select specimens web-accessible (e.g. SD.16) in order to stimulate an interest in nature among Syracuse inner city secondary school biology students. Syracuse is now among the poorest cities in the nation, especially among blacks and Hispanics (Jargowsky 2015, http://apps.tcf.org/architecture-of-segregation). These are audiences we want to recruit into natural history and conservation fields. Our high-res specimen images will allow students to investigate specimens in almost infinite detail. This method protects the specimen, but also engages students using their phones and technology as gateways to natural history enthusiasm. We will begin this effort by reaching out to existing teacher contacts through the well-established ESF in the High School program, beginning with City High Schools: Corcoran, Fowler, Henninger and Nottingham. We will follow-up with a short voluntary questionnaire for teachers to assess the effectiveness of the website and to solicit ways in which we could build our program into their existing curricula. (3) The public will have the opportunity to tour and view the new space through interpretive natural history collections-themed professionally designed exhibits (SD.15), large windows onto the cabinetry, collections bioinformatics and active collections work (SD.7). The visual openness of the new space delivers the message that collections belong to all of us.
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(a) Professional Preparation
Cornell University (Ithaca, NY) Biology and Ecology & Evolutionary Biology B.S. 1996
University of Chicago (Chicago, IL), Evolutionary Biology M.S. 2004
University of Chicago Evolutionary Biology Ph.D. 2008

(b) Appointments
2013-present  **Head Curator**, Roosevelt Wild Life Collection, Roosevelt Wild Life Station,
Department of Environmental and Forest Biology, State University of New York,
College of Environmental Science and Forestry (SUNY-ESF), Syracuse, NY
2012-present  **Assistant Professor**, Department of Environmental and Forest Biology, SUNY-ESF
2011-2012  **George Gaylord Simpson Post-Doctoral Fellow**, Department of Ecology and
Evolutionary Biology and **University of Arizona Museum of Natural History**,
University of Arizona, Tucson, AZ
2008-2011  **Post-Doctoral Fellow**, Departments of Zoology and Botany, Biodiversity Research
Centre and **Beaty Biodiversity Museum**, University of British Columbia,
Vancouver, BC, Canada
2000-2001  **Research Assistant, Bishop Museum**: University of Hawaii, Honolulu, HI
1999-2000  **Research Assistant**: University of Hawaii
1998-1999  **Research Assistant, Bishop Museum**: University of Hawaii
1997-1998  **Assistant to the Director and Volunteer Coordinator**: Paleontological Research
Institution, Ithaca, NY
1996-1997  **Collections Assistant**, Cornell University, Ithaca, NY
1996-1997  **Collections Assistant**, Paleontological Research Institution, Ithaca, NY

(c) Most closely related publications
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dwelling entoproct from the western coast of North America: *Loxosomella vancouverensis* sp. nov.
Rundell, R.J. 2011. Snails on an evolutionary tree: Gulick, speciation, and isolation. *American
and nonecological speciation. *Trends in Ecology and Evolution* 24(7): 394-399. [Faculty of 1000
Biology Recommended Paper]
Rundell, R.J. 2008. Cryptic diversity, molecular phylogeny and biogeography of the rock- and leaf
litter-dwelling land snails of Belau (Republic of Palau, Oceania). *Philosophical Transactions of
the Royal Society B Biological Sciences* 363(1508): 3401-3412.
Five other significant publications


(d) Synergistic Activities

1. **Invited Collections Expert:** External Review Commission for Collections at INECOL (Xalapa, Veracruz, Mexico). INECOL holds diverse, large and nationally important natural history collections and is preparing a move to a new integrated Collections facility. Advised and provided oversight for curatorial organizational structure, Collections Management Policies, planning for upcoming collections move, and mission, vision, and expansion. (July 2014)

2. **Lead PI** on a collaborative project with the U.S. Fish and Wildlife Service, involving the conservation and captive breeding of the rarest land snail species in NY. We are also building capacity at local informal education venues (zoos) to educate the public about the importance of invertebrates in the ecosystem. (2013-Present)

3. **Invited speaker:** “Linking research and teaching through museum collections and natural objects” at the Integrative STEM Learning: Pedagogy and Partners Conference at Trinity University (San Antonio, TX). Spoke about provoking emotional/reactive learning responses in formal and informal learners through hands-on experiences with natural history specimens. (October 2013)

4. **Produced and designed specimen-based museum exhibits** on evolution at the Beaty Biodiversity Museum in Vancouver, BC, Canada, integrating information on evolution process and pattern with cultural (primarily First Nations/indigenous peoples) and environmental perspectives. (2008-2011) Produced fossil exhibits at the Paleontological Research Institution in Ithaca, NY, and provided related outreach to home-schooled students from a creationist background. (1996-1998)

5. **Mentored undergraduates** in convening local celebrations of International Darwin Day e.g. at SUNY-ESF featuring the latest research in evolutionary and organismal biology in poster format, translated into layperson’s language by undergraduate evolution students. (February 2013, 2014)

(e) Collaborators, co-authors & other affiliations within the last 48 months

**Collaborators and Co-editors:** Gary Barker (LandCare Rsch., NZ), Michael Barker (Univ. Arizona), Steven Campbell (Albany Pine Bush Preserve Commission), Jacqui Frair (SUNY-ESF), David Furth (NMNH Smithsonian Inst.), David Gernandt (UNAM, Mexico), James Gibbs (SUNY-ESF), Kenneth Hayes (Howard Univ.), Michel Labrecque (Montreal Botanical Garden), Brian Leander (Univ. British Columbia), Diarmaid Ó Foighil (Univ. Michigan), Orlik Gomez Garcia (INECOL, Mexico), Liliana Lara (CONABIO, Mexico), Wallace Meyer (Pomona Coll.), Claudia Medina Uribe (Humboldt Inst., Columbia), Ricardo Valenzuela Garza (ENC-B-IPN, Mexico), Norine Yeung (Univ. Hawaii at Manoa)

**Graduate Advisers and Postdoctoral Sponsors:** Rudiger Bieler (Field Museum of Natural History), Paul Z. Goldstein (NMNH Smithsonian Inst., USDA), Robert Cowie (Univ. of Hawaii at Manoa), Brian S. Leander (Univ. of British Columbia), Michael Barker and Michael Sanderson (Univ. of Arizona)

**Thesis Adviser and Postgraduate-Scholar Sponsor:** David Bullis (SUNY-ESF), Jesse Czekanski-Moir (SUNY-ESF), Cody Gilbertson (SUNY-ESF) (thesis adviser); Jessica Miller (SUNY-ESF), Logan Osterhoudt (SUNY-ESF) (postgraduate-scholar sponsor); **Total graduate students sponsored:** (5)
Biographical Sketch for Quentin D. Wheeler, Ph.D.
State University of New York | Syracuse, NY 13210 | (315) 470-6623 | president@esf.edu

(a) **Professional Preparation**
The Ohio State University  Columbus, Ohio  Entomology  B.S.  1976
The Ohio State University  Columbus, Ohio  Entomology  M.S.  1977
The Ohio State University  Columbus, Ohio  Entomology  Ph.D.  1980

(b) **Appointments**
2014-present  **President**, College of Environmental Science and Forestry (SUNY-ESF), Syracuse, NY
2007-2012  **Vice President and Dean**, College of Liberal Arts and Sciences, Arizona State University, Tempe, Arizona
2007-2014  **Virginia M. Ullman Professor of Natural History and the Environment**, School of Life Sciences, Arizona State University, Tempe, Arizona and Senior Scientist, Global Institute of Sustainability, ASU
2007-present  **Founding Director**, International Institute for Species Exploration
2001-2004  **Division Director**, Division of Environmental Biology, National Science Foundation, Arlington, Virginia

(c) (i) **Most closely related publications**

(ii) **Five other significant publications**
(d) **Synergistic Activities**


2. Organized, with Sandra Knapp, a collection of essays as a means for scientific community to commemorate the 250th anniversary of Linnaeus’ *Systema Naturae X*, resulting in edited volume *Letters to Linnaeus* published by the Linnean Society of London.


5. Co-organizing meeting for the Systematics Association in Oxford University in August, 2015, on taxonomic monography with Robert Scotland.

(e) **Collaborators, co-authors & other affiliations within the last 48 months**

Collaborators and Co-editors: David Williams (Natural History Museum, London), Michael Schmidt (Zoologisches Forschungsinstitut und Museum), Frank Krell (Denver Museum of Science and Nature), Robert Scotland (Oxford University), Theirry Bourgoi (Museum National d’Histoire Naturelle, Paris), Andrew Polaszek (Natural History Museum, London), Leandro Assis (Universidade Federal de Minas Gerais), Olivier Rieppel (Field Museum of Natural History, Chicago), Sara Pennak (Arizona State University), Rebecca Dornberg (Arizona State University)

Graduate Advisors and Postdoctoral Sponsors: Charles A. Triplehorn (The Ohio State University), Weston Opitz (Kansas Wesleyan University)

### SUMMARY PROPOSAL BUDGET

**YEAR 1**

**FOR NSF USE ONLY**

<table>
<thead>
<tr>
<th>ORGANIZATION</th>
<th>PROPOSAL NO.</th>
<th>DURATION (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUNY College of Environmental Science and Forestry</td>
<td>Proposed</td>
<td>Grants</td>
</tr>
</tbody>
</table>

**PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR**

Rebecca Rundell

**NSF Funded**

**Person-months**

<table>
<thead>
<tr>
<th>Funds Requested by proposer</th>
<th>Funds granted by NSF (if different)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAL</td>
<td>ACAD</td>
</tr>
</tbody>
</table>

**Funds Requested By**

| proposer | 8,175 |

**Date Checked**

**Date Of Rate Sheet**

**Initials - ORG**

**FOR NSF USE ONLY**

**ORGANIZATION PROPOSAL NO. DURATION (months)**

**Proposed**

**Granted**

**PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR AWARD NO.**

**A. SENIOR PERSONNEL: PI/PD, Co-PI’s, Faculty and Other Senior Associates**

(List each separately with title, A.7. show number in brackets)

<table>
<thead>
<tr>
<th>CAL</th>
<th>ACAD</th>
<th>SUMR</th>
</tr>
</thead>
</table>

1. **Rebecca J Rundell - PI/Assist Professor-EBF**

0.00 0.45 0.75 8,175

**B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)**

1. **POST DOCTORAL SCHOLARS**

0.00 0.00 0.00 0

2. **OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)**

0.00 0.00 0.00 0

3. **GRADUATE STUDENTS**

18,000

4. **UNDERGRADUATE STUDENTS**

4,848

5. **SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)**

0

6. **OTHER**

0

**TOTAL SALARIES AND WAGES (A + B)**

31,023

**C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)**

6,125

**TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)**

37,148

**D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)**

| Cabinet, Carriage Mobile Storage System | $339,000 |

**TOTAL EQUIPMENT**

339,000

**E. TRAVEL**

1. **DOMESTIC (INCL. U.S. POSSESSIONS)**

0

2. **INTERNATIONAL**

0

**F. PARTICIPANT SUPPORT COSTS**

1. **STIPENDS**

0

2. **TRAVEL**

0

3. **SUBSISTENCE**

0

4. **OTHER**

0

**TOTAL NUMBER OF PARTICIPANTS ( ) TOTAL PARTICIPANT COSTS**

0

**G. OTHER DIRECT COSTS**

1. **MATERIALS AND SUPPLIES**

2,400

2. **PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION**

0

3. **CONSULTANT SERVICES**

0

4. **COMPUTER SERVICES**

0

5. **SUBAWARDS**

0

6. **OTHER**

12,592

**TOTAL OTHER DIRECT COSTS**

14,992

**H. TOTAL DIRECT COSTS (A THROUGH G)**

391,140

**I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)**

a, b, c, g1 (Rate: 57.0000, Base: 39548)

**TOTAL INDIRECT COSTS (F&A)**

22,542

**J. TOTAL DIRECT AND INDIRECT COSTS (H + I)**

413,682

**K. SMALL BUSINESS FEE**

0

**L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)**

413,682

**M. COST SHARING PROPOSED LEVEL $**

0

**AGREED LEVEL IF DIFFERENT $**

<table>
<thead>
<tr>
<th>PI/PD NAME</th>
<th>FOR NSF USE ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rebecca Rundell</td>
<td>INDIRECT COST RATE VERIFICATION</td>
</tr>
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**ORG. REP. NAME**

William Nicholson

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET*
**SUMMARY PROPOSAL BUDGET**

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<tr>
<th>PROPOSAL NO.</th>
<th>DURATION (months)</th>
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<tr>
<td></td>
<td>Proposed</td>
</tr>
<tr>
<td></td>
<td>Granted</td>
</tr>
</tbody>
</table>

**ORGANIZATION**
SUNY College of Environmental Science and Forestry

**PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR**
Rebecca Rundell

**A. SENIOR PERSONNEL: PI/PD, Co-PI’s, Faculty and Other Senior Associates**
(List each separately with title, A.7. show number in brackets)

<table>
<thead>
<tr>
<th>Name</th>
<th>CAL</th>
<th>ACAD</th>
<th>SUMR</th>
<th>Total Person-months</th>
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</thead>
<tbody>
<tr>
<td>Rebecca J Rundell - PI/Assist Professor-EFB</td>
<td>0.00</td>
<td>0.45</td>
<td>0.75</td>
<td>8,301</td>
</tr>
<tr>
<td>2.</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>3.</td>
<td></td>
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</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0</td>
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<tr>
<td>7. (1) TOTAL SENIOR PERSONNEL (1 - 6)</td>
<td>0.00</td>
<td>0.45</td>
<td>0.75</td>
<td>8,301</td>
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**B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
<th>Total Person-months</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. POST DOCTORAL SCHOLARS</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2. OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3. GRADUATE STUDENTS</td>
<td>1</td>
<td>18,540</td>
</tr>
<tr>
<td>4. UNDERGRADUATE STUDENTS</td>
<td>1</td>
<td>4,848</td>
</tr>
<tr>
<td>5. SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>6. OTHER</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL SALARIES AND WAGES (A + B)</strong></td>
<td></td>
<td>31,689</td>
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**C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Total Person-months</th>
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</thead>
<tbody>
<tr>
<td><strong>TOTAL SALARIES AND WAGES AND FRINGE BENEFITS (A + B + C)</strong></td>
<td>38,355</td>
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**D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Dollar Amount</th>
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<tbody>
<tr>
<td><strong>TOTAL EQUIPMENT</strong></td>
<td>0</td>
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</tbody>
</table>

**E. TRAVEL**

<table>
<thead>
<tr>
<th>Category</th>
<th>Total Person-months</th>
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</thead>
<tbody>
<tr>
<td>1. DOMESTIC (INCL. U.S. POSSESSIONS)</td>
<td>3,000</td>
</tr>
<tr>
<td>2. INTERNATIONAL</td>
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**F. PARTICIPANT SUPPORT COSTS**

<table>
<thead>
<tr>
<th>Category</th>
<th>Total Person-months</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. STIPENDS</td>
<td>0</td>
</tr>
<tr>
<td>2. TRAVEL</td>
<td>0</td>
</tr>
<tr>
<td>3. SUBSISTENCE</td>
<td>0</td>
</tr>
<tr>
<td>4. OTHER</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL NUMBER OF PARTICIPANTS</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL PARTICIPANT COSTS</strong></td>
<td>0</td>
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**G. OTHER DIRECT COSTS**

<table>
<thead>
<tr>
<th>Category</th>
<th>Total Person-months</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. MATERIALS AND SUPPLIES</td>
<td>0</td>
</tr>
<tr>
<td>2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION</td>
<td>0</td>
</tr>
<tr>
<td>3. CONSULTANT SERVICES</td>
<td>0</td>
</tr>
<tr>
<td>4. COMPUTER SERVICES</td>
<td>0</td>
</tr>
<tr>
<td>5. SUBAWARDS</td>
<td>0</td>
</tr>
<tr>
<td>6. OTHER</td>
<td>13,096</td>
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<tr>
<td><strong>TOTAL OTHER DIRECT COSTS</strong></td>
<td>13,096</td>
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**H. TOTAL DIRECT COSTS (A THROUGH G)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Total Person-months</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL DIRECT COSTS</strong></td>
<td>54,451</td>
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**I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)**

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<tr>
<th>Rate</th>
<th>Base</th>
<th>Total Indirect Costs (F&amp;A)</th>
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</thead>
<tbody>
<tr>
<td>a,b,c,e (Rate: 57.0000, Base: 41355)</td>
<td>23,572</td>
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<tr>
<td><strong>TOTAL INDIRECT COSTS</strong></td>
<td>23,572</td>
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</table>

**J. TOTAL DIRECT AND INDIRECT COSTS (H + I)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Total Person-months</th>
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<tbody>
<tr>
<td><strong>78,023</strong></td>
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</tbody>
</table>

**K. SMALL BUSINESS FEE**

<table>
<thead>
<tr>
<th>Category</th>
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<tbody>
<tr>
<td><strong>0</strong></td>
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**L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Total Person-months</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>78,023</strong></td>
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**M. COST SHARING PROPOSED LEVEL**

<table>
<thead>
<tr>
<th>Category</th>
<th>Total Person-months</th>
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</thead>
<tbody>
<tr>
<td><strong>0</strong></td>
<td>AGREED LEVEL IF DIFFERENT</td>
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</tbody>
</table>

**PI/PD NAME**
Rebecca Rundell

**FOR NSF USE ONLY**

**INDIRECT COST RATE VERIFICATION**

<table>
<thead>
<tr>
<th>Category</th>
<th>Total Person-months</th>
</tr>
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<tbody>
<tr>
<td><strong>2</strong> ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET</td>
<td></td>
</tr>
<tr>
<td>ORGANIZATION: SUNY College of Environmental Science and Forestry</td>
<td>PROPOSAL NO.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
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<tr>
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<td></td>
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</tbody>
</table>

**A. SENIOR PERSONNEL:** PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title. A.7. show number in brackets)

<table>
<thead>
<tr>
<th>Name</th>
<th>CAL</th>
<th>ACAD</th>
<th>SUMR</th>
<th>Proposed Person-months</th>
<th>NSF Funded Person-months</th>
<th>Funds Requested by proposer</th>
<th>Funds granted by NSF</th>
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<tbody>
<tr>
<td>Rebecca J Rundell - PI/Assist Professor-EBF</td>
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<td>0.90</td>
<td>1.50</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
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**B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
<th>Funds Requested by proposer</th>
<th>Funds granted by NSF</th>
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<tbody>
<tr>
<td>POST DOCTORAL SCHOLARS</td>
<td>(0)</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)</td>
<td>(0)</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>GRADUATE STUDENTS</td>
<td>(2)</td>
<td>36,540</td>
<td>36,540</td>
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<tr>
<td>UNDERGRADUATE STUDENTS</td>
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<td>0.00</td>
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<tr>
<td>SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)</td>
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<tr>
<td>OTHER</td>
<td>(0)</td>
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**C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)**

<table>
<thead>
<tr>
<th>Subcategory</th>
<th>Number</th>
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<tr>
<td>TOTAL SALARIES AND WAGES (A + B)</td>
<td>62,712</td>
<td>12,791</td>
<td>12,791</td>
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**D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)**

<table>
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<th>Item</th>
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<td></td>
<td>$339,000</td>
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**TOTAL EQUIPMENT**

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<th>Funds Requested by proposer</th>
<th>Funds granted by NSF</th>
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<tbody>
<tr>
<td>TRAVEL</td>
<td>1</td>
<td>3,000</td>
<td>3,000</td>
</tr>
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</table>

**F. PARTICIPANT SUPPORT COSTS**

<table>
<thead>
<tr>
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<th>Number</th>
<th>Funds Requested by proposer</th>
<th>Funds granted by NSF</th>
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<tbody>
<tr>
<td>STIPENDS</td>
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<tr>
<td>TRAVEL</td>
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<tr>
<td>SUBSISTENCE</td>
<td>(0)</td>
<td>0.00</td>
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</tr>
<tr>
<td>OTHER</td>
<td>(0)</td>
<td>0.00</td>
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**G. OTHER DIRECT COSTS**

<table>
<thead>
<tr>
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<th>Funds Requested by proposer</th>
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<td>PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION</td>
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<td>0</td>
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<tr>
<td>CONSULTANT SERVICES</td>
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<td>0.00</td>
<td>0.00</td>
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<tr>
<td>COMPUTER SERVICES</td>
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<tr>
<td>SUBAWARDS</td>
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<td>OTHER</td>
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<td>25,688</td>
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**TOTAL OTHER DIRECT COSTS**

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**H. TOTAL DIRECT COSTS (A THROUGH G)**

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**INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)**

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**L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)**

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**N. AGREED LEVEL IF DIFFERENT $**

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**PI/PD NAME**

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**FOR NSF USE ONLY**

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**ORG. REP. NAME***

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*ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET
BUDGET JUSTIFICATION

A. SENIOR PERSONNEL
5% academic year and summer salary support (3 weeks in years 1 and 2) for PI Rundell is sought as she has a 10-month academic year appointment and has primary responsibility for the project. She will be planning and supervising the entire collections pack and move, providing data and project quality control and adherence to the proposed timetable. Much of this activity will occur over the summer when Rundell is not teaching and is unsupported. Rundell will also mentor the undergraduate Collections Intern and the graduate Collections Assistant as well as oversee related interpretive efforts such as exhibit signage promoting the collections move.

No additional support is sought for co-PI Wheeler. Wheeler will meet with Rundell each week to discuss move progress and troubleshoot any problems with workflow or equipment installation.

B. OTHER PERSONNEL

Graduate Collections Assistant. – Funding for one graduate student Collections Assistant – 50% FTE is requested for project years one and two ($18,000 x 2 years, as well as a second-year salary increase of 3%) to assist the Collections Manager with the inventory, assessment, reorganization, and installation of the bird and mammal collections. This position will provide an attractive organismal biology and collections education opportunity for a collections and biodiversity-oriented graduate student. The graduate Collections Assistant will be mentored by the PI (Rundell) and will take the lead on researching the appropriate modern phylogenetic arrangement of the collections, data quality control (with the help of the Collections Manager) and troubleshooting the digitization effort. The Collections Assistant will also contribute to communicating the work of the move and the RWLC to the scientific community through e.g. a poster presentation at the annual Society of Systematic Biologists/American Society of Naturalists/Society for the Study of Evolution joint meeting in Portland, Oregon, and to school audiences through the RWLC website. Academic year tuition is also included in the budget under “Other” for the graduate student collections assistant.

Undergraduate Collections Intern. – Funding for one undergraduate Collections Intern is requested for the summers of project years one and two. This position will provide transformative training in collections work and biodiversity, particularly for our conservation, wildlife and environmental biology majors in the Department of Environmental and Forest Biology, many of whom will be seeking leadership roles in state and federal conservation and wildlife agencies, either immediately following graduation, or after graduate study. With the help of the Collections Manager and graduate Collections Assistant, the Collections Intern will be involved in assessing the conservation status of specimens, employing Integrative Pest Management approaches to specimen drawers using the -20°C walk-in freezer, digitizing specimen data and moving and organizing specimens. The intern will work closely with the Graduate Collections Assistant and PI in developing an independent research project using specimens from the RWLC and their associated data, and will help promote the collections through the RWLC website and social media. The intern’s research project will be continued during the regular academic year as an independent study (EFB498 course “Research Problems in Environmental and Forest Biology,” with mentoring by the Graduate Collections Assistant
and PI) and presented at the annual ESF Spotlight on Student Research Symposium in April. The Intern will work 12 weeks for 40 h/w at $10.10/hr. during the two summers (2015 and 2016).

*Academic Year Collections Interns.* – Four additional volunteer interns will be recruited for project years 1 and 2 during the regular academic year. Each intern will receive SUNY-ESF credits, initially under EFB298 “Research Apprenticeship in Environmental Biology” under PI Rundell. Students will be trained by Collections Manager Giegerich and the graduate Collections Assistant and ultimately supervised by PI Rundell. Collections Interns will be involved in collections assessment, pest management, specimen moving, and digitization. All digitization tasks undertaken will be carefully overseen by the graduate Collections Assistant and the Collections Manager to ensure high data quality. Interns’ performance will be assessed at the end of each semester, and students with good track records will be asked to participate in the program in subsequent semesters. Collections Interns who excel in their role after the first semester will enroll in the more advanced undergraduate research course, EFB498 “Research Problems in Environmental and Forest Biology,” and work with the graduate Collections Assistant and PI Rundell to develop independent research involving specimens in the RWLC, which will be presented at the annual ESF Spotlight on Student Research Symposium. These presentations will help promote the use of Roosevelt Wild Life Collections in research among faculty researchers, undergraduates and graduate students.

**C. FRINGE BENEFITS**

Fringe benefits are calculated current and proposed rates per DHHS approved agreement and RF proposed rates beginning July 1 each year. Current rates employed for this proposal are: PI-academic year- 53.58%, 59.75%, 59.59%; PI-Summer – 15%; Graduate Student – 16%; 18%; 20%; and 5% for the Undergraduates.

**D. PERMANENT EQUIPMENT**

The $2M state award will fund the finishing of the Gateway Shell space from its current raw state (gravel floor). This finishing includes a concrete floor, walls, plumbing, ventilation, attached lighting, glazing, doors, attached lab counters, and a -20° C walk-in freezer. Plans for this space are well-advanced (see SD.7, Floorplan and Perspective Views). The $26,000 needed to embed the mobile storage system rails (Item I. in SD.9) will be covered within this state award and has been integrated into our architect’s plans. The rails will be embedded during the concrete pour for our new floor to allow for future expansion. The construction of the rails is such that pedestrians and wheelchairs face no obstruction in freely moving over them (see SD.4).

Major equipment funding from NSF CSBR is sought for mobile carriages (for compactorized storage), new cabinets and drawers. Competing quotes from two companies (O’Brien Systems, Inc. and Henderson-Johnson, attached) have been obtained. The lowest quoted price for the Gateway Shell space was $704,000 (including $26,000 for rails; Henderson Johnson Co. Inc., SD.9). The quoted price for the Gateway Shell by O’Brien Systems Inc. (SD.6, Items 4 and 5) is $813,273 plus $31,102 for rails, i.e. $844,375. Our most immediate space need is for the birds and mammals (enough space for the current specimens to be properly rehoused in adequate space plus accommodations for about 3 years of expansion while additional funding is sought. Based on the newly designed floorplan for the Roosevelt Wild Life Collections Research and Education
Center, the amount requested in this project would cover the current bird and mammal collections, or ½ of the total quoted cabinetry at a total of $339,000.

E. TRAVEL
$3000 is requested for meeting travel for PI Rundell and a graduate student, who will co-author a poster and give a talk at the Society of Systematic Biologists/American Society of Naturalists/Society for the Study of Evolution joint meeting in Portland, Oregon in the summer of 2017. We will promote RWLC, the new facility, and our outreach activities to a diverse organismal and systematic biology audience, including ornithologists and mammalogists.

F. PARTICIPANT SUPPORT COSTS
None requested.

G. OTHER DIRECT COSTS
1. Materials and Supplies:
$2400 is requested for an I-Class Mark II Industrial Barcode Printer, printer cable, thermal transfer ribbon, 1D Code 128 barcode labels and a Symbol LS2208 Barcode Scanner. These will be used in Phase II digitization of bird and mammal specimens. Best practices and products used for barcoding was researched through iDigBio:

I. INDIRECT COSTS
SUNY-ESF’s Indirect Costs of 57% MTDC applies to federally-funded “on-campus” projects. The modified indirect cost base= $80,903 (minus equipment and tuition).
Current and Pending Support
(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

<table>
<thead>
<tr>
<th>Investigator: Rebecca Rundell</th>
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**Support: **
- ☒ Current
- ☐ Pending
- ☐ Submission Planned in Near Future
- ☐ *Transfer of Support

**Project/Proposal Title:**
Belau's Islands of Diversity: Development of a Natural Laboratory for Evolutionary Research and Teaching

**Source of Support:** Research Foundation of SUNY

**Total Award Amount:** $3,900

**Total Award Period Covered:** 7/1/13-6/30/15

**Location of Project:** SUNY College of Environmental Science and Forestry, Syracuse, New York

**Person-Months Per Year Committed to the Project:** Cal: ☐, Acad: .45, Sumr: ☐

**Support:**
- ☐ Current
- ☒ Pending
- ☐ Submission Planned in Near Future
- ☐ *Transfer of Support

**Project/Proposal Title:**
Removing the Threat of Stochastic Extinction for Chitenango Ovate Amber Snail: A Collaborative Captive Propagation Effort to Develop Ex Situ Populations in New York State

**Source of Support:** Research Foundation of SUNY

**Total Award Amount:** $3,900

**Total Award Period Covered:** 9/1/13-8/31/16

**Location of Project:** SUNY College of Environmental Science and Forestry, Syracuse, New York

**Person-Months Per Year Committed to the Project:** Cal: ☐, Acad: .72, Sumr: ☐

**Support:**
- ☐ Current
- ☒ Pending
- ☐ Submission Planned in Near Future
- ☐ *Transfer of Support

**Project/Proposal Title:**
Baselines and Barcodes: Developing Land Snails as Indicator Species on Fort Drum

**Source of Support:** US Army Corps Engineers

**Total Award Amount:** $73,815

**Total Award Period Covered:** 5/1/15-4/30/16

**Location of Project:** SUNY College of Environmental Science and Forestry, Syracuse, New York

**Person-Months Per Year Committed to the Project:** Cal: ☐, Acad: .45, Sumr: 4 weeks

**Support:**
- ☐ Current
- ☒ Pending
- ☐ Submission Planned in Near Future
- ☐ *Transfer of Support

**Project/Proposal Title:**
This proposal: Natural History: Securing, Expanding and Making Accessible the Roosevelt Wild Life Collections at the State University of New York College of Environmental Science and Forestry

**Source of Support:** National Science Foundation

**Total Award Amount:** $491,705

**Total Award Period Covered:** 6/1/16-5/31/18

**Location of Project:** SUNY College of Environmental Science and Forestry, Syracuse, New York

**Person-Months Per Year Committed to the Project:** Cal: ☐, Acad: .45, Sumr: 3 weeks

**Support:**
- ☐ Current
- ☒ Pending
- ☐ Submission Planned in Near Future
- ☐ *Transfer of Support

**Project/Proposal Title:**

**Source of Support:**

**Total Award Amount:** $

**Total Award Period Covered:**

**Location of Project:** SUNY College of Environmental Science and Forestry, Syracuse, New York

**Person-Months Per Year Committed to the Project:** Cal: ☐, Acad: ☐, Sumr: ☐

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.*

NSF Form 1239 (10/99)
The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Quentin D. Wheeler

Support:
- [ ] Current
- [x] Pending
- [ ] Submission Planned in Near Future
- [ ] *Transfer of Support

Project/Proposal Title:
This proposal: CSBR: Natural History: Securing, Expanding, and Making Accessible the Roosevelt Wild Life Collections at the State University of New York College of Environmental Science and Forestry

Source of Support: National Science Foundation

Total Award Amount: $491,705
Total Award Period Covered: 6/1/16-5/31/18
Location of Project: SUNY College of Environmental Science and Forestry, Syracuse, New York

Person-Months Per Year Committed to the Project:
Cal: .12  Acad:  Sumr: 

Support:
- [ ] Current
- [ ] Pending
- [ ] Submission Planned in Near Future
- [ ] *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $
Total Award Period Covered:
Location of Project: SUNY College of Environmental Science and Forestry, Syracuse, New York
Person-Months Per Year Committed to the Project:
Cal:  Acad:  Sumr: 

Support:
- [ ] Current
- [ ] Pending
- [ ] Submission Planned in Near Future
- [ ] *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $
Total Award Period Covered:
Location of Project: SUNY College of Environmental Science and Forestry, Syracuse, New York
Person-Months Per Year Committed to the Project:
Cal:  Acad:  Sumr: 

Support:
- [ ] Current
- [ ] Pending
- [ ] Submission Planned in Near Future
- [ ] *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $
Total Award Period Covered:
Location of Project: SUNY College of Environmental Science and Forestry, Syracuse, New York
Person-Months Per Year Committed to the Project:
Cal:  Acad:  Sumr: 

Support:
- [ ] Current
- [ ] Pending
- [ ] Submission Planned in Near Future
- [ ] *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $
Total Award Period Covered:
Location of Project: SUNY College of Environmental Science and Forestry, Syracuse, New York
Person-Months Per Year Committed to the Project:
Cal:  Acad:  Sumr: 

Support:
- [ ] Current
- [ ] Pending
- [ ] Submission Planned in Near Future
- [ ] *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $
Total Award Period Covered:
Location of Project: SUNY College of Environmental Science and Forestry, Syracuse, New York
Person-Months Per Year Committed to the Project:
Cal:  Acad:  Sumr: 

Support:
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- [ ] Pending
- [ ] Submission Planned in Near Future
- [ ] *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $
Total Award Period Covered:
Location of Project: SUNY College of Environmental Science and Forestry, Syracuse, New York
Person-Months Per Year Committed to the Project:
Cal:  Acad:  Sumr: 

Support:
- [ ] Current
- [ ] Pending
- [ ] Submission Planned in Near Future
- [ ] *Transfer of Support

Project/Proposal Title:
FACILITIES, EQUIPMENT & OTHER RESOURCES

Laboratory
Prior to the beginning of this project SUNY-ESF will have finished a 5290 square foot facility that will house the bird, mammal and parasite collections of the Roosevelt Wild Life Collections (RWLC). The concrete floor however will only be poured when funding for the compactor rails has been secured, since this is a key component of the proposed work. The new facility will meet all current fire safety codes and will be fully climate-controlled. This new Gateway Shell facility will also have lab benches, work spaces, educational and interpretive areas, which will be installed once the concrete floor is cured.

Clinical
Not applicable.

Animal
Not applicable.

Computer
There are two shared-use networked computers in the RWLC running Windows 7 and Specify. These computers are backed up nightly on several external hard drives, to insure against failure of a single drive). Rundell, Wheeler and Giegerich have computers in their offices that can also be used during the project, as well as the latest versions of Adobe Suite (including Photoshop) and Specify. Printer and scanner are available for use during the project.

Office
Rundell has a private office of approximately 200 sq. ft. Wheeler has an office of approximately 600 sq. ft. Participant Giegerich has an office of approximately 200 sq. ft. Participant Whipps has an office of approximately 400 sq. ft. The graduate student Collections Assistant is allocated 200 sq. ft. of office space. Additional shared space will be made in an empty classroom during the beginning of the project in summer 2016, until some of the collections are moved from the RWLC and work can be resumed there.

Other
There is a DSLR camera, professional tripod and lights available for imaging of specimens and other collections materials as necessary.

Major Equipment
The major pieces of equipment needed for this project would be acquired as a result of the funding action, and would be installed in the new Gateway Shell collections space. These pieces of equipment include the mobile carriages that hold the new cabinets, and the cabinets and drawers themselves. Another major piece of equipment is the -20° C walk-in freezer, which will be built during the finishing of the Gateway Shell space, with funds from SUNY-ESF’s state award. This freezer has the capability to freeze large numbers of specimens (Integrated Pest Management, or IPM) prior to their permanent move into the new drawers. SUNY-ESF will also move its remotely operable digital microscope into the new Gateway Shell space as soon as it is practical to do so (it is currently housed in Rundell’s lab). This microscope will allow for remote taxonomic collaboration.

Other Resources: Not Applicable.
DATA MANAGEMENT PLAN

The Phases I-III of the project proposed here represent the first steps in enacting RWLC’s strategic plan, which calls for prioritization of collections safety and security (of both humans and specimens). A second, but paramount, priority is working toward full digital accessibility. To accomplish this we will use the computing power described in “Facilities” with regular back ups on several redundant external hard drives. During the project we will be connecting different types of data and introducing new forms of managing those data (i.e. barcodes). Initial data capture (Phase I) will involve scanning individual specimen cards from hard copy card files. Each individual scanned image will then be linked with a hand-keyed RWLC catalog number in the Specify database (on a Dell desktop PC). The Collections Intern inputting the scanned image will check the catalog number against the entered number once upon opening of the record, and once again before the closing of the record. During the Intern’s work period, the Collections Assistant will check in with the Intern to address any questions or concerns. At the end of the day the Assistant will open up 30% of the records entered to ensure match between the RWLC number the scanned images and the keyed number, and address any problems with workflow the following day, in consultation with PI Rundell. Given that the card file is well-organized we expect this work to go smoothly and quickly.

The next step (Phase II) in the data pipeline involves affixing printed barcodes to specimens, scanning the barcodes (printer and scanner purchased through this grant), and linking them with RWLC numbers in Specify. If sufficient new blank label space does not exist on the specimen, an additional archival foot tag will be carefully attached to the specimen so that the barcode may be affixed. The specimen’s cabinet number and drawer number (from the old Illick RWLC) will be recorded so that no specimens are misplaced during the process and specimens can be easily located during the taxonomic reorganization process in Phase III. The specimen will then be graded on a scale between 1 and 10 (1=conservation problem) so that our worst-case specimens can receive special treatment and so we can better assess priorities, both for the current project and for the coming decades. This quantitative assessment process is important in this new era for the Roosevelt Wild Life Collections, since we want to ensure we are making steady progress toward modern standards. Such assessment is also an invaluable tool for budgetary purposes. Assessment data (number) will be entered in a separate field. A list of common problems will also be included in a separate field so that we can identify these problems quickly through a search, rather than all of the information ending up in a “Notes” field. Hard-copy label data (i.e. foot tags) will also be carefully assessed at this stage. Since these sometimes delicate tags are about to move with the specimen into a bag and into the freezer for IPM, the Collections Manager will carefully supervise this process to ensure that specimens with flimsy or detaching tags get moved to a separate staging area for repair prior to freezing, so that their tags are not lost when they come out of the bags. PI Rundell will check on workflow efficiency and data quality on a regular basis, both through checking in with the Collections Manager, and directly.

In Phase III the RWLC specimens have received pest treatment and are safely in the new collections Center, still organized as they were in the old RWLC. New cabinets will be temporarily labeled with the new taxonomic reorganization (using Tree of Life and related publications), allowing plenty of room between drawers for expansion. Drawers coming from the freezer will be moved to a staging area for the final thaw. When they are ready, individual bags will be opened systematically, barcodes scanned, and foot tag data will be hand-keyed into the
Specify database. Any delicate tags at this stage will be fitted with a small narrow archival envelope to protect them. Ideally we will keep the original labels with the specimen, but if a tag does need to be separated for some reason, it will first be imaged, and then stored together in a single file drawer in the Center, within a labeled envelope in a plastic archival hanging folder. Skulls and other skeletal material may also require reboxing at this stage (archival-quality bone boxes) so that label information is keyed into the database at the same time as the reboxing occurs, and by the same person. This will help minimize risky handling of the specimens.

Data quality will be checked every couple of hours by the Collections Manager, (and each morning as the next round of digitization begins) while the Collections Assistant or Intern takes a break, lines and moves new drawers or works on freezer or organization tasks. Periodically PI Rundell will also assess the workflow and work with the Collections Manager to ensure that staging areas to not become overcrowded with specimens awaiting digitization, and to address those problems as they arise. Specimens that have finished being digitized then move to fresh cabinets lined with archival shelf liner. Interns who turn out to be especially mistake-prone in the digitization effort will be moved to other important collections tasks such as preparing new specimens and the reorganization effort. Data quality is the primary concern, and if Collections Interns are too inconsistent, the bulk of the digitization work will be handled by the Collections Assistant or Collections Manager.

PI Rundell, the Collections Manager, and the grad Collections Assistant will work together to ensure the best configuration of fields in the database and to modify our approach as necessary. We will check in with each other to ensure regular back ups. The new Roosevelt Wild Life Collections Research and Education Center will also be fully outfitted with wireless access (unlike Illick Hall) and computers will be fully networked, password-protected and maintained by our on-campus Computer Networking Service and IT professionals, who will be able to trouble shoot any database problems should they arise. We will plan for regular backups on an internal server. We will also still plan on maintaining multiple hard drive backups, one of which will be networked and maintained off-site in case of fire or other unforeseen disaster.

Data will be made available to the public online through our new RWLC website, currently in draft stage and in development (SD.16). Data will not be made public until it has been vetted by our collections staff. The working database will remain password-protected and only accessible by the collections staff on campus. The public database will be a copy of those data that cannot be edited. Any sensitive information about endangered species localities will be discussed by PI Rundell and the Collections Manager before it is released to the public. In a small number of cases, such data may be made more general for the public database in order to protect specific localities from poaching.

Our SUNY-ESF Communications Department is in charge of integrating data to be made available over any of our ESF websites and so they will interface with our RWLC team to make our first complete digital records from Phases I-III available to the public online. Our Wild Life on the Web high-resolution images will also be linked to our website and iDigBio (linked images possible in Specify 6.5). All TIFF images will be backed up on a SUNY-ESF server as well as external hard drives (LaCie d2Quadra 2TB). As our nestling RWLC database grows and becomes more complex (e.g. new collections data entries with GPS points allowing for precise georeferencing of localities), we expect to solicit funding for a database expert who can work closely with RWLC to address our needs and ensure that public accessibility (including speed of and quality of record access) and data security is maintained.
SUNY-ESF Campus Map

Illick Hall

Loading Dock

Gateway Building
("Gateway Shell" is on lower floor)
Current Location of the Roosevelt Wild Life Collections: Illick Hall

A: Birds and Mammals (PHASE I focus of this proposal)
B: Invertebrate Parasites (PHASE I focus of this proposal)
C: Vascular Plant Herbarium
D: Mycology/Moss Herbarium
E: Entomology
F: Non-insect Invertebrates
G: Wet Collection (Fishes and Herpetofauna)
Future Location of RWLC Birds, Mammals & Parasites: New Gateway Building
**L CENTER FLANGE RAIL**

**RECESSED IN CONCRETE**

Spacesaver’s L center flange rail recessed in concrete offers a permanent, aesthetically pleasing alternative for mobile system installation that allows the top of the system’s rails to be evenly aligned with the top of the finished floor without entry ramps.

**BENEFITS**

1. Elimination of entry ramps ensures smooth, easy access for wheelchairs, carts or other equipment.
2. Allows for a natural and efficient screed for exact topping slab application and levelness.
3. Rails can be installed in new construction and the mobile system can be added at a later date.
4. Pre-planned recessed installations provide a cost effective alternative to top mounted installations.
5. Recessing rails means more vertical space is available for storage because less is used for the rail and floor systems.

**INSTALLATION**

Recessing L center flange rails into the floor provides a homogenous, built-in appearance at the floor level and maximizes the amount of vertical space that can be used for storage. Three types of recessed installation are available.

1. The system’s rails are installed in a depression in the floor and concrete is poured around them to fill the depression and level the system’s floor with the existing floor.

   The depression is created equal to or larger than a footprint of the mobile system and deep enough to accommodate the height of the rails and grout and provide accurate clearance for the finished floor covering.

2. The system’s rails are installed after the first rough concrete pour is made. The second pour of concrete is then made around the rails to bring the finished floor to the top of the rails.

3. Each of the system’s rails is installed in a separate trough that is cut out of the existing floor or blocked when the floor is poured initially, and a secondary pour of concrete is then made around the rails to fill the troughs and level the system’s floor with the existing floor.

   Troughs are created a minimum of 9 1/2" (241 mm) wide and deep enough to accommodate the height of the rails and grout and provide accurate clearance for the finished floor covering.

   With all three installation methods, the rails are positioned per the installation drawings, anchored and leveled at a height that allows the top of the finished floor material to be installed flush with the top of the rails. They are then set with grout, and the second concrete pour is made. The positioned rails simplify the second pour by providing accurately leveled screeds to gauge the thickness of the concrete.

   * Second pour depth determined by architect and/or structural engineer.
APPLICATION

Recessed in concrete installation, of L Center Flange rail, can be used at the guide rail locations of powered, mechanical assist or manual systems using center flange guidance.

TECH SPEC

Recessed Concrete Rail Installation:
After appropriate rail specification, add: Rails shall be recessed in concrete with top of rail to be 1/16" (1.6 mm) above finished floor level. (Architect and/or structural engineer to provide secondary pour and/or trough details.)

Specifications subject to change.

NOTE: The wider the trough, the easier it will be to grout and it will be less noticeable for feathering the second concrete pour from the existing concrete to the concrete form channel on the rail due to any existing concrete out-of-level conditions. Existing concrete surface must be level to 1/4" over a 20' span non-cumulative or a relative ramping will accumulate at the low point.

NOTE: For trough installation, existing concrete surface must be level to 1/4" (6.4 mm) non-accumulative over a 20' (6.1 m) span or relative ramping will occur at the low point.

* Trough depth determined by architect and/or structural engineer.
MEMO ANDUM

To:       Dr. Rebecca Rundel
          Roosevelt Wildlife Collections, SUNY ESF

From:    Brian Boothroyd
          Asst. Director of Physical Plant for Facilities

Project: CSBR: Nurturing, Expanding, and Making Accessible the Roosevelt Wildlife Collections at the State University of New York College of Environmental Science and Forestry

Subject: Floor Loading Analysis (for High Density Mobile Storage System “Compactor Shelving”)

Design work for SUNY/SUCF Project No. 20233 “RWL Education and Research Center, Gateway” is currently underway. The project focuses on the interior design of an existing, unfinished “shell” space within the basement (Lower Level) of the SUNY ESF’s Gateway Center. The program for this facility includes banks of high density mobile storage systems carrying museum storage cabinets for compact storage of biological specimens. The storage systems ride on overhead rails that are to be embedded and set flush with a new concrete floor. The steeply reinforced, concrete floor, which is to be a slab-on-grade, shall be designed to support the anticipated live and dead loads, including those required for support of the compact storage system (150-200 lb/sf). The existing sub-grade material upon which the concrete floor is to be constructed, consisting of several feet of compacted sedimentary material, is easily capable of supporting the intended loads, and is not expected to be an issue in the design of the space or incorporation of the high density mobile storage system.

Sincerely,

[Signature]

Brian Boothroyd, R.A.
NYS License No. 022646
September 4, 2015

Project: State University of New York
Attn: Rebecca Rundell
Subject: Budget Proposal for Compact Storage

Prepared By: Lorraine Reed

Scope of Work:

- Supply and install carriages, cabinets and all necessary compactor components
- Installation plan based on multiple phases to allow for collection relocation and building renovations

Project Benefit Analysis

- Provide state of the art, powder coat finished cabinets with 100% closed cell Silicone gaskets. Cabinets are designed to maximize the capacity within the present footprint.
- Entomology Cabinets will accept the 860 existing Cornell Drawers.
- Reconfigurable compact storage units which can be incorporated into future collections storage spaces.
- Designed to work with current floor finish conditions from room to room with as much existing material as possible to mitigate project cost.

Investment Data

- Budgetary Cost for work as described:

  1. Vascular Plant Herbarium $174,426.00
  2. Mycology/Moss Herbarium $174,426.00
  3. Entomology (Including 400 New Cornell Drawers) $204,235.00
  4. Birds and Mammals (Includes 18 Drawers Per Cabinet) $813,273.00
  5. Embedded Track Birds and Mammals Installed $31,102.00
  6. Wet Collection Cabinets $79,643.00

Grand Total $1,477,105.00

Investment Notes

1. Proposal is based on work performed during normal working hours. Wages paid for installation labor will be in accordance with the Federal Prevailing Wage guidelines as determined by the Secretary of Labor in accordance with the Davis Bacon Act.
2. Budget reflects installation in calendar year 2016. We recommend carrying a 5% contingency ($45,313.00) on material and freight as a hedge against volatility in commodity pricing.

O’Brien Systems Inc
739 E. Elm Street, Conshohocken, PA 19428 Phone (610) 825-3405 Facsimile (610) 825-0930
August 14, 2015

SUNY ESF
College of Environmental Science & Forestry
Department of Environmental and Forest Biology
1 Forestry Drive
Syracuse, NY 13210

Attn: Rebecca Rundell  email: rrundell@esf.edu
   Head Curator Roosevelt Wild Life Collection

Re: Roosevelt Collection; Wild Life Education Research Center – Spacesaver Storage Solutions

Rebecca,

Henderson Johnson Co. Inc. is pleased to provide the following budgetary proposals as outlined below and illustrated in the attached Basement Floor Plan Concept 2.1 Layout.

I. Collection Storage Room Mobile Storage System Rails available on NYS Contract PC66520.
Spacesaver Mechanical Assist operation storage system recessed in concrete rails per the Concept 2.1 carriage layout.

Furnished and Installed complete per NYS Contract PC66520 for the budgetary sum of... $26,000.00

- Rail Notes:
   The storage system recessed rails assume a two pour concrete process in the Collections Room with an initial pour, installation of the storage system rails and a secondary pour to make the rails level with the concrete sub-floor. See attached recessed rail detail.

II. Spacesaver components available on NYS Contract PC66520
Spacesaver 4-post Shelving, Case Style shelving, Wire shelving, and Mechanical Assist operation mobile carriages as shown in the attached Concept 2.1 Layout Drawing.

Furnished and Installed complete, per NYS Contract PC66520 for the budgetary sum of $78,000.00.

III. Delta Vertebrate Specimen Cabinets mounted to Spacesaver Mechanical Assist operation carriages.
(94) Delta 800 Series Double Wide Steel Door, 55 ½”w x 85”h x 38 ½”d Specimen Cabinets and (2) 55 ½”w x 85”h x 19 ¾”d mounted to mobile carriages for Birds and Mammals Collections as shown. Each 800 Series Cabinet, full or ½ depth is to include (36) 1 ¾”h trays

Delta 800 Series Cabinets furnished and installed complete as shown $600,000.00

Continue
Total Budgetary price for the above quoted Spacesaver & Delta storage solutions... $704,000.00

Notes:
- New York State Contract requires purchase orders to be issued directly from the end user to the dealer of record.
- This proposal excludes the (4) Parco Scientific Company mobile microscope storage cabinets.

We have not included any applicable State or local taxes. The above proposal assumes that Henderson Johnson Co. Inc. will have use of all existing facility loading docks, freight elevators, or lifts as required to receive and distribute materials.

All labor is quoted on a straight time basis during our normal working hours 7:30 a.m. – 4:30 p.m. Monday – Friday, utilizing NYS Prevailing Wage rates.

If I can be of further service, please do not hesitate to call.

Very truly yours,

Christopher R. Anklin
Division Manager
Series 800 Cabinets

- Easily fixed to mobile compact storage
- Cabinets are all steel and include heavy-duty construction
- Non-reactive, solvent-free, baked powder-coat finish
- Mechanically attached silicone gaskets
- Flush-locking hardware
- Three-point latch system
- Full-length piano hinge or lift-off hinge door(s)
- Cabinet contains glides fixed on 1” centers vertically
- Trays and tray gliders to be finished with slip-type powder-coat for tray-slide ease
- Glides are .060” (16 ga.
- Umbrella top
- Easy to stack
- Case allows installation of center partitions for half-width trays

Specifications

- Width: 24” to 72”
- Height: 48” to 96”
- Depth: 24” to 36”

Series 800 Options:

- Center divider to accommodate half-width trays
- 1-3/4” high or 3-3/4” high trays available
- Number strip for re-inserting tray base
- Gravity stops for trays
- Mobile carriage/base access panels
- Base options: 4” to 8” high pallet-style base
- 2” to 6” high platform base
- 6” to 8” high caster base
August 14, 2015

SUNY ESF
College of Environmental Science & Forestry
Department of Environmental and Forest Biology
1 Forestry Drive
Syracuse, NY 13210

Attn: Rebecca Rundell
email: rrundell@esf.edu

Head Curator Roosevelt Wildlife Collection

Re: Illick Hall - Spacesaver Storage Solutions

Rebecca,

On the basis of our 7/30/2014 site meeting and subsequent correspondence thereafter, Henderson Johnson Co. Inc. is pleased to provide the following updated budgetary quotations as outlined below and illustrated in the attached layout drawings.

I. Illick Hall Room 440 Mycology/Moss Herbarium

Spacesaver Mechanical Assist operation storage system with concrete slab subfloor mounted rails, system plywood subfloor, movable carriages as shown, full height metal end panels, and Delta Designs Model DDHYDD or DDHY Herbarium Cabinets as shown.

A. Pricing per NYS Contract #PC66520 is as follows:
   1. Spacesaver Mechanical Assist Operation storage system as shown, furnished and installed complete for the sum of... $37,592.15

B. Non Contract Pricing
   2. Delta Designs Herbarium Cabinets as shown, furnished and installed complete for the sum of... $155,000.00

Illick Hall Room 440 Total System price Complete... $192,592.15

II. Illick Hall Room 452 Vascular Plant Herbarium

Spacesaver Mechanical Assist operation storage system with concrete slab subfloor mounted rails, system plywood subfloor, movable carriages as shown, full height metal end panels, and Delta Designs Model DDHYDD or DDHY Herbarium Cabinets as shown.

Cont’
A. Pricing per NYS Contract #PC66520 is as follows:
1. Spacesaver Mechanical Assist Operation storage system as shown, furnished and installed complete for the sum of... $39,510.53

B. Non Contract Pricing
2. Delta Designs Herbarium Cabinets as shown, furnished and installed complete for the sum of... $170,000.00

Illick Hall Room 440 Total System price Complete... $207,592.15

III. Illick Hall Entomology (Room to be determined)

Spacesaver Mechanical Assist operation storage system with concrete slab subfloor mounted rails, system plywood subfloor, movable carriages as shown, full height metal end panels, and Delta Designs Model DXEN48 Entomology Cabinets as shown.

Pricing per NYS Contract #PC66520 is as follows:

A. Pricing per NYS Contract #PC66520 is as follows:
1. Spacesaver Mechanical Assist Operation storage system as shown, furnished and installed complete for the sum of... $39,510.53

B. Non Contract Pricing
2. Delta Designs Entomology Cabinets as shown, furnished and installed complete for the sum of... $206,496.00

Illick Hall Entomology Total System price Complete... $246,006.53

(400) Insect Storage Drawers supplied by others

IV. Illick Hall Room 215 Wet Storage

Spacesaver Mechanical Assist operation storage system with concrete slab subfloor mounted rails, system plywood subfloor, movable carriages as shown, full height metal end panels, and carriage mounted Spacesaver Universal 4-Post shelving.
The Universal 4-Post shelving is to be (6) tier high with adjustable 10 ¾” vertical openings, 24”deep “back to back” shelves, bin fronts, full height metal closure panels, and carriage lock to lock down the system in the closed position.

A. Pricing per NYS Contract #PC66520 is as follows:
1. Spacesaver Mechanical Assist Operation storage system as shown, furnished and installed complete for the sum of... $34,879.12

Cont’
NOTE:
- We have not included any applicable state or local sales tax on the above quotations.
- All labor is quoted on a straight time basis utilizing New York State Prevailing Wage rates.
- VCT finished floor covering to be installed on System Sub-Floor is not included.

The above pricing is budgetary and subject to field verification of dimensions.

If I can be of further assistance please do not hesitate to contact me.

Very truly yours,

Christopher R. Anklin
Division Manager
Henderson – Johnson Co Inc.
L2 = (72) DELTA Model DXEN 48
43"W X 84"H x 20"D
DRAWER CAPACITY 48 CORNELL DRAWERS

AREA #3 ROOM TO BE DETERMINED - CONCEPTUAL
ENTOMOLOGY COLLECTIONS
(30) WET SHELVING SECTIONS

Room 215 Option 2

ROOM 215
OPTION 2

Project Name: SUNY ESF Roosevelt Wild Life Collection
Salesperson: ANKLIN, CHRIS
Scale: 1:61
Rev level: df
Date Printed: 08/12/2015
Dated: 

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**Project Name:** SUNY ESF Roosevelt Wild Life Collection

**Salesperson:** ANKLIN, CHRIS

**Scale:** 1:55

**Project #:**

**Drawn by:** df

**Date Printed:** 08/13/2015

**Approval**
This drawing Approved By: ____________________________

---

**L1 = (42) DELTA Model DDHYDD**
55"W X 84"H x 19 1/8"D
WITH 52 COMPARTMENTS
PULL OUT REFERENCE SHELF

**L4 = (20) DELTA Model DDHY**
29 1/8"w X 84"h x 19 1/8"d
WITH 26 COMPARTMENTS
PULL OUT REFERENCE SHELF

**AREA #1 ROOM 452**

**VASCULAR PLANT HERBARIUM**
Project Name: SUNY ESF Roosevelt Wild Life Collection

L1 = (38) DELTA Model DDHYDD
55"W X 84"H x 19 1/8"D
WITH 52 COMPARTMENTS
PULL OUT REFERENCE SHELF

L4 = (19) DELTA Model DDHY
29 1/8"W X 84"h x 19 1/8"d
WITH 26 COMPARTMENTS
PULL OUT REFERENCE SHELF

AREA #2 ROOM 440
MYCOLOGY/MOSS HERBARIUM

Salesperson: ANKLIN, CHRIS
Scale: 1:55
Rev level: 

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DDHYDD Herbarium Cabinet

- Heavy-duty rigid steel construction
- Inert non-reactive solvent-free baked powder coat finish
- Mechanically attached silicone gaskets
- Recessed handles with three point locking mechanism
- Flush locking hardware
- Full length piano hinge doors
- Pull out reference shelf available upon request (quotation required)
- Five year guarantee for design, materials, and workmanship

Dimensions:
55” wide x 84” high x 19-1/8” deep

Cabinet Weight:
535 lbs.

Heavy-duty welded steel construction, .048” (18ga.) for sides, back, top, bottom, door, and load bearing posts.

Double Door

Interior:
52 Compartments

Interior Compartment Size: 12-5/8” wide x 5-7/8” high x 17-1/2” deep

Partitions and shelves .036” (20ga.) with front edge folded to provide smooth edge and prevent snagging of folders.
DDHY Herbarium Cabinet

- Heavy-duty rigid steel construction
- Inert non-reactive solvent-free baked powder coat finish
- Mechanically attached silicone gaskets
- Recessed handle with three point locking mechanism
- Flush locking hardware
- Full length piano hinge door
- Pull out reference shelf available upon request (quotation required)
- Five year guarantee for design, materials, and workmanship

Dimensions:
29-1/8" wide x 84-1/8" high x 19-1/8" deep

Cabinet Weight:
312 lbs.

Heavy-duty welded steel construction, .048" (18ga.) for sides, back, top, bottom, door, and load bearing posts.

Single Door

Interior:
26 Compartments

Interior Compartment Size: 12-5/8" wide x 5-7/8" high x 17-1/2" deep

Partitions and shelves .036" (20ga.) with front edge folded to provide smooth edge and prevent snagging of folders.
DX EN Entomology Cabinet

Features

• Cabinets are all steel and include heavy-duty construction
• Non-reactive, solvent-free, baked powder coat finish
• Mechanically attached silicone gaskets
• Flush locking hardware
• Three point latch system
• Full length door piano hinge
• Pull out reference shelf available
• Base levelers activated from the front of the cabinet for all four corners
• To determine interior glide spacing, type of Entomology drawer must be specified
• Five year guarantee for design, materials, and workmanship

Dimensions:
43" wide x 84" high x 20" deep

Cabinet Weight:
445 lbs.

Double Steel Doors

Heavy-duty welded steel construction, .048"(18 ga.) for doors, sides, top, bottom, glides, and back, and .075"(14 ga.)/.060"(16 ga.) for load bearing posts and door frame members. Base to be .060"(16 ga.) and .105"(12 ga.).

Typical sizes for Entomology drawers are as follows:
• California: 19" wide x 2-1/2" high x 17" deep
• Cornell: 19" wide x 3" high x 16-1/2" deep
• KU: 19" wide x 3" high x 19" deep
• USNM: 18" wide x 3" high x 18" deep
State University of New York
College of Environmental Science and Forestry

Department of Environmental and Forest Biology
Illick Hall | 1 Forestry Drive | Syracuse, NY 13210 | www.esf.edu/efb

Drs. Reed S. Beaman and Roland P. Roberts, Program Directors
Directorate of Biological Sciences, Division of Biological Infrastructure
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

To: CSBR Program Directors, Drs. Beaman and Roberts,

By signing below, I acknowledge that I will provide the assistance or collaborate as indicated in the proposal, entitled "CSBR: Natural History: Securing, Expanding, and Making Accessible the Roosevelt Wild Life Collections at the State University of New York College of Environmental Science and Forestry" with Dr. Rebecca J. Rundell as the Principal Investigator. I agree to undertake the tasks assigned to me, as described in the proposal, and I commit to provide or make available the resources therein designated to me.

Signed: [Signature]
Print Name: Ronald J. Giegerich

Date: 9/8/15
Institution: SUNY-ESF
ESF
State University of New York
College of Environmental Science and Forestry

Department of Environmental and Forest Biology
Illick Hall | 1 Forestry Drive | Syracuse, NY 13210 | www.esf.edu/efb

Drs. Reed S. Beaman and Roland P. Roberts, Program Directors
Directorate of Biological Sciences, Division of Biological Infrastructure
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

To: CSBR Program Directors, Drs. Beaman and Roberts,

By signing below, I acknowledge that I will provide the assistance or collaborate as indicated in the proposal, entitled “CSBR: Natural History: Securing, Expanding, and Making Accessible the Roosevelt Wild Life Collections at the State University of New York College of Environmental Science and Forestry” with Dr. Rebecca J. Rundell as the Principal Investigator. I agree to undertake the tasks assigned to me, as described in the proposal, and I commit to provide or make available the resources therein designated to me.

Signed: [Signature] Print Name: [Print Name]

Date: [Date] Institution: SUNY-ESF
It was like lying in a great solemn cathedral, far vaster and more beautiful than any built by the hand of man.
It was like flying in a great white cathedral for taller and more beautiful than any built by the hand of man.
Roosevelt Wild Life Collections

“Wild Life” encapsulates the natural world we all depend on. Like nature itself, specimens in natural history Collections are real and authentic. They represent the lives of organisms that lived and died so that we might learn from them.

Our natural history Collections are central to the education and research missions of the Roosevelt Wild Life Station at the State University of New York College of Environmental Science and Forestry (SUNY-ESF) in Syracuse, New York. Our Station was endorsed by “conservation President” Theodore Roosevelt in the early 1900s, who saw the need for increased scientific understanding of the nature around us.

Natural history Collections preserve the history of life on Earth. By learning from our specimens we hope that students will be inspired to conserve, manage, and immerse themselves in nature, and help spread the word about it.

The development of this website was kindly supported by the John Ben Snow Foundation.
Form Fits Function

Hair and whiskers; antlers and baleen:
Using specimen images, we can help the public discover the way a deer’s antlers connect to its skull, or the way the world’s second largest animal can eat some of the smallest things in the ocean. With more than 100 years of data for some types of organisms, we can illustrate the variability of some populations in space and time, while underscoring the striking uniformity of other types of organisms.
Squirrel Zombie Attack? Study skins like these are for research and teaching. We learn from their coat color, body features, and where and when they were collected. Their eyes are hard to preserve, but their skeletons are carefully organized in boxes and jars.

Tiny Boneyard. Many mammal species are identified based on their teeth, so these skulls are very important.
Labels Matter. The data that go along with each specimen are just as important as the animal itself. These data include where and when the animal was collected. We can go back to that same locality in one hundred years and know what once was there, and what the habitat was like.

Egg Collection. Many of these eggs were collected before the pesticide DDT was used in the United States. DDT resulted in thin eggs that would be easily crushed by bird parents at the nest.
XI. SPECIAL INFORMATION AND SUPPLEMENTARY DOCUMENTATION (SD1-16)

- Data Management Plan
- Postdoctoral Mentoring Plan (non-applicable)

1. SUNY-ESF Campus Map
2. Current Location of RWLC: Illick Hall Floor Plan
3. Future Location of RWLC: Gateway Building including Lower Level Gateway Shell
4. Example of concrete-embedded compactor “rails” or tracks
5. Floor Loading Analysis for the new Gateway Shell space
6. Quote for Gateway Shell Compactor Project (items #4-5 Birds and Mammals quotes (Gateway Shell) are the only items pertinent to the proposed Phase I-III project): O’Brien Systems Inc.
7. Proposed floorplan (p. 1) and view perspectives (p. 2) for Roosevelt Wild Life Collections Research and Education Center by our architects (QPK Design LLP, Syracuse, NY)
8. Proposed floorplans for Illick Hall collections (O’Brien Systems Inc.)
9. Quote for Gateway Shell Compactor Project (Birds and Mammals): Henderson Johnson
10. Cabinet specs for Roosevelt Wild Life Collection Research and Education Center
11. Quote for Illick Hall collections improvement (Henderson Johnson)
12. Floorplans and cabinet specs for Illick Hall collections (entomology, herbaria, wet collections): Henderson Johnson
13. RWLC Collections Manager Ronald Giegerich Participant Form Letter
14. RWLC Parasitologist Dr. Christopher Whipps Participant Form Letter
15. Exhibit Plans for the Roosevelt Wild Life Collections Research and Education Center (Experience Design, Boston, MA)
16. Screen shots from RWLC’s new website under development

XII. RESULTS FROM PRIOR NSF SUPPORT

The RWLC has never been awarded a grant from the Collections in Support of Biological Research Program and PI Rebecca Rundell is an early career investigator in her fourth year of a tenure-track faculty appointment who has never held an NSF grant.