



BIOL227

Ecology

S2 External 2014

Dept of Biological Sciences

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General Information

Unit convenor and teaching staff

Unit Convenor

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E8C246

Other Staff

Katherine McClellan

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Credit points

3

Prerequisites

[(6cp(P) in BIOL units at 100 level) or (3cp(P) in BIOL units at 100 level and (GEOS117 or ENVE117))] and (STAT170(P) or STAT171(P))

Corequisites

Co-badged status

Unit description

Ecology is the study of the distribution and abundance of organisms and of the processes that generate these patterns. This unit covers basic ecological concepts at the level of organisms, populations, communities, and ecosystems. We study how interactions among organisms – and between organisms and their physical environment – shape the natural world. This unit also addresses how ecological concepts can be applied to current issues such as climate change, conservation, fisheries and agriculture. There is a compulsory field trip to Smiths Lake in the September vacation.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

Learning Outcomes

On successful completion of this unit, you will be able to:

Explain how organisms interact with each other and their environment

Analyse how biological interactions influence patterns of distribution and abundance
 Analyse the structure of and changes in populations, communities, and ecosystems
 Apply ecological concepts to novel situations, especially to contemporary issues
 Read scientific journal articles critically and evaluate the authors' conclusion
 Give oral presentations that synthesis information on ecological topics
 Develop questions and pose hypotheses about ecological patterns and processes
 Collect and analyse ecological data in order to evaluate hypotheses

Assessment Tasks

Name	Weighting	Due
<u>Problem Set 1</u>	5%	25 August 2014
<u>Oral Presentation</u>	10%	Int: Wk 5/6; Ext: campus w/end
<u>Practical Report</u>	15%	15 September 2014
<u>Field trip graphing exercises</u>	5%	Submit during fieldtrip
<u>Smiths Lake Report</u>	20%	20 October 2014
<u>Problem Set 2</u>	5%	3 November 2014
<u>Final exam</u>	40%	S2 exam period

Problem Set 1

Due: **25 August 2014**

Weighting: **5%**

You will apply ecological concepts introduced in Lectures 1-7 to solve a series of numerical problems.

On successful completion you will be able to:

- Analyse the structure of and changes in populations, communities, and ecosystems
- Apply ecological concepts to novel situations, especially to contemporary issues

Oral Presentation

Due: **Int: Wk 5/6; Ext: campus w/end**

Weighting: **10%**

You will select (from a list of 30) an ecological research paper to critique. The critique will draw upon your understanding of experimental design, logic and ecological principles. You will communicate your critique to your prac group through a 10 minute oral presentation, using

PowerPoint as a visual aid.

On successful completion you will be able to:

- Read scientific journal articles critically and evaluate the authors' conclusion
- Give oral presentations that synthesis information on ecological topics

Practical Report

Due: **15 September 2014**

Weighting: **15%**

You will make observations and develop hypotheses about ecological patterns in the Macquarie University Ecology Reserve. In a small group, you will com up with a sampling design to test some of these hypotheses, and you will collect and analyse data. Individually, you will write up your study following guidelines for the journal *Austral Ecology*.

On successful completion you will be able to:

- Explain how organisms interact with each other and their environment
- Analyse how biological interactions influence patterns of distribution and abundance
- Analyse the structure of and changes in populations, communities, and ecosystems
- Apply ecological concepts to novel situations, especially to contemporary issues
- Read scientific journal articles critically and evaluate the authors' conclusion
- Develop questions and pose hypotheses about ecological patterns and processes
- Collect and analyse ecological data in order to evaluate hypotheses

Field trip graphing exercises

Due: **Submit during fieldtrip**

Weighting: **5%**

In your field trip group you will decide how to present data from each of five Smiths Lake sampling exercises. Individually, you will draw an appropriate graph for each data set.

On successful completion you will be able to:

- Collect and analyse ecological data in order to evaluate hypotheses

Smiths Lake Report

Due: **20 October 2014**

Weighting: **20%**

In a small group you will design and execute sampling to compare the distribution, abundance and diversity of organisms between habitats. Individually, you will write up your study following guidelines for the journal *Austral Ecology*. Production of the field trip report will build on the written communication skills you have already begun to develop through preparation of the first

Practical Report.

On successful completion you will be able to:

- Explain how organisms interact with each other and their environment
- Analyse how biological interactions influence patterns of distribution and abundance
- Analyse the structure of and changes in populations, communities, and ecosystems
- Apply ecological concepts to novel situations, especially to contemporary issues
- Read scientific journal articles critically and evaluate the authors' conclusion
- Develop questions and pose hypotheses about ecological patterns and processes
- Collect and analyse ecological data in order to evaluate hypotheses

Problem Set 2

Due: **3 November 2014**

Weighting: **5%**

You will apply ecological concepts introduced in Lectures 12-19 to solve a series of numerical problems

On successful completion you will be able to:

- Analyse the structure of and changes in populations, communities, and ecosystems
- Apply ecological concepts to novel situations, especially to contemporary issues

Final exam

Due: **S2 exam period**

Weighting: **40%**

You will apply ecological concepts introduced during this course to solve a variety of problems. You will be asked to interpret data of the type collected during this course.

On successful completion you will be able to:

- Explain how organisms interact with each other and their environment
- Analyse how biological interactions influence patterns of distribution and abundance
- Analyse the structure of and changes in populations, communities, and ecosystems
- Apply ecological concepts to novel situations, especially to contemporary issues
- Read scientific journal articles critically and evaluate the authors' conclusion
- Develop questions and pose hypotheses about ecological patterns and processes

Delivery and Resources

RESOURCES

Required and recommended texts and/or materials

There is no prescribed text book for this course. Instead, I have compiled a collection of readings (reviews and key experimental papers) that directly complement the lectures. These are available via the iLearn site for this unit. There is one compulsory reading per lecture, plus optional readings that may expand your appreciation of aspects of the unit in which you are particularly interested. To get the most out of the lectures, it is recommended that you review the compulsory reading before coming to each lecture. The selected papers have been written by world experts in each aspect of ecology and often highlight controversies in the field. I do not expect you to memorise the contents of each paper, but rather in reading these papers, gain an appreciation of the complexity of ecology, its constant evolution as a discipline and how it may be used to solve real-world problems. I have tried to select papers that are relatively free of jargon, but do not be concerned if you do not fully understand everything that you read. It is more important that you understand the general gist of arguments than specific details. If you are struggling with language use of online glossaries may help.

If you would also like to consult a textbook (this is not compulsory), I suggest:

Townsend CR, Begon M, Harper JL (2008) *Essentials of ecology*. 3rd edition. Blackwell Scientific Publications, Cambridge (This is available at the library in special reserve or alternatively can be purchased at the Co-op bookshop). The 2nd (2003) edition is also acceptable, if you can come by it second hand.

Other text books also available in special reserve:

- Begon M, Harper JL, Townsend CR (1996) *Ecology: individuals, populations and communities*. 3rd Edition. Blackwell Science, Boston.
- Krebs CJ (2001) *Ecology: the experimental analysis of distribution and abundance*. 5th Edition. Benjamin Cummings, Publishers, San Francisco, London
- Krebs CJ (2008) *The ecological world view*. 5th Edition. CSIRO Publishing, Collingwood
- Ricklefs R, Miller GL (2000) *Ecology*. 4th Edition. WH Freeman and Co. New York.
- Underwood AJ (1997) *Experiments in ecology: their logical design and interpretation using analysis of variance*. Cambridge University Press, New York.

Unit web page

PowerPoint slides, lecture recordings, unit readings, copies of all unit hand-outs and helpful resources for completion of assessments will be available through iLearn. Consequently, it is strongly recommended that you interact with the BIOL227 online unit regularly. **To access the online unit, go to <https://iLearn.mq.edu.au/login/MQ/> and type in your Macquarie OneID Username and password.**

New to iLearn? You can find out more at: http://www.mq.edu.au/iLearn/student_info/

Experiencing difficulties? Visit: <http://informatics.mq.edu.au/help/>

Unit Schedule

SCHEDULE

Lecture timetable

Part 1. Ecological Methods

WEEK 1

- | | |
|--------------------------------------|--|
| 5 th August | 1. Ecology: what is it and how is it done? (LB: Dr Linda Beaumont) |
| 6 th August
McClellan) | 2. An introduction to ecological field sampling (KM: Dr Katherine |

Part 2. Organisms and their environment

WEEK 2

- | | |
|-------------------------|---|
| 12 th August | 3. Conditions, resources and the niche concept (LB) |
| 13 th August | 4. Distributions (KM) |

WEEK 3

- | | |
|-------------------------|--|
| 19 th August | 5. Global patterns of productivity (LB) |
| 20 th August | 6. Effects of environment on life history (KM) |

WEEK 4

- | | |
|-------------------------|---|
| 26 th August | 7. Population growth and intraspecific competition (LB) |
|-------------------------|---|

Part 3. Interactions among species

27th August 8. Interspecific competition (KM)

WEEK 5

2nd September 9. Predation (KM)

3rd September 10. Parasitism and disease (KM)

WEEK 6

9th September 11. Facilitation (LB)

Part 4. Communities and ecosystems

10th September 12. Describing community structure: diversity and species richness (LB)

WEEK 7

16th September 13. The more the merrier: why biodiversity matters (KM)

field trip preparation...

17th September 14. An introduction to the Smith's Lake environment (KM)

WEEK 8

7th October
succession (LB) 15. Processes influencing community structure: disturbance and

8th October
(LB) 16. Processes influencing community structure: island biogeography

WEEK 9

14th October 17. The flux of energy through food webs (KM)

15th October 18. The flux of matter through food webs (KM)

WEEK 10

21st October 19. Spatial subsidies: another time, another place (LB)

5. Applied ecological issues

22nd October 20. Ecological impact assessment (LB)

WEEK 11

28th October 20. Restoration ecology (KM)

29th October 21. Invasive species and their management (KM)

WEEK 12

4th November 22. Managed ecosystems: agriculture, fisheries and forestry (LB)

5th November 23. Global climate change (LB)

WEEK 13

11th November Exam discussion, revision, 300-level unit information (LB/KM)

12th November No lecture – personal study for the exam

Practical classes

For all practical sessions (including Oral Presentations in weeks 5 and 6) you must be wearing covered shoes to be allowed entry to the labs and there is strictly no eating or drinking.

Timetable for internal students

(external students will be sent a timetable for the on-campus session in the mail)

Week 1	4-5 August	Practical induction
Week 2	11-12 August	Group Practical Part 1
Week 3	18-19 August	Group Practical Part 2
Week 4	25-26 August	Group Practical Part 3
Week 5	1-2 September	Oral presentations

Week 6

8-9 September

Oral presentations

Practical induction

Please meet at your designated laboratory. From there we will head up to the Biology Tea Room (E8A 280) to run through some safety issues pertaining to the pracs in weeks 2-4. We will also hold a question and answer session on sign-up, payment and requirements for the Smiths Lake field trip. We should be finished by 3 pm.

Group Practical Parts 1-3

The practicals during the first half of the semester are focused around the concept of problem-based learning. In Part 1, you will be taken for a walk around the campus and the nearby Ecology Reserve to introduce you to a number of ecosystems. During the walk, you will make observations regarding the distribution and abundance of organisms, from which you will develop research hypotheses. After returning to the lab you will form a group of 3-4 students, decide on a single hypothesis that you will test, and come up with the research plan. The plans will be discussed by the whole class so there is an opportunity for feedback. Once each plan is finalised, you will come up with a list of necessary equipment. In Part 2, the research plan will be carried out. In Part 3, there will be a tutorial on graphing and statistical analysis. You will have time to collate and process your results in your group. Full prac notes will be provided in the first week.

Important:

In weeks 2 and 3 you will be walking to the Macquarie University Ecology Reserve to collect data for the group practical. Please dress appropriately with **sturdy walking shoes** and **long pants**. **Those who are not appropriately dressed will not be able to do the prac and will therefore lose the marks allocated to it.** The prac will go ahead **regardless of the weather**, so bring rain gear if the weather looks doubtful.

Field trip (mid-semester break, September)

All students are required to attend a field trip at the UNSW Smiths Lake Field Station, near Bungwahl at the northern end of the Myall Lakes National Park. You may attend one of two sessions: **A: 20-24 September** OR **B: 24-28 September**. Students who have genuine clashes (e.g. other field trips, work or carer responsibilities; vacations are NOT a valid reason) will be given first preference of fieldtrip. Others are invited to indicate their preferred trip, with remaining places filled on a first-come first-served basis (it is important that we have equal numbers of students on each). Places on specific fieldtrips are not confirmed until full payment has been

made. Sign-ups for field-trips will be done electronically via Google docs. The web link for sign-up will be made available on iLearn from **Mon 11 August**. Please sign up by the end of week 4 (**Fri 29 August**).

Highlights

- Fishing on beautiful Smith Lake
- Nocturnal mammal spotlighting
- Early morning bird watching
- Native plant identification
- Getting to know your fellow students and many of the Biological Sciences staff

Cost

The cost of the excursion will be \$170. This covers cost of food, transport, and a per capita accommodation charge (that goes to UNSW) for the use of the field station. This amount will be due by **Fri 29 Aug** (end of Week 4). Payment is to be made to the Cashier in the Student Centre (Level 1 Lincoln Bldg C8A). The appropriate forms for this are available in the field trip tab of ilearn and hard copies can be picked up in the first prac class. Once you have paid, please register your receipt number electronically via Google docs (link will be available in the field trip tab of ilearn from Mon 11 August). If you are having difficulty paying by the due date please speak to Linda Beaumont to make alternative arrangements. Otherwise, if you have not provided us with a receipt number Week 4, we will assume you are no longer enrolled in the unit.

Transport

Bus transport will be provided. The bus (company: Buses+4WD Hire) will leave Macquarie University from the bus stand on **Macquarie Drive** (outside E3A near the corner of Eastern Rd) at 8.30 am on Saturday 20th September (for students attending session A) and Wednesday 24th September (for students attending session B). **Please arrive no later than 8:15 am**. The bus will not wait for latecomers!

IMPORTANT: If you are running late or miss the bus please contact Andrew Irvine (0427 142 893) or Linda Beaumont (0431 528 574) to make alternative transport arrangements.

The bus will return from Bungwahl on the 24th September (session A; return to MQ around 5 pm) and 28th September (session B; return to MQ around 2 pm).

Those students who live out of Sydney and wish to take their own car should ask for permission

when they select the session they want to attend. Since parking at the Field Station is limited, only those students with a genuine need to drive their own car will be given permission to do so.

Accommodation

Accommodation is primarily in bunk rooms (6-10 beds per room). Please bring your own bedding and pillow, keeping in mind that it is COLD at night (the rooms are not well insulated). A limited amount of space is also available for camping (BYO tent). Camping will be allocated on a first-come first-served basis.

Location

For those making their own way, Smith Lake Field Station is situated about 3 km from Bungwahl (between Bulahdelah and Forster) off the Seal Rocks Rd.

Bungwahl is on the Lakes Way from Bulahdelah to Forster. Turn right to Forster (signposted) opposite a service station, 2 km north of Bulahdelah on the Pacific Highway. At Bungwahl turn east for Seal Rocks (again, signposted). After about 2 km turn left up a steepish dirt road opposite the Fisherman's Cooperative (well beyond the school and the last building on the right out of Bungwahl with a wide parking area around it and a petrol pump outside) and also opposite the turnoff to Myall Lakes National Park. On the dirt road, do not turn left after about 100m, but keep straight on for about 1.5 km. You will pass a private house on the left and then the Field Station is just over a bridge.

If travelling by car you should plan to arrive by 12:30 pm on Sat 20th Sept (session A) or Wed 24th Sept (session B). The field-trip plan will be explained over lunch and then there is work planned from 2 pm onwards. Travelling time from Macquarie Uni is approx. 3.5-4 hrs

What to bring

The field station has bunk beds, showers and toilets, and cooking and eating utensils.

You will need to bring:

- Sleeping bag
- Pillow and pillow case
- Toiletries, towel, sunscreen, insect repellent
- Clothing appropriate for field work in scratchy vegetation, including sturdy footwear, a hat and **rain gear**. There may be snakes about during the day if the weather is warm so long pants are recommended (and are required for the vegetation prac). It will be COLD at night.

- Swimming costume, shorts, sun top and sand shoes (you may be required to wade in waist-deep water in the lake). If you have a wet suit, bring it.
- Torch (if you want to go spotlighting)
- Binoculars (if you have them)
- Day pack to take things out in the field
- Water bottle
- Notebook, pens, calculator, notes etc

IMPORTANT: WHAT NOT TO BRING

We have unfortunately experienced some thefts at the field station. **Please** do not bring a lot of cash or valuables as we cannot ensure their safety.

Program

You will spend a half day prac studying each of five different ecological communities: fish, birds, plants, aquatic invertebrates, and terrestrial invertebrates. On the last day you will be working in small groups to compare the distribution and abundance of organisms between two habitats of your choice. This project will form the basis of the second Practical Report (due Mon 20th Oct, all students). A detailed program will be provided on arrival at the field station.

IMPORTANT NOTE:

Like the practicals, the field trip will involve some walking and perhaps scrambling over difficult terrain. If your health is likely to be adversely affected by exertion of this kind, you are strongly advised to discuss with a doctor whether you should undertake this course. While some of the staff attending the excursion have First Aid certificates, qualified medical assistance is some 40km from the Smith Lake Station. There will be first aid kits provided but **no medication will be supplied**.

So you must bring your own medication if required, including pain relief tablets and antihistamines.

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](#). Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit <http://informatics.mq.edu.au/help/>.

When using the University's IT, you must adhere to the [Acceptable Use Policy](#). The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Explain how organisms interact with each other and their environment
- Analyse how biological interactions influence patterns of distribution and abundance
- Analyse the structure of and changes in populations, communities, and ecosystems
- Apply ecological concepts to novel situations, especially to contemporary issues
- Develop questions and pose hypotheses about ecological patterns and processes
- Collect and analyse ecological data in order to evaluate hypotheses

Assessment tasks

- Problem Set 1
- Practical Report
- Smiths Lake Report
- Final exam

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to

have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Explain how organisms interact with each other and their environment
- Analyse how biological interactions influence patterns of distribution and abundance
- Analyse the structure of and changes in populations, communities, and ecosystems
- Apply ecological concepts to novel situations, especially to contemporary issues
- Read scientific journal articles critically and evaluate the authors' conclusion
- Develop questions and pose hypotheses about ecological patterns and processes
- Collect and analyse ecological data in order to evaluate hypotheses

Assessment tasks

- Problem Set 1
- Oral Presentation
- Practical Report
- Field trip graphing exercises
- Smiths Lake Report
- Problem Set 2
- Final exam

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Analyse how biological interactions influence patterns of distribution and abundance
- Analyse the structure of and changes in populations, communities, and ecosystems
- Apply ecological concepts to novel situations, especially to contemporary issues
- Read scientific journal articles critically and evaluate the authors' conclusion
- Develop questions and pose hypotheses about ecological patterns and processes
- Collect and analyse ecological data in order to evaluate hypotheses

Assessment tasks

- Problem Set 1

- Oral Presentation
- Practical Report
- Smiths Lake Report
- Problem Set 2
- Final exam

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- Read scientific journal articles critically and evaluate the authors' conclusion
- Give oral presentations that synthesis information on ecological topics

Assessment tasks

- Oral Presentation
- Practical Report
- Field trip graphing exercises
- Smiths Lake Report

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcomes

- Apply ecological concepts to novel situations, especially to contemporary issues
- Give oral presentations that synthesis information on ecological topics

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and

country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcomes

- Explain how organisms interact with each other and their environment
- Apply ecological concepts to novel situations, especially to contemporary issues
- Collect and analyse ecological data in order to evaluate hypotheses

Changes from Previous Offering

Changes to unit from earlier offerings • BIOL227 is on iLearn! This will provide even more opportunities for online interaction with unit materials. Be sure to check the site regularly. • Sign-up for the field trip is fully online. The web-site for sign-up will be accessible as of Mon 11 August and will close on Friday 29 August. Be sure to sign up within this period to avoid missing out. Details of how to access the web-site and pay for the fieldtrip will be provided in week 1 pracs (internal students) or by email (external students). Each of the field-trips will be filled on a first-come first-served basis. Places are not guaranteed until payment is received. • The turnitin plagiarism check for the Practical and Field Trip reports is now available through iLearn (see Assignment Submission, pages 5-6, for further details).

Changes since First Published

Date	Description
25/06/2014	corrected and updated
15/01/2014	The Prerequisites was updated.